Study on Contract Structure and CSFs of PPP for development of Sustainable Airports in India

A thesis submitted to the
University of Petroleum and Energy Studies

For the Award of
Doctor of Philosophy
in
Management

by
Avin Shekhar Chourasia

September 2022

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School of Business
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DECLARATION

I declare that the thesis entitled **Study on Contract Structure and CSFs of PPP for development of Sustainable Airports in India** has been prepared by me under the guidance of Dr Karunakar Jha *[Former Professor-UPES],* Director (Academic Affairs), Universal Business School, Kushville Village, Vadap, Gaurkamat, Karjat, Distt.- Raigad, Maharashtra, and Dr Narendra N. Dalei *[Former-Asst. Professor (SG)- UPES],* Associate Professor, Department of Economics, Associate Director (Research), Central University of Himachal Pradesh, Dehra Gopipur, Himachal Pradesh. No part of this thesis has formed the basis for the award of any degree or fellowship previously.

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ACKNOWLEDGEMENT

It is a great pleasure to express my deep sense of gratitude and hearty thanks to my supervisors Dr Karunakar Jha *[Former Professor-UPES],* and Dr Narendra N. Dalei *[Former-Asst. Professor (SG)- UPES],* for their valuable guidance, constant supervision, tireless inspiration, constructive criticism, and affectionate attitude during the entire research works and preparation of the manuscript. I can mention that without their supports, this thesis would not have been completed in the present form.

I would also want to thank the members of the SRC and DRC (School of Business, UPES) for their thoughtful remarks and suggestions.

My heartfelt gratitude goes to my external supervisor Dr Satarupa Bhattacharjee (CEO, M/s. Pristdel Private Limited) for her encouragement and enduring support throughout my doctoral study.

I owe special thanks to Mr Gautam Poddar (Dy Manager, Corporate Affairs at Mumbai International Airport Ltd.), Mr Gopal Chand (Asstt. General Manager, Corporate Planning & Management Services, Airport Authority of India), Mr Yogendra Kumar Chaurasia (Asstt. General Manager, Civil, Airport Authority of India), and Ms Bharti Singh (Asst. Professor, School of Business, UPES), for their support. Their extensive knowledge and familiarity with the field greatly aided me in completing this research work.

I am heartily thankful to my colleagues Dr Baiju Radhakrishnan (Professor and Group Director, SCMS Group of Educational Institute), Mr Deepak Rai (DGM, Nippon Koei India Ltd.), and Mrs Minnu F. Paydnath (Asst. Professor, Rajagiri Business School), Mr Rajasekhar Yalamanchili (Consultant, Nippon Koei India Pvt. Ltd.), Mr Surendra Kumar B S (Dy Contract Expert, Geodata India Pvt. Ltd.), who have been a constant spring of inspiration and knowledge to me.

A simple word of thanks is not enough to my parents Shri Ajay Chourasia and Smt. Kiran Chourasia and my elder brother Shri Shashin Shekhar Chourasia have enabled me to think right and tread straight with focus.

It is my pleasure and privilege to thank all of them, though I am not able to mention the name of every individual here; however, I highly respect their kind help and support.

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Executive Summary

India's civil aviation business has risen to become one of the country's fastest-growing industries in the last two decades, and it is expected to continue to do so in the coming decades. As a result of this growth, current airport infrastructure has been put under severe strain, forcing existing airports to expand capacity and new airports to be built. A considerable investment was required to develop world-class airports, but government and airport authorities were neither able to support modernized infrastructure facilities in the airports nor the development of more airports due to fund constraints. Public-private partnerships (PPP) were adopted to modernize, expand and develop new airports in India. Accordingly, five airports in India were developed using the PPP model. The public-private partnership (PPP) model for airports is defined as a partnership between the government and the private sector that entails major investment, infrastructure upgrades, and capacity development. PPP in airport development addressed the various problems of the airport like poor passenger services, obsolete infrastructures, insufficient space and ground handling systems, and providing world-class airport infrastructures. Various market research and case studies indicate that private engagement in airport operations has resulted in higher operating performance, better facilities, and increased capital investment.

As of now, PPP seems to be a thriving option for the development of airports in India, but the world has also been noticed some failures of PPP airports, i.e., Costa Rican Juan Santamaria International Airport (SJO). Some important concerns associated to the development of PPP airports in India were highlighted by some authors in their research papers, and some articles were also published in the prominent newspapers of the country. These issues were related to the financial gaps, cost overruns, time delay, change in scopes, financial losses, land exploitation, change in shareholding pattern, overbuilding of airports, and environmental and social sustainability. A study is required to understand such contractual as well as sustainability-related issues of Indian PPP airports. Accordingly, this study was taken up to analyze the contract structure, critical success factors (CSFs), and sustainability of the Indian PPP airports.

On the identified business problem, a thorough and systematic literature review was undertaken. Following are the research gaps that were identified during the literature review. To begin with, the PPP airport's contract structure has not been investigated. Second, the

interrelationships between critical success factors of PPP airports are not investigated. Third, the influence of PPP on airport sustainability has not been investigated.

Based on the given justification and identified research gaps, the current study aims to accomplish the following:

(1) Study the Contract structure of PPP airports.

(2) Examine the interrelationships among CSFs of PPP airports.

(3) Study the impact of PPP on the sustainability of airports.

The first objective of the study employs a qualitative method, 'document analysis'. The transactional documents (contract agreements) of Delhi International Airport and Mumbai International Airport were analyzed based on the developed codes and themes. The outcomes of the first objective were considered to draft the list of preliminary critical factors of PPP airports for the second objective. However, these CSFs (i.e., supervision, financial abilities, information disclosure, and legal framework) were further confirmed in the literature review and a detailed conversation with the experts during working on the second objective.

The second objective of the study employs quantitative methods. Some of the critical factors were drawn from the outcomes of the first objective. Further, these CSFs were confirmed, and other CSFs were drawn from existing literature. Total twenty-three CSFs were considered after having detailed discussions with the experts. Following that, a comprehensive questionnaire was created, and a pilot survey was conducted. In accordance with the feedback received through the questionnaire survey and suggestions received during the in-person interviews, the questionnaire was revised. The final questionnaire was sent to industry professionals who have relevant experience in PPP airport and/or airport projects as a client/consultants/contractors. A total of 78 numbers responses were received, out of which eight numbers responses were not considered as those were incomplete. Hence, the analysis was conducted considering the 70 responses. The Analytical Hierarchy Process (AHP) was used to build a hierarchical model for determining the most relevant critical factors for the successful development of airports using PPP in India.

Moreover, the inter-relationships among these CSFs were examined. Eight hypotheses were established based on an intensive literature research and a detailed conversation with three industry experts with experience in the field of public-private-partnership airports.

The above-mentioned questionnaire was taken into consideration, and a new pilot survey was conducted to improve the questionnaire's content validity and reliability. Subsequently, the questionnaire was amended in light of the input obtained. After that, the final questionnaire

was sent to the industry professionals who are/were involved in public-private-partnership projects and/or airport projects. A total of 182 replies were obtained, with 170 of them being accepted due to their completeness. The hypothesized model was tested by means of Partial Least Square–Structural Equation Modeling (PLS-SEM) through the SmartPLS software (version 3.2.2).

The third objective of the study employs a quantitative method; PLS-SEM. The impact of PPP on economic sustainability, social sustainability, and environmental sustainability was examined. An extensive literature review was adopted to investigate PPP factors that affect the sustainability of airports. A total of 6 independent variables were considered, and a questionnaire was developed. To improve the questionnaire's content validity and reliability, a pilot survey was undertaken. Following that, the questionnaire was amended in light of the input obtained, and the final questionnaire was distributed to industry professionals who are/were associated with Delhi International Airport or Mumbai International Airport. A total of 90 responses were received for Delhi International Airport, and 85 responses were received for Mumbai International Airport. A PLS-SEM was used for analyzing the impact of PPP on the sustainability of airports, and SmartPLS software (version 3.2.2) was used to test the hypotheses and analysis. The influence of PPP on airport sustainability was investigated using a PLS-SEM, and the hypotheses were tested by means of SmartPLS software (version 3.2.2).

The study's findings of the first objective identify that the contract structure of both Delhi and Mumbai International Airports follow the structure of the Project consortium wherein the contracts between AAI and DIAL (JV), and AAI and MIAL (JV) were signed for Delhi and Mumbai airports, respectively. The lead party of the JV/consortium has more share percentages in the consortium. According to the shareholding structure of DIAL (as per shareholding agreements dated 4th April 2006), GMR Infrastructure Limited (31.10%) is the lead member in the Delhi International Airport. Similarly, as per the shareholding structure of MIAL (with reference to shareholding agreements dated 4th April 2006), GVK Airport holdings Pvt. Ltd. (37%) is the lead member in the Mumbai International Airport. However, members of the joint venture are allowed to transfer their shares as per Sub-Clause No. 2.5 JVC Ownership Structure of the OMDA. Delhi and Mumbai airports are an example of successful PPP implementation in airport development in India. However, some anomalies in the contract agreements were found, which will need to be addressed in the future for development or up-gradation of airports through PPP. The contract agreements of these airports were not balanced and the concessionaires received preferential treatments. Because this study did not cover all of the

provisions of the OMDA for these two airports, another study may be undertaken to analyze the numerous provisions of the OMDA and to check the sections that were not adhered to during the contract execution.

The findings of the second objective revealed, effective project management, government cooperation, financial abilities, and appropriate risk allocation are the top four CSFs. Further, the finding demonstrate that process characteristics have a greater effect on public characteristics and, similarly, cooperative environment has a greater effect on process characteristics. On the other hand, process characteristics have a minor effect on private characteristics. The study also discovered that efficient government oversight is essential in order to provide high-quality services and public-interest preservation through a PPP framework. Customers' satisfaction and opinions also play a role in providing excellence services and greater value-for-money.

The findings of the third objective identify that public-private partnerships have a significantly positive affect on the economic sustainability of both Delhi and Mumbai International Airports. However, there is comparatively less influence found on the social sustainability and environmental sustainability of both Delhi and Mumbai International Airports. To achieve social sustainability and environmental sustainability equally along with economic sustainability, there shall be a direct involvement of the government in developing and implementing the strategies. There shall be involvement of regulatory authorities who control the activities of JV and provide a motivation to achieve social as well as environmental sustainability. Under a PPP framework, effective government oversight is also essential to deliver high-quality services and defend the public interest. Sustainable airports can be developed by keeping the critical factors under control, as shown by the lessons learnt from Delhi International Airport and Mumbai International Airport, where environmental and social sustainability lag significantly behind economic sustainability. To achieve environmental and social sustainability is indispensable along with economic sustainability. Ultimately sustainable airports are essential that conceivably develop by earnestly considering the ensuing components of sustainability:

(1) Policy formulation: Policy statements, trade policies, and regulations for sustainability, benchmarking, design factors for airport and aircraft, technological breakthrough, security, safety, administration of resource, effective usage of airport capacity, and consolidated transportation planning.

(2) Finance: Prospective financing, rate of return, concessions/tenants, financiers, regulating agency.

(3) Social conscience: Civic participation, betterment of living standard, equality in airport access, employment generation, human rights protection, innocuous life.

(4) Environment: Atmospheric pollution, noise emissions, pollution of hydrosphere, conservation of water, solid waste management, dryland management, and energy.

(5) Quality of service: Trustworthiness, receptiveness, guarantee, palpability, promptness, modernization, and gratification.

The study has added to the current body of knowledge. The uniqueness peculiarity is that it looked into the contract structure of PPP airports which had never been looked into before. The study has empirical contributions as it explained the importance of public opinion and satisfaction in PPP airports and elaborated the direct impact of government characteristics and cooperative environment on the process and private characteristics of PPP airports. As the study focused on the factors of PPPs, policy makers are mainly expected to be the beneficiaries. Policy makers should definitely consider the impact of a cooperative environment and accordingly design a favourable legal framework, commercial viabilities, and sound economic policies for successful private participation in PPP airports.

There are additional methodological contributions in the work. Although PLS-SEM is widely utilized in the social sciences and a variety of business disciplines, it is rarely used in the infrastructure sector. For studying the interrelationships between the critical success factors of PPPs, the study developed a formative-formative model utilising a unique methodology, the PLS-SEM. This model is also capable of accurately predicting private characteristics, public characteristics and process characteristics.

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Chapter 1. Introduction

1.1 Overview

1.1.1 Public-private partnership (PPP)

The phrase "public-private partnership" (PPP) was coined by the Labour government of the United Kingdom in 1997. Although there is no widely accepted definition of a public-private partnership, it can be defined as a large contract involving government and private agencies for the provision of services\assets delivery to the public wherein the private agency bears the substantial risk and administration responsibility and remuneration is associated with performance (World Bank Report, 2014). In general, the private partner is accountable for more commercial functions of designing, constructing, and operating along with project financing. PPP is an approach used across a wide range of public-sector infrastructures to improve infrastructure's output for economic benefits (Cui et al., 2018). The goal of PPP is to attain both substantial growth and equity on a long-term basis (Kumar et al., 2018). The private party is exposed to significant risk and is also responsible for management. In contrast, the government body participates as a partner or regulator in the PPP project to ensure effective utilization of the resources and delivery of the object as per contract agreement on the specified time duration. As a result, there must be an adequate risk distribution and management between the private party and public entity (Zhang, 2005). There are various PPP formats for including private parties, depending on the risk allocation and responsibilities between the private partner and the public authority. Contractual-PPPs and Institutionalized-PPPs are the two types of public-private partnerships:

 (1) Contractual PPP: The Contractual PPP is purely appertaining to contractual relationships involving the public agency and private parties. In the Contractual PPP, there are various types of arrangements that are dependent on the project's characteristics and risks exposure. Some of the PPP models are listed hereunder:

    (i) BOT (Build-Operate-Transfer): The private partner under this model is accountable for the designing and constructing the facility. The facility will thereafter be operated until the concession period has come to an end, following which this is going to be returned to the public body. The private partner also

finances and maintains the project while it is in operation. To gain a return on investment, the private partner may levy user fees.

(ii) BOOT (Build-Own-Operate-Transfer): This concept is analogous to BOT, but with a difference in the facility's 'ownership' throughout the concession time. During the concession time, the private partner will own the facility and then hand it over to the government/public body at the close of the concession period. The private partner is also responsible for the facility's design, construction, and operation under BOOT. BOOT is more efficient since the private partner owns the company, which creates a better management environment. It is better suited to the creation of a new service facility than to the improvement of an existing service facility (Bashiri, et al., 2011).

(iii) BOO (Build-Own-Operate): The private partner, in this arrangement, designs and builds the facility, then owns and operate it. The private partner owns the facility, and the public entity has a contract to 'buy' the facility's goods and/or services according to the terms of the contract (Sambrani, 2014).

There are some other models of PPP like Build-Transfer-Operate (BTO), Design-Build-Operate (DBO), Build-Lease-Transfer (BLT), Lease-Develop-Operate (LDO), Design-Build-Finance-Operate (DBFO), Rehabilitate-Operate-Transfer (ROT), etc. are available.

(2) Institutionalized PPP: The institutionalised PPP entails the formation of a joint-venture (JV)/consortium in which the public body and private entity collaborate. A private party can also become a part of the entity by purchasing or owning shares in a public body that already exists. As a shareholder or through special provisions, the public partner typically has authority over the entity. The entity is in charge of supplying the facilities to the general public. The institutionalised PPP's key advantage is that the public partner retains authority over the corporation and its parities.

PPP is a long-term contract amongst a public body and a private entity in which the private organisation is given the right to run a facility in accordance with the terms of the contract.is a long duration contractual arrangement involving the public body and private entities wherein the private entity is provided with a right to operate a facility as per the contract agreement. How the work shall be carried out, services to be provided need to

specify clearly in the contract, along with adequate risk allocation between the parties. PPPs will only be successful if the service/work requirements allow the private partner to add his or her own skills and knowledge while the public authorities provide proper oversight. If there is a risk transfer to the private partner at a high level, the cost will be high, and there will be benefits in terms of process and delivery quality. When all obligations are delegated to the private partner, the private party has a lot of leeway in terms of making efficient changes to the project's design and maintenance while decreasing the area for discussion and lowering the expenses related to extensive negotiations. Similarly, if the private partner transfers a significant portion of the big risk to the public partner, the cost will be lowered, but the private partner's potential gains in terms of quality improvement and innovation will not be recognised.

Following are the features of the public-private partnership contract stated by (Habets, 2010) that differentiate it from the traditional methods of procurements:

a. Constrict the phases of the project within an exclusive contract
b. A method for defining output specifications
c. Major risks sharing by the private partner
d. A long duration contracts

1.1.2 Contract structure of PPP

In a PPP project, private parties, government bodies, and/or civil-society organizations combine their resources based on their expertise and jointly work to achieve the pre-decided goals. But it is found that such collaboration is difficult to maintain, and the possibility for the occurrence of collaborative inertia (collaborative inertia is a negative experience that leads to slow output and discouragement of the partners). The collaboration has multiple views and is characterized like contradictions, tensions, and predicaments and complications. The collaborative inertia can be avoided by developing a more effective, accountable, and appropriate PPP structure wherein the coordination between the partners is considered important (Stadtler, 2012).

A PPP structure typically defines the procedures, roles and responsibilities of all the partners involved in that PPP project. How the things to be processed, by whom, in which order, and which partner will play what role at each step in the PPP generally specified under the contract structure of PPP. The contract structure of PPP depends upon the type

of PPP model. It varies with the PPP model adopted for developing an infrastructure facility.

There are involvements of many partners having different expertise/skills in the PPP project. As the number of partners increases on the PPP, the number of potential relationships increases exponentially. Accordingly, a fundamental problem of accommodation and coordination of activities between the multiple partners occurs (Provan & Kenis, 2008). Under such conditions, a contract structure becomes extremely complex. Three basic models or forms of PPP structure were proposed by (Provan & Kenis, 2008) and then explained by (Stadtler, 2012), which are lead organization structure, administrative organization structure, and shared governance structure.

In a lead organization structure, one of the partners acts as a lead organization, and all major activities, key decisions are coordinated through and by the lead organization of PPP. Therefore, this PPP structure is highly centralized and brokered, with asymmetrical power. To achieve the desired goal, the administration facilitates the activities for other partners of the structure. Basically, the lead organization reduces the points of conflict by reducing the points of interaction among other partners of the structure. The number of partners shall be moderate for adopting a lead organization structure for developing a PPP.

The administrative organization structure is similar to the lead organization structure but having one major difference is a separate administrative entity is a setup specifically to govern the structure and its activities. All major activities, key decisions are coordinated through the administrative entity of the PPP structure. All partners of the PPP structure mandate the administrative entity that manages the PPP operationally and builds a formal board or committee. The number of partners shall be moderate to high for adopting an administrative organization structure for developing a PPP.

In a shared governance structure, all partners/participants/members of the structure govern all the major activities and key decisions. All members themselves administrate with no separate and unique governance entity. Therefore, the coordination within the structure depends exclusively on the involvement and commitment of all the partners. This structure has low centrality, and it shall be adopted where the number of participants is very low.

1.1.3 Critical success factors of PPP

Critical success factors (CSFs) were first presented in 1979 by John F. Rockart and the MIT sloan school of management. The concept was developed with the phrase first used in the context of information systems and project management. Then it was formulated in a book by Schraer in terms of 80:20 rules, which says that 'only 20% of the total effort required to solve a problem fully needed to achieve 80% results' and the CSF method pursues to identify such 20% factors. In the context of a PPP, CSFs are those factors that need to be conserved in order to improve the accomplishment of a project's success so that the objectives of its different stakeholders are achieved (Morledge & Owen, 1998). Critical factors of PPP control the success of a project. A PPP project is called successful when it achieves its objectives in terms of delivering excellent outcomes that satisfy the goals of the government, the needs of society, and propitious financial return to the private partner. Lossa & Spagnolo (2007) have studied the contract design for PPP and listed the external and internal factors of PPP, which significantly affect the outcomes of PPP. These factors are; a) the characteristics of the sector and the market structure wherein PPP is to be implemented, b) the degree of macroeconomic instability, c) the regulatory and institutional framework of the country wherein PPP is to be implemented, and d) the contract design and management of PPP contract. The listed factors a) to c) are the external factors, and d) is the internal factors.

Contract design of PPP deals with the contractual arrangements between the private and public partners of PPP. It helps to allocate the risk between the involved parties and drafting of contracts terms and conditions. As the PPP contracts are long-term contracts, any mistake during the contract drafting may become a costly event for the public sector partner. Poorly designed PPP contracts and misspecifications of PPP contracts lead to the failure of the PPP project.

CSFs of PPP in an airport are broadly categorized as; macro factors and project-specific factors, which are dealt with as an operational PPP policy in the country/region and PPP contract agreement in the project. Ayo-Vaughan et al., (2019) have studied the CSFs for PPP airport infrastructures and classified the CSFs into two categories; internal success factors and external success factors. Some authors like (Gleave, 2012), (Hussain, 2010), etc. have also classified the CSFs of PPP airport into financial feasibility, stable

regulatory & institutional framework, prevailing environment, apparent procurement procedure, availability of robust concessionaire consortium/association, adequate risk distribution, and application of sound technical solutions. The CSFs can be identified by using quantitative measures or by expert opinions (Zhang, 2005).

1.1.4 PPP in airports

The application of PPP has been used in the development of the different types of infrastructures, including airports. The participation of the private party in the development of airports has enabled the cash-strapped government to provide world-class airport infrastructures. It also contributes to a country's international competitiveness and brings foreign investment (Chaudhuri, 2011). However, fully privatized airports are very rare, and participation of private parties is made through PPP. There are different PPP models, i.e., BOO, BOT, BOOT, etc., available by which private participation is made by keeping a certain intervention of the government. The PPP models for airports may be defined as a shareholding between government and private parties which is based on high investment, building facilities as per international standards, enhancing the capacity of airports to handle the increased number of passengers & cargo (Gupta, 2015). PPP in airport development addressed the various problems of the airport like poor passenger service, obsolete infrastructure, insufficient space, and ground handling system and provided world-class airport infrastructures. Several market studies and cases show that private participation has brought greater operating efficiency, improved amenities, and increased capital investment for airports (Starkie, 2018).

The participation of private parties in publicly owned airports has become a global trend. In the year 2015, the centre for aviation issued a report wherein it was stated that 40 airports out of 100 largest airports throughout the world are either fully or partially owned or governed by private investors in the context of revenue (In et al., 2017). India has also followed other developed countries and adopted PPP for the development of airports. Airports in Delhi, Mumbai, Hyderabad, Bengaluru, and Kochi were developed using PPP models. Delhi and Mumbai airports are brownfield airports, while the airports in Bengaluru, Hyderabad, and Kochi are greenfield. The private participation in Delhi, Mumbai, Hyderabad, and Bengaluru airport is 74%, while the share of the public sector through AAI or the relevant state government is 26%. Indira Gandhi International

Airport, Delhi, is owned and operated by DIAL (Delhi International Airport Limited) that is a consortium of GMR Group – 64%, Fraport AG - 10% and AAI - 26%. Chatrapati Shivaji International Airport, Mumbai, is owned and operated by MIAL (Mumbai International Airport Limited), a joint venture between GVK consortium (GVK, Airport Co. South Africa Ltd., Bidvest Group) - 74% and AAI - 26%. Rajiv Gandhi International Airport, Hyderabad, is owned and operated by GHIAL (GMR Hyderabad International Airport Limited), a joint venture between GMR Group - 63%, Malaysia Airport Holdings Berhad - 11% and AAI - 13%, Government of Telangana - 13%. Kempegowda International Airport, Bangalore is owned and operated by BIAL (Bangalore International Airport Limited) that is a consortium of Karnataka State Industrial Investment and Development Corporation - 13%, AAI - 13%, private companies; Fairfax Financial - 48% and Siemens Project Ventures - 26%. Cochin International Airport is the 1st Indian airport built on public-private partnership and is owned by a public limited company 'CIAL' (Cochin International Airport Limited), a joint venture between the Government of Kerala (GOK), Indian government companies (Air India, BPCL), Foreign companies (Emke group, Galafar group, Majeed Bukatara, commercial banks (federal bank, SBT and canara bank) & NRIs. Following is the stakeholding structure of CIAL: GOK - 33.36%, Indian Government Companies - 8.74%, Foreign Companies - 5.42%, Indian Companies - 8.57%, Commercial Banks - 5.91%, NRIs - 38.03%.

There are 153 airports in India; 29 International airports, 10 Customs airports, and 114 Domestic airports (Airport Authority of India, 23rd June 2020). Five airports have already been developed using PPP models. Recently, AAI has been approved the development of 13 more airports (Six major airports; i.e., Amritsar, Bhubaneshwar, Indore, Raipur, Trichy and Varanasi, and seven smaller airports; Aurangabad, Gaya, Hubli, Jabalpur, Kangra, Kushinagar, and Tirupati) by PPP model (Times of India, 10th September 2021). Delhi airport used to call Palam airport. It became a passenger airport in 1962 and was able to handle a maximum of 1300 passengers an hour. In 1986, Palam airport was officially renamed Indira Gandhi International Airport, wherein a new terminal (terminal 2) was constructed. Terminal 1 was continued to use for domestic flights, and terminal 2 served as the new hub for international flights. As the aviation demands grew exponentially after 1990, there was a need to expand the capacity of the airport. Accordingly, the government decided to develop and modernize the airport using PPP, and subsequently, Delhi airport was awarded to GMR consortium in January 2006 after completion of the bidding process. The construction of terminal 3 was started in 2006

and completed in 2010. The airport is being operated by Delhi International Airports Ltd. (DIAL), which is a consortium led by the GMR group. The airport handled 69.23 million passengers in 2018-19.

Mumbai airport used to call Sahar airport. It was renamed Chhatrapati Shivaji Maharaj International Airport in 1999. It was decided by the government to expand and modernize the airport by PPP in 2003, and the bidding process started in May 2004. In January 2006, the airport was awarded to GVK lead consortium, and a special purpose vehicle (SPV) was set up called Mumbai International Airport (MIAL) for the development, operation, and maintenance of the airport. There are two terminals, T1 and T2, in the airport. Terminal T1 is to cater to domestic passengers and terminal 2 for international services besides domestic operations for some of the Indian airlines. In FY 2018-19, the airport handled 48.83 million passengers.

Both the airports were developed using the build-operate-transfer (BOT) model and had 30 years concession period, which can be further extended for 30 years. The concession agreement for the modernization and operation of both the airports is referred to as the Operation Management and Development Agreement (OMDA) which is a part of transaction documents. The contractual terms and conditions for structuring the pubic-private partnerships are laid out in the OMDA of respective airports. However, the structuring and award of such a large PPP airport is very complex and throws up several significant issues (Jain et al., 2007).

The PPP model adopted for the development of these two airports is associated with the contract theory that deals with the legal agreements between the public and private partners of PPP for the long terms concession period. The original model of Hart (2003) explained that there are involvements of a contractor and an ordering party (public authority) in the development, construction, and operation of a specific service that is similar to the concept of the BOT model of these two airports.

1.1.5 Sustainable airports

Air transportation is considered an important part of the transportation infrastructure, and it has a great impact on urbanization and growth of economy. Airports and aircrafts together make air transportation possibly feasible. The airport consists of airside and landside infrastructures required for the steady operation of aircraft. The airport infrastructure is a critical part of airport sustainability as it provides support to aircraft

operation. Airports significantly add to the local economy and facilitate a country's integration into the global economy. However, together with the socio-economic benefits, airports affect the environment in many stages, i.e., construction as well as operation. Anti-environmental behaviour has long been a stronghold at airports. The environment and human lives are both adversely affected by airport development and operation. In their immediate surroundings, airports have a tremendous effect on the environment, ecology, and society. Some of the most challenging environmental and sustainable development concerns, such as aircraft emissions, noise during aircraft operation, use of land, treatment of water and traffic congestion, and power generation and utilization, have been raised in relation to airport operations, and regulatory authorities must address them in order to minimise the impact on the environment and social life. The airport authorities must find a balanced strategy to increasing the capacity of existing airports while also exploring the possibilities and potentials for future development of new airports while minimising the negative consequences. The social and environmental responsibility of airports is critical. As a result, measures must be taken to reduce the negative influence on the environment while also improving the social life of the airport's corporate activities. The future of airport planning is developing sustainable airports.

A sustainable airport is a practice to improve the airport's financial performance along with minimizing the adverse effect on the environment and providing significant benefits to society. The term 'sustainability' was first introduced in the Brundtland report in 1987 and defined as a process wherein the development meets the present requirements without detriment to the capability of forthcoming generations to meet their own requirements. Boons et al. (2010) have applied the term 'sustainability' as a notion to strike a balance between the economic, ecological and social impacts. In sustainability, there shall not only be a consideration for the environment but also apprehension for social and economic growth. A business is called sustainable when there are significant considerations for the impact on the environment, society, and regional and national economy.

There are three aspects of sustainability; economy, environment, and social. Considering all three aspects of sustainability altogether are usually denoted as the triple-bottom-line (TBL). The framework of TBL was introduced in the 1990s by John Elkington for

assessing sustainability. The TBL may be measured by economic, social, and environmental lines.

(1) Economic line (Ec): The influence of an organization's business operations on the provincial and global economy is characterised as the economic line of TBL (Elkington, 1997). It assesses an organization's effect on economic growth as a result of its operations. Earnings, spending, the low employment rate, workforce sharing, employment creation, income creation, GDP contribution, ability to contribute to gross state product, procurement processes, indirect economic consequences, and anti-competitive behaviour are some of the factors that deal with the economic line.

(2) Social line (S): The consideration of a company's fair and advantageous business practises to the worker, employees, social resources, and society is defined as the social line of TBL (Elkington, 1997). It calculates the earnings a company makes in terms of human capital as a result of its operations. The impact of a company's operations on workers, vendors, financiers, users and domestic and international communities is referred to as social sustainability.

Social variables include health, well-being, and quality of life, as well as equality and access to social resources and education. Workforce architecture, employee management, staff/labour wellbeing, safety regulations, medical facilities at the working area, provision for skills and retraining, non-biased social engagement, sound business practices, civil rights integration, local official, distributor management, policy initiatives, health and security, and consumer autonomy are some of the variables that Global Reporting Initiatives (GRI) established guidelines to assess the impact on society with.

(3) Environmental line (En): TBL's environmental line is described as the assessment of the environmental impact of a firm's business operations. When a firm's business does have a lower environmental effect and uses fewer natural resources, it will last longer and be more profitable. The consequence of wastes, pollutants, emissions, and greenhouse gases on the environment can be controlled and maintained by documenting the resource consumption for operating the company and the effect on the environment by releasing wastages, pollution, emmisions, and greenhouse gases.

Environmental sustainability factors track environmental effect (air pollution, water pollution, noise pollution), resource use (renewable and non-renewable), and natural resource degradation. Water and air quality, energy usage, solid and toxic waste,

unnecessary nutrients, energy consumption, waste treatment, water management, groundwater, and land conversion may all be taken into account.

Further, John Elkington, 1994 has addressed 'sustainable development', which involves the simultaneous pursuit of economic prosperity, environmental quality, and social equity. Term sustainable development is identical to sustainable growth. However, sustainability and sustainable development are not identical. Sustainable development is a 'development' that need to be sustainable in term of economically, environmentally, and socially. The same may be measured with TBL.

For aiming the development of sustainable airports, there must be accountability not only for the financial bottom line but also the social development and environmental protection due to numerous activities of airports.

1.2 Motivation for the research:

Thirty years ago, all major airports around the world were public entities and were considered to be a strategic part of infrastructure without any reason for the transfer of ownership or management to the private sector. But at present, airports have become commercialized and devaluated from the public sphere using different modes of airport ownership and management with private sector participation. Similarly, India is also going ahead with the commercialization of public airports, considering the international experience of PPP in airport development. Accordingly, Cochin, Delhi, Mumbai, Hyderabad, and Bangalore airports are developed through BOO, BOT, and BOOT models of PPP.

As of now, PPP seems to be a thriving option for the development of airports in India. According to the report published in Indian Express on 9th April 2018 in which NITI Aayog has stated after reviewing of infrastructure sector for the financial year 2015-16, that Indian airports are performing better in private hands; *'privatized airports recorded higher performance with regard to customer satisfaction when compared with counterparts operated solely by the Airport Authority of India (AAI)'*. However, the world has also been noticed some failures of private participation in airports through PPP like Costa Rican Juan Santamaria International Airport (SJO) (Pena, 2013). Private participation in public airport business always remains debatable, and management complications arise due to conflict in objectives. EI-Gohary et al. (2006) have

admonished that participation of private parties may raise critical sustainability-related issues due to its profit-making mindset, that are not normally met while procuring the project through the traditional route. Moreover, according to (Chou & Pramudawardhani, 2014) the primary causes for the failure of most PPP initiatives are ineffective risk distribution and a lack of information on success determinants in specific nations. Pena (2013) has highlighted that government needs to address significant focus concerning the subject (critical factors), as private participation is a very intricate and contentious topic associated with corruptive behaviours imposing loss to social welfare. Similarly, some major issues related to the development of PPP airports in India were highlighted by some Authors (Gupta, 2015), (Gupta & Agrawal, 2013), and (Ohri, 2009) in their research papers. Moreover, some news articles were also published related to the issues of Indian PPP airports in the leading newspapers of the country. Some of the issues are summarized hereunder:

(1) The regulator, AERA, discovered massive finance shortages in Delhi's (27.4%) and Mumbai's (28.7%) international airports, which were allowed to be recovered by the imposition of airport development fees on passengers.

(2) There was a cost overrun due to time delays and changes in scopes in Delhi (49.5%) and Mumbai (113.4%) international airport.

(3) Developers of private sector are allowed to utilize the real estate elements of the land under their jurisdiction, and by leasing a portion of the land permitted at Delhi airport and Mumbai airport a total of INR 147,151 million and INR 100 billion cash flow created, respectively.

(4) The government provides the lands free of charge to the project or developer, and the developer does not utilise these funds to determine subsidised aviation service pricing.

(5) A shift in the principal shareholder at Bangalore airport favoured the GVK group.

(6) The Bangalore airport is predicted to handle barely 7% of the traffic of London Heathrow, despite having a 12.43-fold increase in commercial space.

(7) It shows whether we are over-building our airports?

A study of the contract structure, CSFs, and sustainability of Indian PPP airports is essential to comprehend such contractual as well as sustainability-related issues. A detailed analysis of the contract structures will enable us to understand the scope,

critical factors, arrangements, and allocation of obligations, rights, and risks between each member of the JV. The study of critical factors will aid in determining the most important factors influencing the airport's success or failure. This will also provide a reference for the administration as well as assistance to industry experts in addressing the CSFs with appropriate approaches for the successful building of PPP airports in India. The evaluation of the impact of PPP on the sustainability of the airport would provide a greater comprehension of the mechanism's influence and provide an apparent comprehension for the administration of the factors and their indicators in the development of PPP airports in India.

During the literature review, some studies were found wherein CSFs for PPP airports were explored. But these studies were limited to the CSFs of PPP airports located in South Africa, Greece, and China. Similarly, no research work was found that looked into the contract structure of a PPP airport as well as the impact of PPP on the sustainability of airport.

As a result, this study was undertaken to look into the contract structure, identification, and ranking of CSFs, as well as the influence of PPP on the sustainability of Indian PPP airports.

Accordingly, two* airports viz. Delhi and Mumbai international airports were considered in the study. Moreover, the experience of two international PPP airports which are based on BOOT and BOT models, were considered in the study to have a better understanding and a comparison with Indian PPP airports.

*[Only two airports were taken into consideration for the study, despite the fact that India has five international airports that were developed under PPP. Due to time and data collection limitations, only two airports could be chosen].

1.3   Business Problem:

Public-private partnership (PPP) had been considered for expansion of existing airport infrastructures, capacity addition, and development, as well as operation of airports in India. As of now, the development of airports through PPP seems successful. However, some contractual and sustainability-related issues of PPP airports were highlighted by some authors in their research papers and also were published in the major newspapers. Such issues are summarised hereunder:

(1) Because of the aeroplane noise, living near an airport raises heart risks. *(Z6MAG 9th October 2013).*

(2) Cost overrun in 113.4% in Mumbai airport and 49.5% in Delhi airport *(Business Standard 20th January2013 & Gupta, 2015).*

(3) Change of lead shareholder in Bangalore airport *(Business Line 11th January 2017, LiveMint 29th March 2016, Gupta, 2015, Gupta & Agrawal, 2013).*

(4) Over-building of airports *(Gupta, 2015).*

(5) A mismatch between capacities, area constructed and investment in airports *(Gupta, 2015).*

(6) Land monetization of public land *(Gupta, 2015).*

(7) Huge funding deficits were identified, which were able to be filled by levying airport development fees on passengers *(Gupta, 2015, Gupta & Agrawal, 2013).*

(8) Due to faulty contract arrangements with joint venture companies that operate airports in the national capital (Delhi) and Mumbai, the state-owned AAI has suffered financial losses of INR 43 crore. *(The Economic Times, 05th August 2016).*

(9) Airports noise level comes under scan *(Telegraph India 27th July 2016).*

(10) NGT calls for curbing noise pollution at Delhi airport *(The Economic Times 24th November 2017).*

Business Problem Statement:

"Improper contract structure of PPP is leading to dispute, airport's losses and affecting the sustainability of Indian airports".

Chapter 2. Literature Review

The literature review chapter discusses the existing literature related to critical factors of PPP, airport development and sustainability of PPP airport. For this purpose, the literature was searched from the database such as Google Scholars, Scopus, Research Gate, PubMed, Science direct and JSTOR using the following keywords:

Contract structure; public-private-partnership; airport development; PPP-contract; critical-success-factors; PPP airport; sustainable airport; contract theory.

2.1 Theme wise Literature review

The literature, which was found from the above-mentioned database, were categorized into three broad themes. An exhaustive literature review was conducted based on the following themes:

2.1.1 PPP for airport development
2.1.2 CSFs of PPP
2.1.3 Sustainable airports

Inferences and research gaps for each theme are aligned in **Annexure-1.**

2.1.1 PPP for airport development

The transport sector is called the lifeline of an economy and is a key for economic development (Carnis & Yuliawati, 2013). The growth and development of an economy have a direct impact on the transport sector. As an economy grows, it put pressure on its transport sector (Kumar et al., 2018). Air transportation is considered an essential part of the transportation sector. As the Indian economy is growing, the demand for aviation services is increased. Increasing demand led to significant pressure on existing airport infrastructures. Capacity expansion of existing airports and development of greenfield airports is only the solution to handle the existing pressure on airport infrastructures, which require a considerable investment and adoption of modern technologies (Pena, 2013). Government and airport authorities are neither able to support modernized infrastructure facilities in airports nor further development of airports due to fund constraints. Efficient airport infrastructures with modern technologies are needed for

better performance of airports. Hence, private participation is the way to develop and upgrade airport infrastructures.

A number of market studies and cases show that private participation has brought greater operating efficiency, improved amenities and increased capital investment for airports (Starkie, 2018). Private participation through PPP brings modern facilities to the airport without increasing the burden of spending more funds on the government. lo Storto (2018) has concluded in his study that private capital brought by the private party influenced the overall airport efficiency positively, and PPP operated airports have better performance than public-owned airports. Kumar et al., (2018) has measured the performance efficiency of Indian airports by using the DEA method and have concluded that privatized airports are more performance efficient as compared to public airports. The involvement of the private party in the development of public infrastructures was started for enhancing the economic value of infrastructure output (Cui et al., 2018).

The PPP approach was adopted by the British government in the 1980's to overcome debt issues. BAA's (British Airport Authority) privatization was the first case of airport privatization in the world, done through an IPO in the London Stock Exchange. In 1987 seven major British airports (Heathrow, Gatwick, Stansted, Prestwick, Glasgow, Edinburgh and Aberdeen) got privatized via 100% public stock offering (Tolic et al., 2011). Thereafter, the UK and New Zealand followed the same path and their three largest airports were privatized by selling the stake of the central government to a private party (Pena, 2013). Thenceforth, private participation in publicly owned airports has become a global trend and is followed by many developed/developing countries.

As per the database of PPIAF, 2014 (Public-Private Infrastructure Advisory Facility), there are 141 airports around the world having the involvement of the private parties in airports through PPP (Engel et al., 2018). In year 2015, the centre for aviation issued a report wherein it was stated that 40 airports out of 100 largest airports throughout the world are either fully or partially owned or governed by private investors in the context of revenue (In et al., 2017). Considering the Indian aviation sector, it is recommended by (Manzoor, 2010) that private participation is necessary for the development of airports in India and to reinforce economic growth. India followed the same trend, and its six major airports; Cochin, Bengaluru, Hyderabad, Delhi, Mumbai and Nagpur, absorbed the private ownership with the intervention of a public body under PPP (Singh, et al., 2015). In most countries, the private sector is involved in two ways. The first way is, through a contract known as a public work contract for performing civil works according to

government specifications, in which the private sector bears the risk of only construction activities in exchange for a fixed amount. And second way is, through divestiture or privatisation, in which a government asset is sold to a private sector and it is accountable for finance, development, operation and management (Cruz & Marques, 2011). The most appropriate form/model of PPP for airport development necessitates a decision-making procedure that is complicated, and entirely dependent on the objectives of the government as well as the peculiarities of the airport. PPPs come in a number of different forms, such as BOT (Build-Operate-Transfer), wherein the private partner is in control of funding, building, operation, and maintenance before transfer back to the public body when the concession period comes to an end (Tolic et al., 2011). The alternative version of BOT is Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO), Build-Transfer-Operate (BTO), Build-Lease-Transfer (BLT), etc. that can be utilized for the engagement of both private and public entities. Basically, there is a variation of ownership and key responsibilities of the private partner in different PPP forms. A suitable PPP model is to be selected by the government for the successful development of the airport. As different ownership patterns, contract structures are adopted in airport development worldwide, the ownership pattern majorly impact the outcome of PPP airports. H. Oum et al. (2008) has studied the ownership impact on airports' cost efficiency and concluded that mixed ownership with the majority of government share should be avoided in airports, and the majority of shares should transfer to the private partner.

As consider the PPP airports in India, the five airports were developed through three PPP modes, i.e., Delhi and Mumbai airports were developed through BOT, Bangalore and Hyderabad airports were developed through BOOT and Cochin airport was developed though BOO model. The share of private partners is at a maximum size of 74%, except in Cochin airport that having a share of private partners is 57.9%. There were involvements of two private parties in the development of four Indian PPP airports. These two parties are M/s. GMR and M/s GVK, who made theatrical changes in Delhi, Hyderabad, Mumbai and Bengaluru airports by enhancing the capacity of the airports, transforming the service experiences of the passages and increasing the performance efficiencies. They may also be able to provide a respectable dividend to the AAI, which receives a predetermined percentage of gross revenue from airport operators under the PPP concession agreements. Between 2007 and 2012, the AAI could collect INR 26.69 billion (USD 397 million) from DIAL and INR 20.82 billion (USD 310 million) from

MIAL, due to the application of PPP in airports (Source: MIG-2017). The AAI's revenue climbed to INR 28.9 billion (USD 430 million) in 2014-15 as a consequence of the PPP development of these two airports, up from INR 5.0 billion (USD 74 million) in 2006-2007, and the AAI utilised that money to modernise and expand its other public-owned airports (Source: MIG-2017).

While considering the world experience under private ownership through PPP, (Rodrigues et al., 2006) have analysed the impact of changes in managerial style on Brazil airports using DEA (Data Envelopment Analysis) and summarised that there was a drastically improvement in the financial performance of airports in Brazil. Cruz & Sarmento (2017) have highlighted in his research work that maximising the economic output through PPP can have an adverse impact on social welfare.

The involvement of private partners in the airport is a source of concern, as the public and private PPP partners have competing interests. The private partner's major purpose is to accentuate profits, that is in direct opposition to the government's fundamental goal of safeguarding the interest of the public and promoting societal benefits (In et al., 2017). To avoid such conflicts, they suggest focusing on key elements when structuring private participation, such as ownership type, ownership transition process, and ex-post government regulations, as well as specifying that the government must have a well-defined agenda and goal for involving the private partner in PPP airports. There is a need for a new regulatory system whose major goal is to safeguard the environment because of the presence of private business in airports.

Gerber (2002) has argued that privatisation can be beneficial provided the government establishes a sufficient regulatory framework prior to privatisation that protects the environment and consumer interests while also ensuring the airline's engagement as a key user. Economic, social, and administrative rules are the three types of regulations, and the aviation industry belongs to technical, safety, and economic categories (Sengur, 2011). The role of an independent regulator in the aviation sector is to develop a transparent mechanism to manage the conflicting interests of the stakeholders of PPP airport. In India, the Airport Economic Regulatory Authority (RERA) is the regulator body for economic regulation of airports by making regulations, issuing licences, setting performance standards and determining tariffs and also having the power to enforce its regulations. RERA's major goal is to increase airport performance and social protection while also addressing potential conflicts of interest among various parties (Singh, et al., 2015).

Further, the negative impacts of private ownership under PPP may be taken care of by the independent regulatory authorities and enforcing its regulations. The outcome of privatization depends upon the framework of regulation under which the privatized airport is to be developed (Vasigh & Haririan, 1996). Thereafter some authors studied the development of an effective regulatory framework. In et al., (2017) performed research in order to create a framework for policy formulation and execution for effective private-public partnerships in the airport industry, as well as some recommendations.

2.1.2 CSFs of PPP

CSFs of PPP Infrastructure Projects:

The involvement of private sectors has been increased in the development of mega infrastructures by adopting the public-private partnership (PPP) method. A PPP in infrastructure development became a successful option, but many cases of failure have also been noticed. A complicated procedure, long concession period, involvement of high risk, and management of multiple stakeholders put forward that a detailed study on PPP critical factors is important for the industry as well as academicians. Many studies have been taken up to explore the PPP in infrastructure development that focused on the procurement methods of PPP (Babatunde et al., 2016), problems in PPP (Macario et al., 2015), risk allocation in PPP (Chou & Pramudawardhani, 2015) and (Hwang et al., 2013), identification of CSFs of PPP (Alinaitwe & Ayesiga, 2013) and (Chou & Pramudawardhani, 2014), and exploration of relationships among CSFs of PPP (Thomas et al., 2010), (Shi et al., 2016).

CSFs are an uncommon critical extents of activity wherein beneficial outcomes are unconditionally important for a manager to achieve his objectives (Bullen & Rockart, June 1981). CSFs are responsible for the accomplishment or let-down of the project. A public-private partnership project is called successful when its outcome has the quality and fulfil the objectives, i.e., community needs, meeting the government goals, providing a favourable financial return to the private partner etc. Now the question arises as to how to measure the achievement of a PPP project? What are the indicators/parameters for measuring the success of a PPP project? Many authors have performed research to better understand the accomplishment measures of PPP projects. Some of them are as follows:

Yuan et al. (2009) who have identified fifteen KPIs for evaluating the performance of a PPP project by identifying the strengths and weaknesses. They divided the fifteen KPIs into five categories: physical project features indicators, finance and commercial indicators, invention and training indicators, stakeholder indicators, and process indicators.

Similarly, (Aje & Adeniyi, 2012) have created a set of fifteen performance indicators (PIs) for PPP infrastructure projects in Nigeria, with cost, innovation, learning and development, and sustainability being the three most important PIs. They came to the conclusion that the success of PPP projects may be measured using a number of qualitative and quantitative indicators.

Eshtaiwi, et al., (2017) have researched and developed seventeen key performance indicators (KPI) for airports, which are organised into five key performance areas (KPA). According to their study, Libyan airports are monitored and evaluated using five key performance indicators; traveller experience, airport's space, cost focus, security and safety, and the environment.

CSFs are the precarious concerns of the project that need to administer orderly for working as a team to materialize in a proficient and efficacious manner. These factors necessitate daily attention and operate throughout the project's lifespan (Rowlinson, 1999). In order for a PPP to be successful and to accomplish all the goals of its various stakeholders, certain factors must be protected and maintained, these factors are called critical success factors (Morledge R & Owen K., 1998).

In a PPP project, there are involvements of many stakeholders who have different objectives that may create complications in the management. Therefore, the critical factors need to be identified in the first step, then a feasible and effectual framework to be developed taking into account the CSFs, to govern a PPP project in an effective manner (Zhang, 2005). Since the 1970s, the CSF approach has been employed as a management tool in a multitude of a sectors; like the commercial/financial sector (Boyonton & Zmud, 1984), manufacturing sector (Mohr & Sekman, 1994) and in the construction sector (Tiong, 1996) and (Li et al., 2007). CSF methodology was started to use in PPP projects in the late nineties thereafter, it was started to apply in different models of PPP like BOT, BOOT etc.

Zhang (2005) has been studied in order to identify CSFs of PPP for building infrastructure projects. On the basis of a public-private win-win premise, he has identified, analysed, and classified forty-seven CSFs. Economic viability, appropriate

risk allocation via. stable contract arrangements, prudent fiscal package, dependable concessionaire consortia with high engineering capabilities, and climate conducive to investment climate are the five categories in which he has classified the CSFs.

The relevance in relation to eighteen CSFs of building projects in the United Kingdom under the PPP was investigated by (Li et al., 2007). The CSFs are grouped using the factor analysis method. As a result, five categories have been defined; efficient procurement, project implementation capacity, government grant, attractive economic circumstances, and a readily available finance market. Three of the eighteen CSFs are the much more important in the development of PPP/PFI projects in the UK: robust private collaboration, adequate allocation of risk, and a sufficient credit system.

Meanwhile, some authors have focused on the connection amongst the CSFs. Critical factors internally affect each other. To look at the connection among the different evaluation factors, (Thomas et al., 2010) constructed a model using the SEM (Structural Equation Modelling) approach. They categorized the factors used to determine the efficacy of projects under PPP into five categories: technological, commercial, societal, governmental, and constitutional, and discovered that technological and societal are seemed to be more relevant than other factors in deciding PPP project success. PPP has become the most popular way of developing infrastructure projects. Chan et al. (2010) have explored the CSFs necessary to develop PPP projects in China. They classified eighteen CSFs into five categories based on five underlying factors: a steady socio-political environment, a sound macro-economy, an efficient and fair procurement mechanism, prudent public administration, and delegation of responsibilities amongst the both public entity and private sector.

Alinaitwe & Ayesiga (2013) used Uganda as a case study to overcome a dearth of awareness about the success determinants for public-private partnerships in civil infrastructure projects in developing countries. First, CSFs have been identified from the literature, and then validation of these factors have been performed using interviews with different stakeholders of the construction projects, i.e., contractors, financial institutions and government departments. Ranking to the CSFs has been provided using the coefficient of variation. They came to the conclusion that transparent bidding process, properly organised private industry, the existence of trained specialists to participate in PPP projects execution, and strong institutions are the most significant characteristics. The PPP project is divided into phases, with each phase's success determined by a variety of factors. Project success can be broken down into two

categories: the success of the product and the success of the project management. The majority of previous CSF research has been on the success of the product rather than the success of the project management.

(Liu et al., 2014) identified CSFs for different phases of PPP infrastructure projects; initiation stage, planning stage, procurement stage and collaboration stage; and established a framework that recognizes the significant elements of operational management activity in different life-span of a PPP project and provides recommendations for doing so. In 2014, a study to recognize the CSFs for PPP in infrastructure development in South Africa was conducted by (Maseko, 2014) by using Stacey's Normal Distribution Fitting Algorithm. He outlined the top three CSFs for PPP in South Africa: project financial and technical feasibility, effective contract administration, and competent private entity with technical expertise. He also mentioned that to implement PPP in infrastructures successfully, an attractive environment shall be created. Chou & Pramudawardhani (2014) have focused on success factors of PPP and stated that if complete information about success factors of PPP of a specific country is shared with others, it will help to implement the PPP in infrastructure successfully. They evaluated Indonesia's primary drivers, success factors that are critical in nature, and risk apportioning under PPP with the United Kingdom, Singapore, Taiwan, and China. The study's finding may be useful to inventors to gain a greater comprehension of key drivers, CSFs, and risk allocation, as well as develop anticipatory tactics based on national similarities and variances. Total seventeen CSFs along with five key drivers were determined in the study. Favourable legal framework, commitment and responsibility, procurement procedure with transparency roles and responsibilities that are clearly established, and favourable governance/governmental success were the most crucial CSFs in Indonesia.

Ameyaw & Chan (2015) carried out a study in which they used a fuzzy synthetic evaluation approach to undertake a detailed analysis for appreciating and categorising risk elements in PPP water supply projects in poor nations. They found twenty-two CSFs and divided them into three categories: fiscal, juridical, social and political, and technological risk factors. Their data suggest that the fiscial risk category is the utmost severe and should be addressed with caution.

Liu et al., (2016) state that the tendering process' performance is significant to the success of a PPP project. They analysed the CSFs that influence the effectiveness and outcomes of PPP tendering in China and Australia, and discovered that integrity of

comprehensive business fidelity, project briefing quality, administration's competencies, and institutional arrangements are the most important CSFs.

Hsueh & Chang (2017) did a review of all prior CSF research for PPP in Taiwan and found twenty-six CSFs. The CSFs were then divided into four categories: supportive legislative framework, favourable investment climate, proper PPP project selection, and public backing. Competent quality service and appropriate legal frameworks, simpler credit facility and coherent project control, compelling agreement varieties the executives, proper partner commitment instrument, and ecological wellbeing and security control were the nineteen CSFs identified at the functional phase of the PPP project, and the main variable gathering was concluded using Fuzzy synthetic evaluation technique (Kyei et al., 2017). Number of studies have been carried through to recognize and access the CSFs in PPP projects, but researchers have not studied the interrelationship between success criteria and CSFs.

To fill this gap, (Ahmadabadi & Heravi, 2018) evaluated the consequence of CSFs on the success of PPP projects. They came to the conclusion that the private party's competences have an immediate effect on project accomplishment during the development phase of a PPP project, while government competencies determined project success or failure during the operational stage. They additionally expressed that the utmost CSFs for PPP in developing nations are transparency in the bidding process, risk allocation, and good collaboration.

A summary of CSFs of PPP projects identified by different Authors are tabulated hereunder:

Table 2.1 Summary of Critical Success Factors (CSFs) for PPP projects

Authors	Study for the Project	CSFs for PPP projects
Zhang (2005)	PPP Infrastructure projects	Financial suitability, proper risk designation by means of stable agreement courses of action, judicious monetary bundle, trustworthy concessionaire consortia with solid specialized strength, and good speculation environment.

Authors	Study for the Project	CSFs for PPP projects
Li et al. (2007)	Construction projects (PPP) in UK	Proficient procurance mechanism, project execution capacity, administration grant, appealing monetary conditions, and a readily available finance market.
Thomas et al. (2010)	Infrastructure projects (PPP) in Hong Kong	Staff challenges and potential management actions, technological aspects, economic and financial concerns, socioeconomic factors, legal and political factors.
Chan et al. (2010)	Infrastructure projects (PPP) in China	A steady social and political climate, a steady macroeconomic climate, a straightforward and successful acquirement framework, judicious government contribution, and divided responsibility among general society and private areas.
Alinaitwe & Ayesiga (2013)	Construction projects (PPP) in Uganda	Competitive procurement procedure, effective administration, an efficient private area, and the accessibility of qualified people to participate in PPP execution in the venture.
Liu et al. (2014)	Life Cycle CSFs for Infrastructure projects (PPP)	A thorough pre-project evaluation, a thorough feasibility analysis, and a well-thought-out implementation plan, risk mitigation, transparent and efficient, VfM evaluation, adequate PPP procedures, effective assessment, effective interface management, competitive and consistent bidding procedure. Final foundation for effective negotiating financial closing technique that is efficient in the procurement of public-private partnerships, effective interface management is essential. Efficient contract management, optimal utilisation of resources, efficient conflict resolution framework, effective facility management, effective interface management, excellent management.
Maseko (2014)	PPP Infrastructure projects in South Africa	Project financial and technological feasibility, rigorous contract management, and a technically strong and experienced private consortium.

Authors	Study for the Project	CSFs for PPP projects
Chou & Pramudawardhani (2014)	PPP Infrastructure projects in Indonesia	Transparent legal framework, commitment and accountability, Procurement procedure with transparency, clear responsibilities and roles, and good governance.
Hair et al. (2019)	Water supply projects under PPP for developing countries	Technological, financial/commercial, administrative, and social and political.
Liu et al. (2016)	PPP projects in Australia and China	Business case development's robustness, the nature of the undertaking brief, the ability of the public area, efficient governance frameworks, transparent tendering process,
Hsueh & Chang (2017)	PPP projects in Taiwan	Supportive legislative framework, favourable investment climate, proper PPP project selection, and public backing, competent quality service and appropriate legal frameworks, simpler credit facility and coherent project control, compelling agreement for handling the escalation and variation, appropriate partner commitment instrument, and environmental wellbeing and security control.
Kyei et al. (2017)	Operational stage of PPP projects	Continual project supervision, compelling agreement for handling the escalation and variation, capable assistance conveyance and satisfactory legitimate structures, simplified instalment instrument, proficient stakeholder relationships mechanism, and and environmental wellbeing and security control.
Ahmadabadi & Heravi (2018)	PPP projects	Favourable Legal and political assistance, macroeconomic stability, available finance market, favourable social assistance, economic viability, solid contractual agreement, adequate equipment procurement, adequate labour procurement, effective collaboration, reliable private consortium.
Ayo-Vaughan et al. (2019)	PPP Airports in Nigeria	Adequate risk allocation, good finance structure, long concession term, strong

Authors	Study for the Project	CSFs for PPP projects
		government support, adequate organisational framework, strong legal framework, efficient procurement procedure, competitive and transparent bidding process, sound policies, proficient operation and maintenance cost management, favourable operational environment, Guarantee of return on investment.

Source: Literature Review

CSFs of PPP Airport:

Various studies were conducted to examine the CSFs for implementation of PPP in infrastructure development, but very few were examined the CSFs for airports.

Gerber (2002) has conducted a study based on a literature review to find the indicators to evaluate the success of PPP in airports. He has come to the conclusion that privatisation can be beneficial provided the government establishes a sufficient regulatory framework prior to privatisation that protects consumer interests and ensures the airline's participation as a key user. He has also studied the different approaches for privatization of airports in airline perspective. Involvement of the private party in airports can be made through different PPP forms/models. The decision for choosing the PPP model is based on airport characteristics and national/regional government. The decision making for the development of the airport should address political, technical, financial, operational and managerial prospects. Stakeholder management is a critical task for the airport business as it is linked with complications of principal-agent (In et al., 2016).

Oum et al. (2008) have advocated shifting majority shares to private parties and avoiding mixed ownership of airports with a government majority to address the principal-agent problem and ownership implications. Moreover, all stakeholders are required to give adequate attention to CSFs of PPP for the successful development of airports.

Ayo-Vaughan et al. (2019) have studied the CSFs for PPP in airport infrastructure in Lagos, Nigeria. He identified fourteen CSFs, with the top four being "viable finance structure," "transparent procurement procedure," "appropriate risk distribution", and "cost recovery".

2.1.3 Sustainable airports:

The World Commission on Environment and Development (WCED) declared the concept of sustainability in its report in 1987, introduced the idea to the public sphere. This report is all the more normally recognized as the Brundtland report, which shows sustainability as "improvement that matches the prerequisites of the present without jeopardizing the abilities of succeeding ages to meet their own necessities". The term 'sustainable development' was characterized in the report of WCED as an advancement that not just achieves the prerequisites of the current age yet in addition considers and satisfies the necessities of things to come ages (Kearins & Fryer, 2011). With the continuous course of globalization, air transportation is expected to be thought as a fundamental part and to think about for sustainable development (Carlucci, et al., 2018).

Airport Cooperative Research Program (ACRP) has characterized the term 'airport sustainability' as policies and procedures that guarantee assurance of the climate including protection of common assets". The accomplishment of airport sustainability assures the steady growth of the economy, employment generation, social development, and environmental protection (ACRP REPORT 80, 2012). The plans and strategies for the development of sustainable airports are not uniform across the world. These may differ from one air terminal to another and rely on the air terminal's size, geological position, air terminal administration, and partners. To plan, implement and maintain a sustainability program in airports, the SAGA (Sustainable Aviation Guidance Alliance) was established in 2008. SAGA urges airport administration to investigate and determine its own portrayal of sustainability assists with creating and execute a sustainable development strategy (SAGA, 2009).

To execute a sustainability program successfully, there is a requirement for the commitment of all vital partners of the airport. Amaeshi & Crane (2006) have developed a stakeholder engagement framework that assists the airport operators and regulatory authorities in developing and following the procedures for the building the sustainable airports. They also provided guidance for the proper administration of the framework. The framework offered here assists in aligning sustainability initiatives with non-market environments, answering questions about a sustainable airport, and establishing targets and performance monitoring norms.

The sustainability of European airports using the application of data envelopment analysis was investigated by (Adler, et al., 2013). They have considered 85 small and regional airports in their study and concluded that the airport's performance improved under private ownerships with incentive regulation than public ownerships/management with budget constraints.

Chao, et al. (2017) have fostered a model for appraisal of environmental protection performance utilizing a use of the fuzzy delphi method. The model was validated by five Chinese international airports. The model is fit to assess the functioning of the environment protection and assists the stakeholders in formulating and implementing the strategies for further enhancing the functioning of the environment protection of airports.

Freestone (2009) has highlighted the concept of sustainable aerotropolis and shared the fundamental principles for achieving the same, are: study on economic forecasting data, impact on the environment, detailed plan for environment safety, integration of aviation with metropolitan development, integrated transport planning, stakeholder's engagement, detailed plan for effective land use, detailed plan for environment safety, investment in airport region, coordination between public and private partners, regular meetings between airport management and society, steadiness of the scheduled objectives, and territorialities at the airport and its environs, as well as at the city, state and national levels coordination among public and private accomplices, customary gatherings among air terminal administration and public, unfaltering quality of the planned targets, and territorialities at the air terminal and its environs, as well as at the city, state and public levels.

A study was conducted by (Longhurst, et al., 1996) to apply the use of sustainable development in airports and specified the terms which are required to make an airport sustainable. These terms are; involvements of the key stakeholders, regular discussions with the shareholders especially to resolve the issues, maintaining the relationships with the society, identification and restoration of the environmental complexity, capabilities to fulfil consumer's requirements, occasion to deliberate the standards of living at regional and national levels, monitoring and analysis, and reporting of the ill-effects on the environment, eagerness to develop a sustainable airport.

Till 2003 many studies were directed to investigate the sustainability and evaluation of sustainable performance but in 2004, (Kaszewski & William, 2004) have specified the concepts to improve and maintain the sustainability of an airport considering the airport

structure. Their concept represents a four-course of action consisting of the physical infrastructure components of an airport, which are; BAU, GTP, GAP and a suitable combination of GTP and GAP. 1. BAU is a business-as-usual planning for surface transportation, 2. GTP is a green transportation planning, 3. GAP is a green architecture planning and 4. A combination of GTP and GAP along with the adoption of modern technologies.

Oto, et al. (2012) have stated in their study that to achieve sustainability, airport stakeholders including surrounding societies required to be enlightened about sustainability. They have specified that all stakeholders and consumers to make conscious about their acts that negatively affect environmental sustainability. Actually, sustainability cannot be achieved by only following sustainability planning and implementing modern technologies. Sustainability education to society is a must that creates awareness about sustainability and provides assistance for achieving sustainability. Such education can be provided through regular workshops, training, seminars, and coaching to all stakeholders, business partners, civil society, and employees of an airport. Only environmental education is insufficient; understanding the environmental challenges that happen because of airport expansion necessitates the application of the idea of "environmental bioethics." As a result, education is critical in addressing such environmental issues. The EfS (education for sustainability) has introduced by (Oto, et al., 2012) that pursued the conception of 'biopolitics for the sustainable airports'. EfS is a method of incorporating the major concept of sustainability, namely environmental, social, and economic sustainability.

Upham & Mills (2005) have directed research to propose and evaluate a set of core sustainability indicators, i.e., environmental and operational for use in developing sustainable airport standards. Some key core metrics for airport environmental and operational sustainability have been proposed: Surface access vehicles in large numbers, aircraft movement, static power usage, commuters/travellers, and environmental emissions i.e., noxious gases, noise and effluent.

Sabatino et al. (2011) have analysed the impact of airport operation on the environment using a model inter-comparison study (EDMS model). They made a contextual analysis of Heathrow airport and examined the quality of air surrounding the airport and found the presence of nitrogen oxide gases (NOx and NO_2) within and near the airport. Fasone et al. (2012) have studied a new concept of MAS (Multi-Airport System). A good MAS must be backed up by a well-coordinated management style that assists the airport in

achieving sustainability on both a commercial and infrastructure level. MAS may also strengthen the infrastructural competitiveness of an airport along with its financial performance and economic growth. Private participation through PPP in an airport has a critical impact on airport sustainability However, it may achieve along with environmental protection by building sustainable contract relationships.

The definition of airport sustainability was provided by Airport Cooperative Research Program (ACRP), a practice that assures environment protection along with the conversation of environmental resources. Additionally, it comprises the societal process that recognise the necessity of airport stakeholders, staff, officials and the public and ensures the persistent growth of the economy as well as employment (ACRP REPORT 80, 2012). The airports provide a contribution to the local economy and employment, but they also offer negative environmental impacts like emissions, noise, land use and energy consumptions. To manage such impacts, a balanced approach is required to maximize the economic benefits along with minimal impacts on social and environmental sustainability. Samesh & Scavuzzi (2016) have stated that community involvement has a key role in facing the environmental concerns due to the operation and expansions of airports. They also explained the role of regulatory authority in making airports more environmentally and socially sustainable along with achieving economic growth.

The theme wise research gaps and inferences found in the literature review are mentioned hereunder in 2.2. Research Gaps:

2.2 Research Gaps

2.2.1 Research gaps and inferences

A summary of theme-wise research gaps and inferences are organized hereunder:

Theme	Authors	Inferences	Gaps
PPP for airport development	D.P. Singh, N. Dalei, T. Bangar Raju; Richardo Rodrigues Pacheco, Elton Fernandes; George C.L. Bezera, Carlos F. Gomes; Carlos Oliveira Cruz, Rui Cunha Marques; Manzoor K P; Catriona Cahill, Donal Palcic, Eoin Reeves; Xavier Ballart, Casilda Guell; Ohri Manuj; Anil Kumar, Manoj Kumar Dash, Rajendra Sahu; Tejashree Barde, Aristeidis Pantelias, Vedran Zerjav; Anne Graham; Caio Mario da Silva Pereira Neto, Paulo Leonardo Casagrande, Filippo Maria Lancieri; A. Assaf;	(i) Studies were conducted to compare the 'service quality' delivered by public airports and PPP airports. Also, the authors have discussed the performance and efficiency of PPP airports. It was concluded that concessioning of airports enhances t operational performance and management efficiency. (ii) The review was directed to examine the requirements for extending the limit of Indian air terminals, with anticipating information for the following 20 years demonstrating that 866 million traveller terminal limit and 7.53 thousand MT freight terminal limit would be expected, with a complete speculation of around US$25.94 billion. (iii) The effect of changes in possession and administrative style on air terminal execution was investigated, and it was found that ownership has an impact on a company's performance since various	(i) Factors / reasons for delivering more qualitative services in private-owned airports than public-owned airports were not studied. And, also a comparative analysis for all concessioning models for airports was not discussed. (ii) The way by which the existing capacity of airports and required investment can be met was not discussed. Adequate contract structure for successful capacity addition in Indian airports was missing. (iii) The Contract structure of the PPP airport was not analyzed.

Theme	Authors	Inferences	Gaps
	Bijan Vasigh, Mehdi Haririan; Soh Young In, Luiza A.S. Casemiro, Julie Kim; Hans-Arthur Vogel; Matteo Rossi, Renato Civitillo; Caiyun Cui, Yong Liu, Alex Hope, Jianping Wang; D.P. Singh, N. Dalei, T. Bangar Raju; Vinod N. Sambrani; Rosario Macario, Joana Ribeiro, Joana Costa; Marjan Bashiri, Shabnam Ebrahimi, Maryam Fazali	owners have different aims and motivations. The effect of different proprietorship and administration structures on the public area's capacity to achieve its own objectives was additionally examined. The major factors in structuring private participation were (a) ownership type, (b) the course of this proprietorship change, and (c) ex-post government limitations. (iv) The study was conducted on "Airport Competition in Multiple Airport Privatization", and concluded that the government should develop regulatory constraints (for limiting/ restricting cross-ownership) for airport privatisation that accounts for the competitions between airports, and their restrictions, must be carefully designed and constructed in order to achieve their goals. (v) Various models for private sector participation were discussed. And it was determined that, in the plan and execution of a PPP project, risk transfer and mitigation were the most important factors in realising the full potential of private participation. Production risks,	(iv) The role and structure of independent regulatory to enhance the competition in airports and to regularize the privatization was not discussed. (v) The Contract structure for adequate risk sharing was not discussed to avoid the conflicts between involved public sectors and private sectors.

Theme	Authors	Inferences	Gaps
		commercial risks, and context risks were identified as the most significant risks in airport development, management, and operation.	
		(vi) The study was conducted to analyse how private participation helps low-income countries like India to make big investments in the airports to meet its growing air travel demand, and private management can provide good facilities and services for passengers at airports. And also, it was concluded that Low-cost airports provide a profitable environment.	(vi) Adequate mode of airport privatization for low-income countries was not studied, and also, the PPP structure for low-cost airports was not discussed.
Critical Success Factors (CSFs) of PPP	Peter Gerber; Felix Villalba-Romero, Champika Liyanage; Olaniyiaje, Onaopepo Adeniyi; S. Thomas Ng, Yoki M.W.Wong, James M. W. Wong; Chuen-Ming Hsueh, Luh-Maan Chang; Robert Osei-Kyei, Albert P.C. Chan, Ernest Effah Ameyaw; Afeez Olalekan Sanni; Solomon Olusola Babatunde, Akintayo Opawole,	(i) The studies were related to the success factors of PPP. These studies concluded that the success of PPP depends upon government support in the form of providing a regulatory framework. Such a regulatory framework assures the involvement of airlines as primary consumers and also safeguards the interest of the consumer. (ii) Except for airports, several authors have looked at the Critical Factors that add to the success of PPP in various civil or construction projects.	(i) Critical Factors which were affected by an independent regulator and lead to the success of airport privatization was not discussed. (ii) CSFs were not identified for PPP airports, and also the inter-relationships among CSFs were not studied. No study has been conducted so far to know that how

Theme	Authors	Inferences	Gaps
	Olusegun Emmanuel Akinsiku; Rauda Al-Saadi and Alaa Abdou; Rajkumar K, Selvakumar C, Sharavanakumar P S; Reetika Sehgal, Ashish Mohan Dubey, Nidhi Tiwari; Xueqing Zhang; Marcus Jefferies; Henry Alinaitwe, Robert Ayesiga; M. Maseko; Shiying Shi, Heap-Yih Chong, Lihong Liu, Xiaosu Ye; Effan Ernest Ameyaw, Albert P.C. Chan; Robert Osei-Kyei; LiYaning tang, Qiping Shen, Martin Skitmore, Eddie W.L. Cheng; Junxiao Liu, Peter E.D. Love, Jim Smith, Michael Regan, Peter R. Davis; Patrick T. I. Lam, Daniel W. M. Chan, Esther Cheung, Yongjan Ke; Jui-Sheng Chou, Dinar Pramudawardhani;	(iii) A total assessment system was intended for leaders to analyze the underlying achievability of a PPP project, as well as a model that thought about the interests of the public authority, private financial backers, and the local area to show up at a reasonable and commonly advantageous task. (iv) The factors that add to the progress of a PPP project during the construction stage have been examined, and different authors have recognized the factors that add to the outcome of a PPP project at the operational stage. (v) The majority of the studies were carried out with a view to determine the CSFs of Infrastructure projects under PPP. For identifying the CSFs, some authors were considered the user's perception, while others were considered the stakeholder's perception. (vi) The success indicators (PIs) for the PPP Infrastructure project were investigated. There are nine Key Performance Indicators and twenty-nine Performance Measures that have been identified.	these critical success factors affect each other. (iii) Evaluation factors were identified for project success while considering the satisfaction of stakeholders. However, other dimensions of project success, i.e. economically, environmentally, socially, were not considered in the study. (iv) Factors that affects the success of tendering stage or contracting stage (pre-execution stage) were not identified. (v) No review was led to recognize the CSFs for different PPP modes (BOO, BOT, BOOT etc.) for different PPP Infrastructure projects. (vi) PIs were not studied for airport projects.

Theme	Authors	Inferences	Gaps
	Bing Li, A. Akintoye, P.J. Edward, C. Hardcastle; Sungmin Yun, Wooyong Jung, Seung Heon Han, Heedae Park; Khalid Almarri, Bassam Abu-Hijleh		
Sustainable airports	James Longhurst, David C. Gibbs, David W. Raper, D.E. Conlan; Silvana Di Sabatino, Efisio Solazzo, Rex Britter; Kenneth M. Ameshi, Andrew Crane; Andrea L. Kaszewski, William R. Sheate; Ching-Cheng Chao, Taih-Cherng Lirn,Hing-Chun Lin Master; Nicole Adler, Tolga Ulku, Ekaterina Yazhemsky; Yung-Kil Lee, Jin-Woo Park; Nurhan Oto, Nesrin Cobanoglu, Cevat Geray; Fasone V., Giuffe T., Maggiore P.; MI Setiawan, S Surjokusumo,	(i) The study was conducted to measure the airport's emissions. (ii) The research offered a novel approach to combining PPP with sustainability in order to accomplish optimum capital structure selection while building healthy PPP projects. In addition, the study highlighted seven critical factors that influence the cash position of PPP projects from a sustainability standpoint (profit, expenses, capacity, threat, project state government support aid, and external environment). (iii) The study's findings provided guidance for airport administration in assessing airport execution as far as carbon decrease, energy preservation, and natural security measures. (iv) The term "environmental bioethics" was brought forward. The findings were based	(i) The impact of surrounding buildings on the airport's emission was not studied. However, the only available road network was considered to measure the airport's emission. (ii) The impact of Private/Public Sector's ownership and involvement of the private sector on the sustainability of PPP projects was not studied. The impact of PPP on airport sustainability was not studied. (iii) The impact of environmental as well as socio-economic factors on airport sustainability was not studied in the Indian context. (iv) The application of "Environmental bioethics' in developing

Theme	Authors	Inferences	Gaps
	DM Ma'some, J Johan; Ismael Cremer, Stephen Rice, Alexander Michaels, Korhan Oyman; Paul J. Upham, Julia N. Mills; Liyin Shen, Vivian W.Y. Tam, Lin Gan, Kunhui Ye, Zongnan Zhao; Frank Boons, Arwin van Buuren, Greet Teisman;	on a case study of Turkish Airports' Ankara Esenboga International Airport (ESB) [BOT Model], in which sustainability was accomplished through sustainable schooling and preparing of staff, clients, partners, and the overall population. (v) For the environmental and operational sustainability of airports, a core set of indicators were identified, including the number of urban transit vehicles, static power usage, airplanes motion, gaseous pollutant emissions, and aircraft's noise pollution among others. (vi) The topic of Business Centre Development in the Airport Premises was considered. It was related to airport administration and real estate growth at the airport, and it was established through a public-private collaboration that covered commercial property building, execution and maintenance. The airport was meant to help the region's economic growth by constructing Aero City.	sustainable airports was not discussed, and also the role of stakeholders in airport sustainability was not discussed. (v) The impact of environmental as well as socio-economic factors on airport sustainability were not studied. (vi) Success factors of the 'Business Centre Development Model' in airport sustainability were not studied.

2.2.2 Theme wise research gaps:

Following Research Gaps are found in the literature review under the theme *'PPP for airport development'*:

(i) Factors/ reasons for delivering more qualitative services in private owned airports than public-owned airports were not studied. And also, a comparative analysis for all concessioning modes for airports was not discussed.

(ii) The way by which the existing capacity of airports and required investment can be met was not discussed. Adequate contract structure for successful capacity addition in Indian airports was not discussed in the study.

(iii) The contract structure of the PPP airport was not analyzed.

(iv) The role and structure of independent regulatory to enhance the competition in airports and to regularize the privatization was not discussed.

(v) The contract structure for adequate risk sharing was not discussed to avoid the conflicts between involved public sectors and private sectors.

(vi) Adequate mode of airport privatization for low-income countries was not studied, and also, the PPP structure for low-cost airports was not discussed.

Following Research Gaps are found in the literature review under the theme *'Critical Success Factors (CSFs) of PPP'*:

(i) Critical factors which were affected by an independent regulator and lead to the success of airport privatization was not discussed.

(ii) CSFs were not identified for PPP airports, and also the inter-relationships among CSFs were not studied. No study has been conducted so far to know that how these critical success factors affect each other.

(iii) Evaluation factors were identified for project success while considering the satisfaction of stakeholders. However, other dimensions of project success, i.e., economically, environmentally, socially, were not considered in the study.

(iv) Factors that affect the success of tendering stage or contracting stage (pre-execution stage) were not identified.

(v) No study was conducted to identify the CSFs for different PPP modes (BOO, BOT, BOOT etc.) for different PPP infrastructure projects.

(vi) PIs were not studied for airport projects.

Following Research Gaps are found in the literature review under the theme *'Sustainable airports':*

(i) The impact of surrounding buildings on the airport's emission was not studied. However, the only available road network was considered to measure the airport's emission.

(ii) The impact of private/public sector's ownership and involvement of the private sector on the sustainability of PPP projects was not studied. The impact of PPP on airport sustainability was not studied.

(iii) The impact of environmental as well as socio-economic factors on airport sustainability was not studied in the Indian context.

(iv) The application of 'environmental bioethics' in developing sustainable airports was not discussed, and also the role of stakeholders in airport sustainability was not discussed.

(v) The impact of environmental as well as socio-economic factors on airport sustainability was not studied.

(vi) Success factors of the 'Business Centre Development Model' in airport sustainability were not studied.

2.2.3 Research Gaps identification Process

Theme 1: PPP Airport development

Research Gaps found

(i) Factors/ reasons for delivering more qualitative services in private owned airports than public-owned airports was not studied. And also, Comparative analysis for all concessioning modes for airports was not discussed.

(ii) The way by which the existing capacity of airports and required investment can be met, was not discussed. Adequate contract structure for successful capacity addition in Indian airports was not discussed in the study.

(iii) The Contract structure of existing PPP airports was not analyzed, and the study was also missing for analyzing and proposing adequate contract structure and ownership control for airports.

(iv) The role and structure of independent regulatory to enhance the competition in airports and to regularize the privatization was not discussed.

(v) The Contract structure for adequate risk sharing was not discussed to avoid the conflicts between involved public sectors and private sectors.

(vi) Adequate mode of airport privatization for low-income countries was not studied, and also, the PPP structure for Low-cost airports was not discussed.
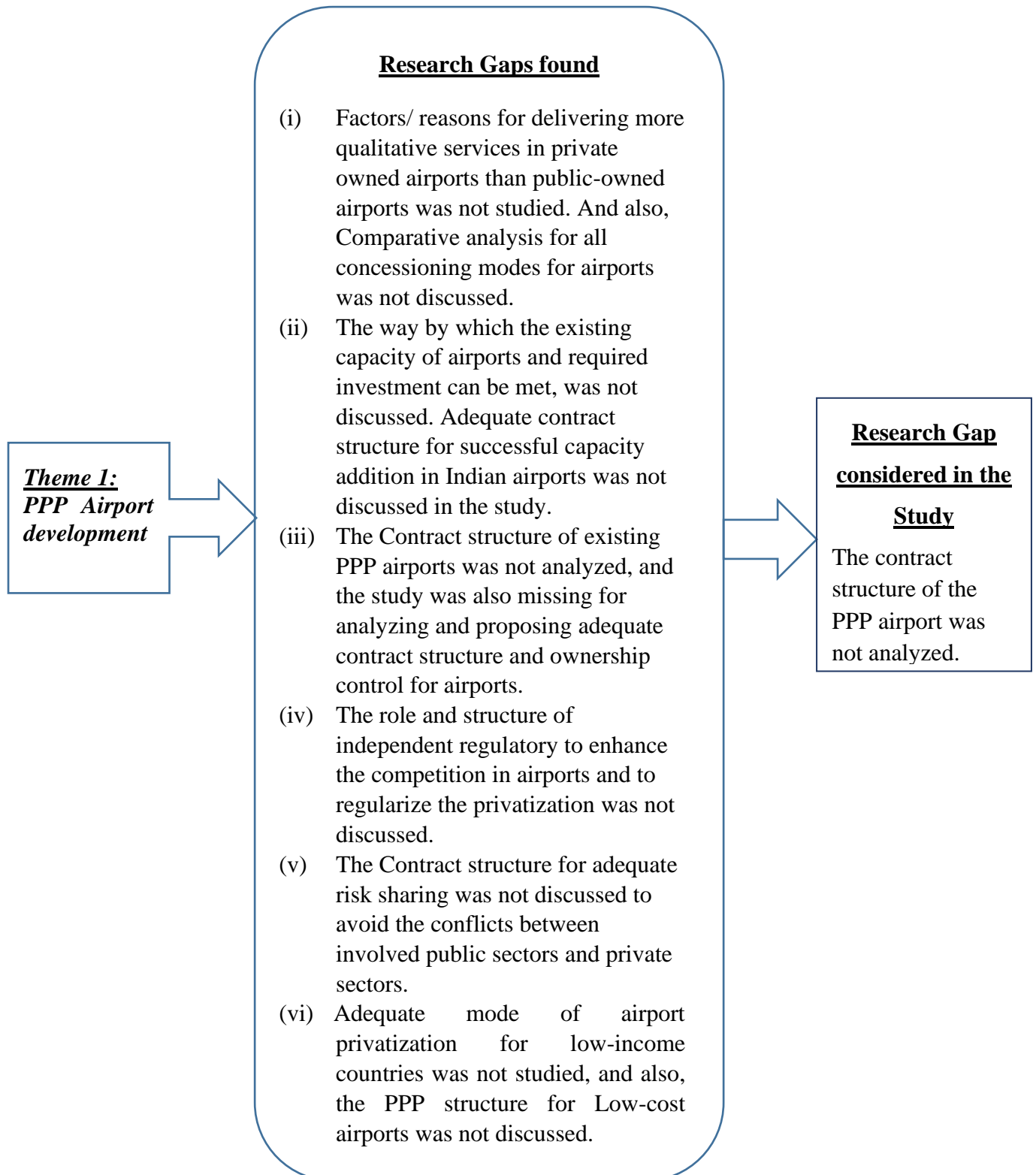
Research Gap considered in the Study

The contract structure of the PPP airport was not analyzed.

Theme 2:
Critical
Success
Factors
(CSFs) of PPP

Research Gaps found

(i) Critical Factors which were affected by an independent regulator and lead to the success of airport privatization was not discussed.

(ii) CSFs were not identified for PPP in airports, and also the Inter-relationship among CSFs were not studied. No study has been conducted so far to know that how these critical success factors affect each other.

(iii) Evaluation factors were identified for project success while considering the satisfaction of stakeholders. However, other dimensions of project success, i.e. economically, environmentally, socially, were not considered in the study.

(iv) Factors that affect the success of tendering stage or contracting stage (pre-execution stage) were not identified.

(v) No study was conducted to identify the CSFs for different PPP modes (BOO, BOT, BOOT etc.) for different PPP Infrastructure projects.

(vi) PIs were not studied for Airport projects.

Research Gap considered in the Study

CSFs were not identified for PPP airports, and also the inter-relationships among CSFs were not studied. No study has been conducted so far to know that how these critical success factors affect each other.

Theme 3: Sustainable airport development

Research Gaps found

(i) The impact of surrounding buildings on the airport's emission was not studied. However, the only available road network was considered to measure the airport's emission.

(ii) The impact of Private/Public Sector's ownership and involvement of the private sector on the sustainability of PPP projects was not studied. The impact of PPP on airport sustainability was not studied.

(iii) The impact of environmental as well as socio-economic factors on airport sustainability was not studied in the Indian context.

(iv) The application of "Environmental bioethics' in developing sustainable airports was not discussed, and also the role of stakeholders in airport sustainability was not discussed.

(v) The impact of environmental as well as socio-economic factors on airport sustainability was not studied.

(vi) Success factors of the 'Business Centre Development Model' in airport sustainability were not studied.

Research Gap considered in the Study
The impact of PPP on airport sustainability was not studied.

2.2.4 Research Gaps

(1) The contract structure of the PPP airport was not studied.

(2) Inter-relationships among critical success factors of PPP airports were not analysed.

(3) The impact of PPP on airport sustainability was not studied.

A literature review was also conducted for theoretical premise and following inference and gap is found.

The ideas of contract theory were applied to public-private contracting, and a paradoxical solution based on contract theory was presented. Some reasons for PPP contract failure were reviewed, with the suggestion that such issues can be handled and mitigated utilising contract mechanism/contract structure. However, the contract mechanism and structure were not examined in detail.

2.3 Research Problem

The contract structure of a PPP defines the allocation of responsibilities, rights and risks to each party who is participating in the contract. Different PPP models may have different contract structures. Critical factors of PPP are accountable for the success and sustainability of airports.

Research problem statement:

Many studies are undertaken on analysing the performance of PPP airports. However, the contract structure of PPP airport, the relationships among the critical success factors of PPP, and the impact of PPP on the sustainability of PPP airports in India are still, conspicuously, missing.

2.4 Research Questions

(1)   What are the contract structures of PPP, which have already been used in the development of airports?

(2)   What are the relationship and consequences of the critical factors in the success of PPP airports?

(3)   What is the impact of PPP on the sustainability of airports?

Chapter 3. Research Objectives and Theoretical Framework

3.1 Research Objectives

Following are the Objectives of the research:

(1) To study the contract structure of PPP airports.
(2) To examine the interrelationships among CSFs (critical success factors) of PPP airports.
(3) To study the impact of PPP on the sustainability of airports.

The study is focused on the analysis of the contract structure of PPP used in the development of airports, identification of the success factors which are critical for the successful development of airports, and the examination of the interrelationships among those factors. Further, the impacts of PPP on sustainability of airports were analysed.

3.2 Underpinning Theory of the Research:

PPP is a mechanism wherein different stakeholders participate in achieving a fixed common goal. There are involvements of different private and government entities (principal and agents) to perform their functions as per the contract agreements. Accordingly, the principal-agent theory, Mechanism design theory, and contract theory are applicable to the research.

The principal-agent theory (PAT) is a concept to establish a contract between the principal (the Owner/Employer) and the agent (the Contractor). PAT provides a framework to address the conflicting interests amongst the principal and agent during project development. It is exclusively depend upon the characteristics of the association between the principal and agent. The agent performs a task in accordance with their contract agreement. The contract agreement is designed as per the project requirements, but a 100% complete contract can't be written due to asymmetric information that is dealt with the contract theory or theory of incomplete contract.

The mechanism design theory is to design a system/mechanism to achieve some functional standard or particular outcome. It is derived from the game theory and provides an understanding for achieving the optimal outcome in the presence of information asymmetry and individuals' different self-interests. mechanism-design theory is concerned about the

relationship of principal and agent. It deals with the problems faced by a principal designing a mechanism that offers a base for interaction with different agents but is not available to the principal. Consequently, certain actions taken by the agent is difficult to monitor or control by the principal. Therefore, the principal needs to design a mechanism for the agents that helps them to produce the desired outcome by the principal or satisfying the criteria of efficiency. The contract theory deals with such an optimal design of scheme that encourages the involved parties to act more efficiently.

Contract theory is the study of the formation of a contract. It deals with the development of legal agreements by individuals and/or organizations. It observes the formation of formal and informal contracts that formed in the existence of asymmetric information. The situation of asymmetric information takes place when one party has supplemental information as compared to the other. In spite of the fact that there is an irreconcilable situation between the concerned gatherings, it offers each party with the right of incentives or motives to work together to attain the shared goal. It causes a disparity of power in the transaction. Therefore, the roles and responsibilities of each party shall be well defined at the possible extent on the contract to avoid disputes, but such an ideal contract may never be achieved due to various reasons. Contract theory applies to multi-party negotiations between different parties, called principal and agents, and it provides guidance to structuring the arrangement between them. The contract theory has three models or framework that assist principals and agents in taking proper acts under various contractual scenarios: moral hazard, adverse selection, and signaling & screening.

Moral hazard:

Definition of moral hazard has been provided by (Zhang Y. , 2016). He stated that 'moral hazard is a risk or problem that develops when one party to an interaction takes advantage of another owing to conflicting interests and information asymmetry amongst the parties involved.' When a risky behaviour is adopted, considering that the consequences will be covered or insured by another party, the moral hazard occurs. It recurrently involves the assumption of risks that disadvantage the other party having less information.

Moral hazard is defined in the economic theory as an inconvenience or disadvantage that occurs to a party (a person or organization) due to the actual or potential disregard of moral implications of behavioural choices on the part of another party (Kuznetsova, 2014). It exists in a situation wherein one party makes a decision to take a risk while knowing the fact that

another party bears the cost of the risk absorption. Moral hazard also happens because the action of one party is unobservable, and the observation or monitoring is extremely costly. Hart and Holmstrom have added that the moral hazard is a contractual circumstance wherein an asymmetry of information occurs after the signing of the contract by the concerned parties. There are two conditions necessary for the occurrence of a moral hazard; information asymmetry and a contract that affects the behaviour of the parties. There are two types of moral hazard; ex-ante and ex-post moral hazard. Ex-ante moral hazard refers to a behavioural change before an event occurs, whereas ex-post moral hazard refers to a behavioural change after an event occurs. Hidden action and hidden information models are used in moral hazard models. When an agent works to maximise its own self-interest at the expenses of the principal, moral hazard occurs.

Adverse selection:

Adverse selection occurs when asymmetric information causes a judgement or selection prejudice in the direction of poor quality or, more widely, under performance in the market outcomes (Anton, 2016). It is a contract situation when one party of the contract has better information than the other party related to some external characteristics that are significant to the contractual relationship of the involved parties. The party who has less information is at a disadvantage to the other party having more and accurate information because the party with more information stands to gain more in the contract with that information. Generally, the information asymmetry causes the problem of adverse selection between principal and agent wherein the principal is unable to recognise the type of an agent during or after signing of the contract.

The major distinction between moral hazard and adverse selection is that in moral hazard, one party's behaviour changes after the contract is signed, however in adverse selection, there is insufficient information before and during the contract signing between the concerned parties.

Signaling & Screening:

Screening relates to a state in which the principal doesn't even have any private information, however the agent has, whereas signalling refers to a situation in which the agent has private information but the principal does not.

Signaling may be defined as an idea that one party (sender) provide some information about itself to another party (receiver). The sender chooses whether or not to communicate, as well

as how to transmit that information, while the receiver decides how to interpret the sender's signal.

The contract theory has two parts; complete contracts and incomplete contracts. A complete contract cannot be written due to many reasons, including asymmetric information. An incomplete contract has missing provisions/information, no contingencies for future events, and has to be completed by renegotiations or by the courts. Such missing provisions are expensive to obtain and inaccessible to the parties, and such missing contingencies are unable to foresee by each party during the contract. Scott & Triantis (2005) have stated that in every possible condition of the world, as incomplete contract fails to establish a useful set of duties. From the economic standpoint of the incomplete contract theory, all contracts can be seen as incomplete.

Incomplete contract theory:

A contract is considered an incomplete contract from an economic perspective when some provisions are missing for a future event that cannot be stated at present. Future contingencies are unspecified in the incomplete contracts due to non-observable and/or non-verified states of the world.

The concept of incomplete contracting was presented by Grossman and Hart (1986) and then established by Hart and Moore (1990), and Hart and Holmstrom (1987). Contracts are usually incomplete in the real world because the cost of writing a contract that is complete in nature is expensive. There are consistently exists some space for negotiation in the form of bending the conditions of the contract in the incomplete contract for the benefit of own. Determination of such rooms in the contract is essential in favour of the success or failure of the partnership between public and private entities. It generates uncertainties for the public and private partners by allowing additional profits to be made at the expense of other. Hart (2003) has investigated the incompleteness of PPP contracts using an incomplete contracting model. According to him, a PPP contract is incomplete since the contractor can change the nature of the services in a variety of ways without breaking the contract. He also developed a theoretical model to evaluate which aspects are most important in determining the final outcome of public-private partnerships, although he did not go into detail about the PPP contract structure. Epstein (2013) has applied the principles of the contract theory to a contract amongst public sector and private entity and summarized the reasons of contracting involving public-private partnerships. He came to the conclusion that parties to government outsourcing contracts should be required to serve the public interest, and the individuals who are outraged by lacking

assistance arrangement will be permitted to sue for infringement as outsider recipients of the agreement. Most of the problems of public-private contracting can be addressed and decreased by using a contract structure. However, the author did not discuss the detail of the contract structure for public-private contracting.

To bridge such gap, the contract structure of PPP contracts was analysed. The contract agreements of PPP airports (Delhi international airport & Mumbai international airport) were analysed using 'document analysis'. Further, the critical success factors of PPP and the effect of PPP implementation on the airport's sustainability were analysed.

Literature was reviewed for the contract theory, and findings along with research gaps were prescribed in **Annexure-1.**

Chapter 4. Contract Structure

4.1 Contract structure for PPP

The contact structure of a PPP project describes the allocation of responsibilities, rights, and risks to each party who is participates in the contract. Such allocation of responsibilities is clearly stated in the contract. A contract structure is typically formed through a lengthy process, rather of establishing a complete contract straight away. The details of feasibility study and economic viability play significant role in developing the contract structure of a PPP project. Which contract structure shall be used for a particular project is the most fundamental decision which needs to take correctly in the project definition phase. Contract structures are different for unilateral contracts, bilateral contracts, trilateral contracts, string contracts, project consortium contracts and parallel contracts.

(1) Unilateral contracts: In a unilateral contract, one party agrees to pay for a specified activity or activities. It is a one-sided, legally enforceable contract in which one party, referred to as the 'offeror' makes an offer to another, referred to as the 'offeree'. Offeree to perform the specified activity as per the agreement to receive the promises made by the offeror. In the unilateral contract, only one party to fulfil their promises. Insurance between the parties is an example of unilateral contact.

(2) Bilateral contracts: Bilateral contract is a legally binding agreement wherein both the parties mutually agree to perform their obligations or agree to exchange items or services of value as per the terms and conditions. It is the most basic contract structure therein all the terms and conditions are under the control of both parties. Any sales or lease agreement is an example of a bilateral contract.
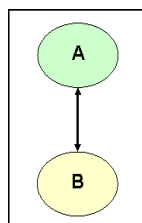
(3) String contracts: A string contract is a collection of bi-lateral agreements involving three or more parties. In a string contract, two parties (i.e., A & B, and B & C, and/or

C & D) are binding to each other by bilateral contracts. For example, party A has a bilateral contract with party B, and party B has another bilateral contract (sub-contract) with party C.
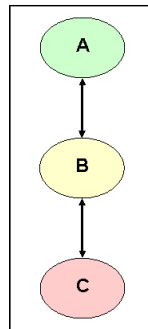
The terms and conditions between two parties of the string are not necessarily under the control of any of the other string parties.

(4) Parallel contracts: Parallel contract is a contract wherein one party is in the contract with other similarly situated parties. In a parallel contract, one party (party A) is in full control of other parties (party B, C, and D) with whom that party (party A) is in the contract.
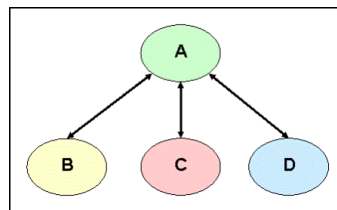
(5) Trilateral contracts: Trilateral contract is a contract wherein more than two parties are involved and binding with a legal agreement with one party. In a trilateral contract, one party (party A) has a direct and separate contract with other parties (party B & party C). One party (Party B) remains a main contractor/supplier. However, certain tasks and/or decisions are delegated to the other party (party C).
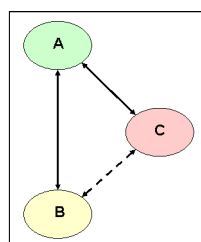
The trilateral contracts are based on the templates provided by the International Federation of Consulting Engineers, FIDIC. In FIDIC based contracts, party A called the employer, party B the contractor, and party C the consulting engineer.

(6) Project consortium: Project consortium is a contract wherein different companies come together and make a consortium for the execution of large amounts of contracts. There is single contract that binds all of the other parties (i.e., C, D, and E) in this contract structure, and they propose one lead partner (i.e., B) that has a direct contract with the employer (i.e., A). This is called a closed consortium. In another form of contract structure, the employer (i.e., A) has a direct contract with all other consortium partners (i.e., B, C, D, and E). This is called open consortium. In a closed consortium, only lead partner contacts with the employer. However, in an open consortium, any member can contact the employer.
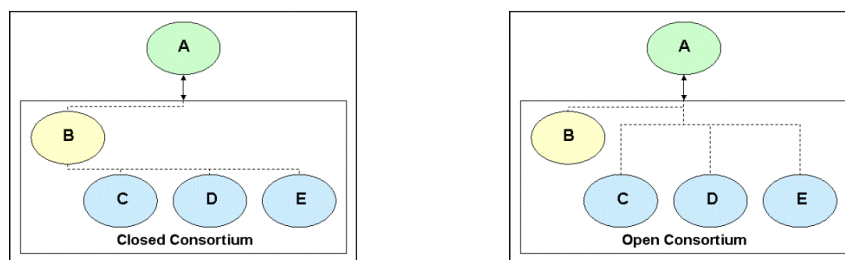
In a very large and complex project, the other partners of the consortium want to have a direct dealing with the employer, and this unusual practice generally weakens the position of the lead partner of the consortium.

The contract structure includes elements such as scope, duties, risk structure, and financial structure. It defines the contract's fundamental commercial elements, as well as financial terms and conditions that explain how the private partner will be reimbursed and risk allocation terms that explain how risks are allocated to each party in the contract. A classic PPP project contract structure can be fairly convoluted, including a multitude of parties' contractual agreements amongst a variety of parties such as the project sponsor, government, contractors, financial intermediaries, project operator, vendors, consultants, consumers, and so on, and the actual contract structure is dependent on the characteristics of PPP model.

As described below in figure 4.1, the private partner(s) will take the shape of an SPV (Special Purpose Vehicle) which is a project firm formed to develop and administer the project.

Figure 4.1 Typical Contract structure of PPP project
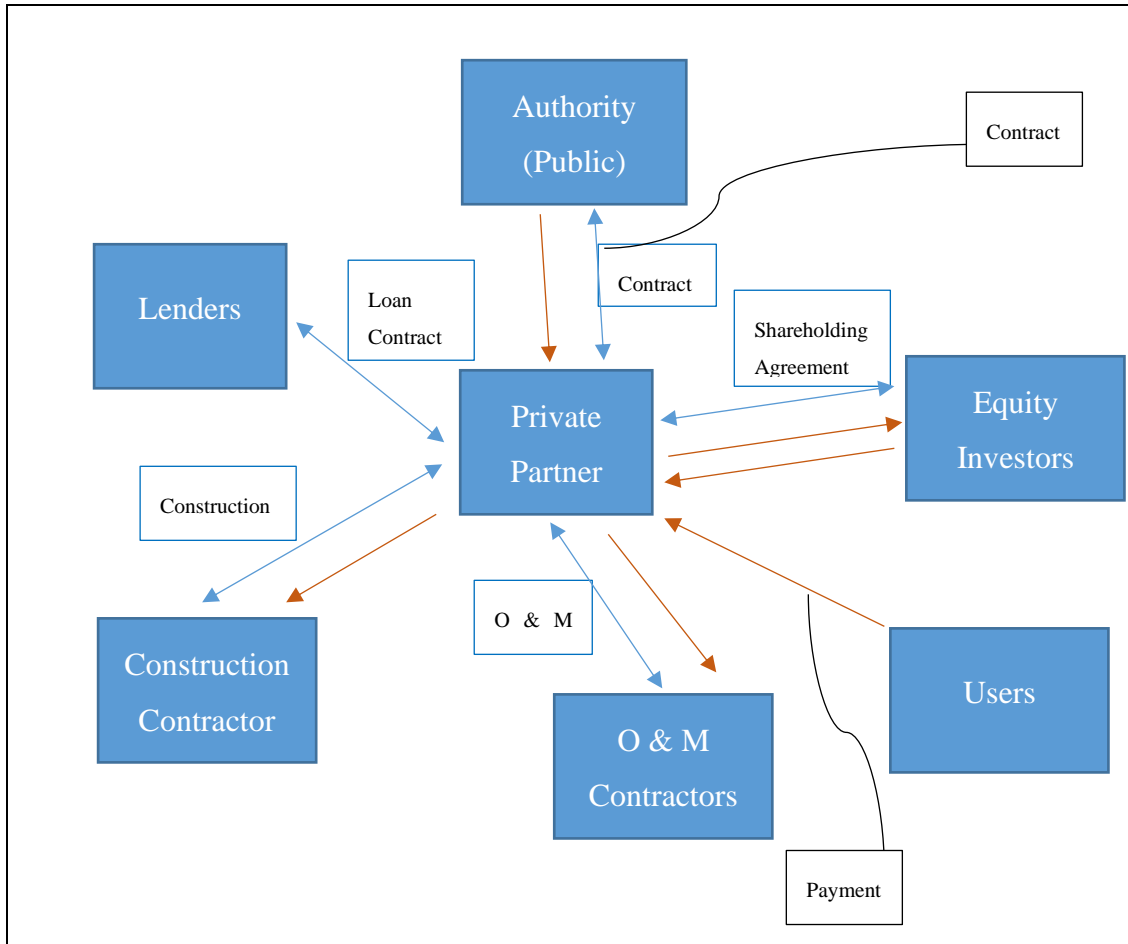
Source: www.unescap.org

The SPV transfers the majority of the duties and responsibilities to a downstream structure, assigning their roles and responsibilities, risks, and working capital from SPV to the many private actors through the following different agreements:

(1)   Shareholders agreement

(2)   Financial or debt agreement

(3)   Construction/engineering, procurement and construction (EPC) contracts etc.

(4)   O & M contracts

(5)   Insurance contracts and guarantees.

Basically, the involved parties are the shareholders of the SPV. There may also be other shareholders in the SPV who does not act as a contractor or consultants.

A PPP project's contract structure must constantly represent the professional connections of all concerned parties as accurately as feasible.

4.2 Data Collection

Two PPP airports of India (Delhi international airport and Mumbai international airport) were considered for the study. Accordingly, contract agreements of these airports were collected from the website of the Ministry of Civil Aviation.

Following contract agreements were collected for the analysis:

A.   For Delhi International Airport:

(1)   Lease Deed Agreement

(2)   OMDA (Operation, Management and Development Agreement)

(3)   CNS/ATM Facilities and Services Agreement

(4)   Shareholders Agreement

(5)   State Government Support Agreement or "SAGA"

(6)   State Support Agreement.

B.   For Mumbai International Airport:

(1)   Lease Deed Agreement

(2)   OMDA (Operation, Management and Development Agreement)

(3)   CNS/ATM Facilities and Services Agreement

(4)   Shareholders Agreement

(5)   Statement Government Support Agreement or "SAGA"

(6)   State Support Agreement

4.3 Research Methodology

The study is to analyse the contract structure of Delhi International Airport and Mumbai International Airport. Accordingly, the transaction documents (contract agreements or concession agreements) of these airports were collected for analysis.

There are following different tools are available for the qualitative research to analyse the above-mentioned contract documents:

(1)   Content analysis,

(2)   Case study analysis,

(3)   Grounded theory study,

(4)   Document analysis

Content analysis is a technique for analysing communication messages that are written, spoken, or displayed visually (Cole, 1988). It is the study of human communication that has been documented, such as hand written notes, text books, journals, newspapers, movies, text messages and emails, etc. The study of contexts, meanings, subtexts, and intentions contained in the messages using a systematized categorization technique of coding and finding themes or patterns is known as content analysis. Content analysis is a research methodology for the interpreting the content of text data forms an existential perspective (Hsieh & Shannon, 2005). But content analysis is a time-consuming and costly process. Analysing and categorizing massive amounts of data is a time-consuming and difficult operation.

A case study is an in-depth examination of a specific phenomenon that is recognized for simplifying/understanding difficult situation and bolstering previous studies (Soy, 1997). The case study research approach has been utilised for numerous years by researchers from several disciplines, particularly social scientists, who have used it to investigate current real-life situations (Soy, 1997; Tellis 1997). The key characteristics of case study research are that it is heavily focused, ensures a high degree of detail, and can integrate both objective and subjective data in order to achieve an in-depth understanding; however, it is also discovered that in the case studies, there is too much data for a smooth investigation, which can be complicated to illustrate in a modest way.

The grounded theory is that the researcher's theories about a topic are constructed based on their data. In other words, a new theory that is "grounded" in that data can be constructed by collecting and analysing qualitative data. In the grounded theory, the data collection starts in an early stage. The primarily interviews and existing documents are

used to build a theory based on the data. There are a series of open and axial coding techniques to identify themes and build the theory.

Although different qualitative tools are available for the analysis of contract documents, after the detailed literature review, we have found that 'document analysis' is best suited to our work.

4.3.1 Document Analysis

Document analysis is a time-saving methodology for studying and assessing electronic and printed (computer-based and internet-based) materials. It is a type of qualitative research in which the researcher infers materials to create expression and meaning around a particular evaluation issue. Document analysis, according to some authors, allows for a thorough and systematic examination of the contents of written documents. This method is not a summary or description of the contents of a document. Document analysis is an arrangement of skimming, reading, and interpretation. It includes parts of content analysis and thematic analysis, as well as the procedure below:

1. Select the data to be analysed: Based on the objective, data to be selected for the analysis. These data may be in the form of text, photographs, speeches etc. However, it is recommended that the data should be in transcribed form.

2. Coding: In this step, the data to be coded represent the meanings and patterns of the word or phrase. The phrases or sentences to be highlighted describe their content.

3. Themes: Review of codes created in the previous step and identified the pattern among them and generate the themes. Themes are broader than codes, and there may be a combination of several codes into a single theme.

4. Review and revise: Review of themes generated in the previous step and to be assured that the themes are useful and have accurate representation of the data. The developed themes may be spilt, combined, discarded or create a new one that makes it more useful and accurate.

5. Analyse and present the result: Thematic analysis of the data to be conducted and inference to be drawn. The properties, dimensions and relationships are to be explored and uncover the patterns in order to present the analysis. The results are to be presented under each theme.

Based on previous research, literature review and thorough review of the transaction documents of the airports, codes and themes were developed as mentioned in tables 4.1 and 4.3. The concession contracts of the airports were analysed on the basis of coding contents developed in step 2 and 3. This analysis was applied only on the standard sections of the contract agreement (not covered all sections of the contract agreement).

After the analysis, the critical findings/observations of each category to be briefly discussed, including the absence or presence of certain subcategories in different concession contacts of airports and also the summary of the proposed changes to be recommended to avoid same issues in future concession contracts of PPP airports.

4.4 Results

A. Delhi International Airport

The cabinet has approved the restructuring of airports in January 2000, which were under control of AAI. Following that, in September 2003, the private participation through a PPP model was approved for the reorganization of Delhi and Mumbai airports. A competitive bidding process was adopted, and the selection of a JV/consortium (Joint Venture/consortium) was made. A SPV (special-purpose-vehicle) viz. DIAL (Delhi International Airport Pvt. Ltd.) was founded, with Airport Authority of India selling 74 percent of DIAL's share to the JV consortium, and AAI signing an OMDA (Operation Management Development Agreement) with DIAL on 4th April 2006 as the promoter of the state. On the 3rd May 2006, AAI officially handed over the IGI (Indira Gandhi International Airport) to DIAL, and DIAL was given the exclusive right to carry out the functions outlined in the contract agreements, including finance, modernization, management, operations, construction, design, development, and upkeep of the airport. The Government of India and DIAL signed an SSA (State Support Agreement) on 26th April 2006 outlining the circumstances and the type of assistance that the Indian government will provide, as well as the collective roles and responsibilities of these two parties.

The contract agreements were analysed using the documents analysis method for the Themes/Sub-themes, as mentioned hereunder in Table 4.1.

Table 4.1 Themes for analysis of Contract Agreements (A)

S. No.	Documents (Contract Agreements)	Codes	Themes
1	OMDA (Operation, Management and Development Agreement) between AAI and DIAL	Grant of Function, Sole Purpose of the JVC, JVC Ownership Structure, Concession Period, Aeronautical and Non-Aeronautical Services, Substitution Agreement	JVC, Ownership, Concession Period, Aeronautical and Non-Aeronautical Services
2	Lease Deed between AAI and DIAL	Grant of Lease, Reservation of Lessor's rights, Lease rent, Lessee's warranties, Lessor's warranties	Lease, Land rent
3	CNS/ATM Facilities and Services Agreement between AAI and DIAL	Scope of Services	Scope of Services
4	Shareholders Agreement by and between AAI and DIAL and GMR Infrastructure Limited and GMR Energy Limited and GVL Investment Private Limited and Fraport AG Frankfurt Airport Services Worldwide and Malaysia Airport (Mauritius) Private Limited and India Development Fund	Capital Structure, Scope and Objective of the JVC, Shareholder's rights and obligations	Shareholding pattern, Funding
5	State Government Support Agreement (SGSA) between Government of NCT (National Capital Territory) of Delhi and DIAL	GONCT Support, Co-ordination Mechanism	Coordination and support
6	State Support Agreement between The President of India	GOI Support, Co-ordination Committees	Coordination and support

S. No.	Documents (Contract Agreements)	Codes	Themes
	on behalf of The Government of India and DIAL		

Source: Author's Compilation

4.4.1 Salient Features (A)

The contract agreements as mentioned above were analysed using the document analysis method for the specific themes. The salient features were prepared from the contract agreements of Delhi International Airport, which were downloaded from the website of the Ministry of Civil Aviation. The contract conditions of the contract agreements related to the research works were only considered hereunder as salient features. These salient features are only a reference and used only for the research works and shall not be used for any other purposes.

4.4.1.1 Operation, Management and Development Agreement (OMDA)

(1) The OMDA was made on 4th April 2006, between Airport Authority of India (AAI) & Delhi International Airport Private Ltd. (DIAL).

(2) The objectives of JVC were financing, designing, developing, constructing, upgrading, modernising, operating, maintaining, and managing the airport.

(3) Airport operator means Fraport AG Frankfurt Airport Service Worldwide.

(4) Consortium members: (i) GMR-Infrastructure Limited, (ii) GMR-Energy Limited, (iii) Fraport-AG Frankfurt Airport Services Worldwide, (iv) Malaysia-Airports (Mauritius) Private Limited, (v) GVL-Investment Private Limited, and (vi) India-Development Fund.

(5) Prime members: (i) GMR-Infrastructure Limited, (ii) GMR-Energy Limited., (iii) Fraport-AG Frankfurt Airport Services Worldwide, and (iv) Malaysia-airports (Mauritius) Private Limited.

(6) Project agreements: (i) OMDA Agreement, (ii) The State Support Agreement, (iii) Shareholders Agreement, (iv) CNS-ATM Agreement, (v) Airport Operator Agreement, (vi) State Government Support Agreement, (vii) The Lease Deed, (viii) Substitution Agreement, and (ix) Escrow Agreement.

(7) Grant of Function: AAI grants to the JVC some specific functions which were agreed upon by the JVC. These functions are like the design, development, construction, upgradation, modernization, finance, management, operation, and maintenance of the airport. The JVC also grant the function to perform services and activities constituting aeronautical services, and non-aeronautical services excluding reserved activities at the airport.

(8) Some exclusive rights of the JVC were also recognised by AAI. Their rights were; (i) to develop, design, build, upgrade, maintain, operate, finance, use and govern the services received by 3rd parties at the airport, (ii) to maintain the airport site and its assets under control, and enjoy the comprehensive and uninterrupted possession, for delivering non-aeronautical and aeronautical services, (iii) to evaluate, collect, demand, hold and charges that the airport's user must pay, and (iv) to hire third parties to perform the stipulated activities on behalf of the JVC through a contract/subcontract, as well as to sublet and/or licence the demised premises.

(9) The JVC can also additionally take part withinside the development, construction, renovation, maintenance and operation of a second airport consistent with the practicing of the right of first refusal conceded to the JVC.

(10) Apart from designated aeronautical, non-aeronautical and essential services at the site of the airport, the JVC is disallowed from participating in any other activity.

4.4.1.2 Lease Deed Agreement

(1) The Lease Deed Agreement between AAI and DIAL was signed on 25th April 2006,

(2) The Lessor (AAI) to develop, operate and maintain airports in India.

(3) The Lessee (JV/consortium) to development, construction, financing, management, operation, maintenance and design the airport.

(4) The OMDA between the Lessor and the lessee gives the lessee the authority to development, construction, financing, upgradation, modernisation, operation, maintenance, management and design the airport.

(5) The Lease Deed does now no longer permit to own mining rights of any kind or any hobby withinside the basic minerals if any.

(6) The Lessee shall pay an annual lease payment of INR 100/- throughout the lease period in advance to the lessor by cheque or demand draught on 1st April of each year.

(7) The lease is for a duration of thirty-years, with the choice to broaden it for additional thirty years. The lease deed will immediately terminate if the OMDA expires or is terminated early.

(8) The lessee guarantees that the airport will develop in compliance with the OMDA's criteria.

(9) Lessee warrants that the demised premises will be used in accordance with the conditions of the OMDA in order to construction, ownership, management, inspection, maintenance, operation, restore and business of the project.

(10) Lessee warrants that permission will be required for the execution of any operations in the demised premises or buildings that may be in violation of any applicable legislation.

4.4.1.3 Shareholders Agreement

(1) Shareholders agreement was made on 4th April 2006, by and between AAI and DIAL and GMR-Infrastructure Limited and GMR-Energy Limited and GVL-Investment Private Limited and Fraport AG Frankfurt Airport Services Worldwide and Malaysia Airport (Mauritius) Private Limited and India-Development Fund.

(2) The JVC must have a legitimate share capital of INR 250,00,00,000 (Rupees Two Thousand and Five Hundred Million only).

(3) The JVC Equity Shares required for shareholders to legally and beneficially process and hold the company's allotted share capital of INR 200,00,00,000 (Rupee Two Thousand Million) are listed below:

Table 4.2 Shareholding pattern (A)

Name of Shareholders	Number of Shares	% holding
Airport Authority of India and its Nominees	52 million	26.00%
GMR-Infrastructure Limited	62.20 million	31.10%
GMR-Energy Limited	20 million	10.00%
GVL-Investments Private Limited	18 million	9.00%
Fraport AG-Frankfurt Airport Services Worldwide	20 million	10.00%
Malaysia-Airports (Mauritius) Private Limited	20 million	10.00%
Indi- Development Fund	7.8 million	3.90%
Total	200 million	100.00%

Source: Shareholder Agreements (Ministry of Civil Aviation)

(4) Any shareholder might also additionally immediately or in roundabout way switch any or all of its fairness stocks to a third party that it's miles in compliance with the provision of the shareholders agreement, the OMDA, and the relevant law, and:

    (i)   there is no breach of the shareholders agreement by the shareholder;

    (ii)   the purchaser, as a 3rd party, accepts and commits to being obligated by the contract's terms of service, and signing a declaration of a compliance in the form.

    (iii)   the consent of AAI is obtained, if the shareholder is a private participant.

    (iv)   the equity-cap for foreign entities and/or the equity-cap for schedules airlines are not to be exceeded by such a transfer.

    (v)   In light of the political sensitivity, the Government of India will approve the buyer and its constitution.

(5) Each shareholder commits to work with other JVC shareholders to the extent necessary to guarantee the accomplishment of the JVC and the project, as well as the achievement of the business plan's objectives. Furthermore, the parties clearly agree and acknowledge that Airport Authority of India will only provide equity-capital to the joint-venture company to the extent indicated there in the shareholder agreement.

(6) In line with the charter articles and the shareholder's agreement, the JVC's personnel would have the responsibility and authority granted by the company's governing body of the company. The board will direct the JVC's administration and control. The JVC and the project will be developed and managed by the Board, which will have authority and accountability for it.

(7) the JVC shall no longer make any decision or take any action in regard to the reserved shareholder's affair unless and until the same is endorsed by way of an AAI's affirmative-vote and until AAI holds at least ten percent of the JVC's equity stocks.

4.4.1.4 State Government Support Agreement (SGSA)

(1) The SGSA was initialled on 26th April 2006 among the government of the NCT of Delhi and Delhi International Airport Limited to modernize and upgrade the airport.

(2) The Government of Delhi's National Capital Territory will provide assistance:

    (i)   in land encroachments and hindrances at the airport site.

    (ii)   to make extra land available for airport development and to enable surface access to the airport.

(iii) to offer full information of the utilities, including amounts, on a payment basis, in order to accommodate growing passenger and other traffic, and to enable growth, modernization, and preservation and development of existing facilities in connection to the utilities.

(iv) to keep the area all around airport clean, and to avoid any intervention with or damage to, the functioning of the airport as a result of the existence of birds and animals in the region.

(v) to support in conceding the permissions/clearances from the respective authorities.

4.4.1.5 State Support Agreement

(1) On 26th April 2006, the President of India on behalf of the government of India, signed a State Support Agreement with DIAL on the airport's modernization and reorganization of the airport.

(2) The government of India (GOI) commits to provide the following support to JVC:

(i) the economic regulatory authority was formed to regulate airports. The economic regulatory authority establishes the aeronautical charges in line with the board's criteria.

(ii) to allow for the charging of a passenger service fee at the airport, which must include the cost of security as determined by the nominated security agency.

(iii) to grant required permissions in full compliance with applicable law, against a request made by the JVC for or in relation to the project.

(iv) to provide the government's exclusive services i.e., customs control, immigration assistance, quarantine services for plant and animal, health-related services, service of meteorology, and services of security. The government, on the other hand, reserves the right to demand that the JVC perform and deliver all or some of the mentioned services, wholly or partially, at any time including any cause.

(v) to create the process that must be followed for the security of the airport, its passengers, visitors, and staff, as well as its aircraft, machinery and other assets.

(3) The members of the JVC thereby pledge and undertake to form a joint co-ordination committee (the "Joint Co-ordination Committee") to guarantee the seamless and effective delivery of government services. Representatives from the AAI, JVC,

security services, customs authority, immigration authorities, quarantine services for plant and animal, health services, and climatological services will make up this joint coordination committee.

(4)   The JVC members also agree to form an airport co-ordination committee (the "Airport Co-ordination Committee") to guarantee the airport's seamless and effective operation, as well as to enable communication and coordination between the GOI and the JVC on all activities regarding GOI policy and resolutions concerning the airport. This airport co-ordination committee will be made of the representatives of the: GOI, state government, and JVC.

4.4.1.6   CNS/ATM Facilities and Services Agreement

(1)   On 25th April 2006, AAI and DIAL members signed a contract intended for the supply of ATM/CNS services and facilities. They also agreed to form a co-ordination group.

(2)   The following services will be provided by AAI in compliance with the relevant conditions of the contract:

  (i)   information exchange services, route planning services, and intelligence gathering services, as well as air traffic management services (ATM/CNS),

  (ii)   maintenance and upgradation services for the AAI Equipment (on an individual basis),

  (iii)   acquisition of the required equipment (on an individual basis) at its own cost in order to make ATM/CNS services available in the airport,

  (iv)   obtaining services and facilities for meteorology in order to provide CNS/ATM services at the airport,

  (v)   to relocate AAI equipment for its operational convenience provided that such relocation does not affect the JVC obligations according to the OMDA and smooth operation of the airport.

B. Mumbai International Airport

On 4th April 2006, MIAL (Mumbai International Airport Private Limited), a JVC (Joint Venture Company), signed an OMDA with AAI, the state promoter, for the expansion and upgrading of Chattrapati Shivaji International (CSI) Airport. On 3rd May 2006, AAI handed over CSI Airport Mumbai to MIAL, according to the OMDA.

The contract agreements were analysed using the documents analysis method for the Themes/Sub-themes, as mentioned hereunder in Table 4.3.

Table 4.3 Themes for analysis of Contract Agreements (B)

S. No.	Documents (Contract Agreements)	Codes	Themes
1	OMDA (Operation, Management and Development Agreement) between AAI and MIAL	Grant of Function, Sole Purpose of the JVC, JVC Ownership Structure, Concession Period, Aeronautical and Non-Aeronautical Services, Substitution Agreement	JVC, Ownership, Concession Period, Aeronautical and Non-Aeronautical Services
2	Lease Deed between AAI and MIAL	Grant of Lease, Reservation of Lessor's rights, Lease rent, Lessee's warranties, Lessor's warranties	Lease, Land rent
3	CNS/ATM Facilities and Services Agreement between AAI and MIAL	Scope of Services	Scope of Services
4	Shareholders Agreement by and between AAI and MIAL and GVK Airport Holdings Private Limited and Bid Services Division (Mauritius) Limited and ACSA Global Limited.	Capital Structure, Scope and objective of the JVC, Shareholder's rights and obligations	Shareholding pattern, Funding
5	State Government Support Agreement (SGSA) between Government of Maharashtra and MIAL	GOM Support, Co-ordination Mechanism	Coordination and support
6	State Support Agreement between The President of India on behalf of Government of India and MIAL	GOI Support, Co-ordination Committees	Coordination and support

Source: Author's Compilation

4.4.2 Salient Features (B)

The contract agreements as mentioned above were analysed using the document analysis method for the specific themes. The salient features were prepared from the contract agreements of Mumbai International Airport, which were downloaded from the website of the Ministry of Civil Aviation. The contract conditions of the contract agreements related to the research works were only considered hereunder as salient features. These salient features are only a reference and used only for the research work and shall not be used for any other purposes.

4.4.2.1 Operation, Management and Development Agreement (OMDA)

(1) On 04-04-2006, the AAI (Airport Authority of India) and MIAL (Mumbai International Airport Private Ltd.) signed an OMDA.

(2) The objectives of JVC were to development, financing, building, upgradation, modernisation, operation, maintenance, and management of the airport.

(3) ACSA Global Limited is the airport operator.

(4) GVK Airport Holdings Pvt. Ltd., ACSA Global Limited, and Bid Services Division (Maritius) Ltd. Are all members of the consortium.

(5) GVK Airport Holdings Pvt. Ltd., ACSA Global Limited, and Bid Services Division (Maritius) Ltd. are the three prime members.

(6) Project agreements: (i) OMDA Agreement, (ii) The State-Support-Agreement, (iii) Shareholders-Agreement, (iv) CNS-ATM Agreement, (v) Airport-Operator Agreement, (vi) State-Government-Support Agreement, (vii) The Lease-Deed, (viii) Substitution-Agreement, and (ix) Escrow Agreement.

(7) Grant of Function: AAI grants to the JVC some specific functions which were agreed upon by the JVC. These functions are like the designing, to construct, develop, modernise, upgrade, manage, finance, maintain and operate the airport. The JVC also allow the function to execute services and activities instituting non-aeronautical services and aeronautical services exclusive of reserved activities at the airport.

(8) Some exclusive rights of the JVC were also recognised by AAI. Their rights were; (i) to develop, design, build, upgrade, maintain, operate, finance, use and govern the services received by 3rd parties at the airport, (ii) to maintain the airport site and its assets under control, and enjoy the comprehensive and uninterrupted possession, for delivering non-aeronautical and aeronautical services, (iii) to evaluate, demand,

collect, hold and charges that the airport's users must pay, and (iv) to hire third parties to perform the stipulated activities on behalf of the JVC through a contract/subcontract, as well as to sublet and/or licence the demised premises.

(9) The JVC can also additionally take part withinside the development, construction, renovation, maintenance and operation of a second airport consistent with the practicing of the right of first refusal conceded to the JVC.

(10) Apart from designated aeronautical, non-aeronautical and essential services at the site of the airport, the JVC is disallowed from participating in any other activity.

4.4.2.2 Lease Deed Agreement

(1) The Lease Deed Agreement between AAI and MIAL was made on 26th April 2006,

(2) The Lessor (AAI) to develop, operate and maintain airports in India.

(3) The Lessee (JV/Consortium) to development, construction, financing, management, operation, maintenance and design the airport.

(4) The OMDA, between the lessor and the lessee gives the lessee the authority to, development, construction, financing, upgradation, modernisation, operation, maintenance, management and design the airport.

(5) The lease deed does now no longer permit to own mining rights of any kind or any hobby withinside the basic minerals if any.

(6) The lessee shall pay an annual lease payment of INR 100/- throughout the lease period in advance to the Lessor by cheque or demand draught on 1st April of each year.

(7) The lease is for a duration of thirty- years, with the choice to broaden it for additional thirty years. The lease deed will immediately terminate if the OMDA expires or is terminated early.

(8) The lessee guarantees that the airport will develop in compliance with the OMDA's criteria.

(9) Lessee warrants that the demised premises will be used in accordance with the condition of the OMDA in order to construction, ownership, management, inspection, maintenance, operation, restore and business of the project.

(10) Lessee warrants that permission will be required for the execution of any operation in the demised premises or buildings that may be in violation of any applicable legislation.

4.4.2.3 Shareholders Agreement

(1)   Shareholders agreement was made on 4th April 2006, by and between AAI and MIAL and GVK-Airport Holdings Private Limited and Bid Services Division (Mauritius) Limited and ACSA Global Limited.

(2)   The JVC must have a certified share capital of INR 250,00,00,000 (Rupees Two Thousand and Five Hundred Million only).

(3)   the JVC equity shares required for shareholders to legally and beneficially process and hold the company's allotted share capital of INR 200,00,00,000 (Rupee Two Thousand Million) are listed below:

Table 4.4. Shareholding pattern (B)

Name of Shareholders	Number of Shares	% holding
Airport Authority of India and its Nominees	52 million	26.00%
GVK-Airport Holdings Private Limited	74 million	37.00%
Bid-Securities Division (Mauritius) Limited	54 million	27.00%
ACSA-Global Limited	20 million	10.00%
Total	200 million	100.00%

Source: Shareholder Agreements (Ministry of Civil Aviation)

(4)   Any shareholder might also additionally immediately or in roundabout way switch any or all of its fairness stocks to a third party that it's miles in compliance with the provision of the shareholders agreement, the OMDA, and the relevant law, and:

(i)   there is no breach of the shareholders agreement by the shareholder;

(ii)   the purchaser, as a 3rd party, accepts and commits to being obligated by the contract's terms of service, and signing a declaration of a compliance in the form.

(iii)   the consent of AAI is obtained if the shareholder is a private participant.

(iv)   the equity-cap for foreign entities and/or the equity-cap for schedules airlines are not to be exceeded by such a transfer.

(v)   In light of the political sensitivity, the government of India will approve the buyer and its constitution.

(5) Each shareholder commits to work with other JVC shareholders to the extent necessary to guarantee the accomplishment of the JVC and the project, as well as the achievement of the business plan's objectives. Furthermore, the parties clearly agree and acknowledge that Airport Authority of India will only provide equity-capital to the joint-venture company to the extent indicated there in the shareholder agreement.

(6) In line with the charter articles and the shareholder's agreement, the JVC's personnel would have the responsibility and authority granted by the company's governing body of the company. The board will direct the JVC's administration and control. The JVC and the project will be developed and managed by the board, which will have authority and accountability for it.

(7) the JVC shall no longer make any decision or take any action in regard to the reserved shareholder's affair unless and until the same is endorsed by way of an AAI's affirmative vote and until AAI holds at least ten percent of the JVC's equity stocks.

4.4.2.4 State Government Support Agreement (SGSA)

(1) The SGSA was initialled on 27th April 2006 among the Government of Maharashtra and Mumbai International Airport Limited, to modernize and upgrade the airport.

(2) The Government of Maharashtra (GOM) will provide assistance:

 (i) in land encroachments and hindrances at the airport site.

 (ii) to make extra land available for airport development, and to enable surface access to the airport.

 (iii) to offer full information of the utilities, including amounts, on a payment basis, in order to accommodate growing passenger and other traffic, and to enable growth, modernization, and preservation and development of existing facilities in connection to the utilities.

 (iv) to keep the area all around the airport clean, and to avoid any intervention with or damage to, the functioning of the airport as a result of the existence of birds and animals in the region.

 (v) to support in conceding the permissions/clearances from the respective authorities.

4.4.2.5 State Support Agreement

(1) On 26th April 2006, the President of India on behalf of the Government of India, signed a State Support Agreement with MIAL on the airport's modernization and reorganization of the airport.

(2) The Government of India (GOI) commits to provide the following support to JVC:

    (i)   the Economic Regulatory Authority was formed to regulate airports. The Economic Regulatory Authority establishes the aeronautical charges in line with the board's criteria.

    (ii)   to allow for the charging of a passenger service fee at the airport, which must include the cost of security as determined by the nominated security agency.

    (iii)   to grant required permissions in full compliance with applicable law, against a request made by the JVC for or in relation to the project.

    (iv)   to provide the government's exclusive services i.e., customs control, immigration assistance, quarantine services for plant and animal, health-related services, service of meteorology, and services of security. The government, on the other hand, reserves the right to demand that the JVC perform and deliver all or some of the mentioned services, wholly or partially, at any time including any cause.

    (v)   to create the process that must be followed for the security of the airport, its passengers, visitors, and staff, as well as its aircraft, machinery and other assets.

(3) The members of the JVC thereby pledge and undertake to form a joint co-ordination committee (the "Joint Co-ordination Committee") to guarantee the seamless and effective delivery of government services. Representatives from the AAI, JVC, security services, customs authority, immigration authorities, quarantine services for plant and animal, health services, and climatological services will make up this joint coordination committee.

(4) The JVC members also agree to form an airport co-ordination committee (the "Airport Co-ordination Committee") to guarantee the airport's seamless and effective operation, as well as to enable communication and coordination between the GOI and the JVC on all activities regarding GOI policy and resolutions concerning the airport. This airport co-ordination committee will be made of the representatives of the: GOI, State Government, and JVC.

4.4.2.6 CNS/ATM Facilities and Services Agreement

(1) On 25th April 2006, AAI and MIAL members contract intended for the supply of ATM/CNS services and facilities. They also agreed to form a co-ordination group

(2) The following services will be provided by AAI in compliance with the relevant conditions of the contract:

    (i)   information exchange services, route planning services, and intelligence gathering services, as well as air traffic management services (ATM/CNS),

    (ii)   maintenance and upgradation services for the AAI equipment (on an individual basis),

    (iii)   acquisition of the required equipment (on an individual basis) at its own cost in order to make ATM/CNS services available in the airport,

    (iv)   obtaining services and facilities for meteorology in order to provide CNS/ATM services at the airport,

    (v)   to relocate AAI equipment for its operational convenience provided that such relocation does not affect the JVC obligations according to the OMDA and/or flawless operation of the airport.

The study considers cases of international airports such as Athens International Airport and Ankara Esenboga Airports in addition to Delhi and Mumbai international airports. It helps us to understand the similarities and differences between the airports in India and abroad. However, the contract agreements could not be found in the open access and also did not get any response from the concerning authorities of these airports. Therefore, the information available for these airports in the open-access used in the study.

The Athens International Airport was built under a BOOT model with 30 years of concession period, making it the world's first largely privatized green-field commercial airport development. The Athens airport's (An example of a developed country's airport) proprietorship and management by Athens International Airport, which is 55% owned by the Greek government and 45% controlled by private corporation (Hochtief-Airport 26.67%, Hochtief-Airport-Capital 13.33% and Copelouzos-family 5%). The project cost was 2.2 billion Euro in which 60% cost was funded by commercial debt. It has the capacity to handle approx. Thirty-five million passengers per annum, and in 2017, it was handled 21.7 million passengers.

The Ankara Esenboga Airport (An example of a developing country's airport) is Turkey's 2nd largest airport. It is under the management of DHMI (General-Directorate of State Airport Authority) and was built using the Build-Operate-Transfer model in year-2006 for a concession duration of fifteen years and eight months. To defend the private endeavors from negative outer shocks, DHMI has offered a surefire number of yearly travellers in most of the cases for the growth of air terminal Ankara Esenboga Airport (Ulku, 2015).

Inferences

(1) Under the AERA act dated 1ˢᵗ January 2009, the government established an independent regulator known as the 'Airport Economic Regulatory Authority' (AERA). The AERA went into effect on 1ˢᵗ September 2009. However, in early 2000 the government sanctioned the reorganization of both Delhi-International Airport and Mumbai-International airport through PPP mode, and in 2006, the agreements to upgrade and develop the airport were inked with the private partner.

As a result, it is thought that in the absence of an independent regulatory authority, the decision to implement PPP in airports was made.

(2) The OMDA and the AERA Act have different definitions of non-aeronautical and aeronautical services, for example, ground handling facilities are deemed a non-aeronautical service in the OMDA on the other hand in the AERA Act, it is described as an aeronautical service. There are distinct terms regarding revenue sharing derived from non-aeronautical and aeronautical services, hence there are conflicts in the classification of such services that result in direct loss.

(3) Concession duration is set for thirty-years, with the choice to broaden it for additional thirty- years on the same terms and conditions. As it is pre-fixed, there is no scope for the government to review or modify any terms and conditions. Generally, the traffic volumes, performance, tariffs, concession period, capital cost, etc., are considered to determine a typical concession period. However, these elements were missing while fixing the further extension for 30 years. It is concluded that the concession period is 60 years for the airport. In the case of Ankara Esenboga Airport, which is Turkey's 2ⁿᵈ largest airport and was built under the BOT model in 2006, is an example of an airport of a developing country. It has a concession-period of fifteen-years and eight months. Similarly, the concession period of Istanbul airport is twenty-years only.

(4) User Development Fees (DF) was levied on the passengers and collected the amount for airport development. However, there is no provision mentioned in the OMDA for financial backing of the project cost by means of levy of development fees.

The levy of DF by DIAL and MIAL was approved by the Ministry and AERA. It was supposed to mention in the bidding documents. Allowing such provision in the post-contract is not fair to other bidders who were participated in the Bid.

(5) The land was given to DIAL on 'as-is-where-is' basis, with a yearly leasing rental charge of INR 100/ for the entire stretch, according to the lease deed.

(6) As a result of upsurge in the area, all the other items of the project were augmented proportionately according to the principal development plans, a total area of 470,179 square metres is expected to be developed. DIAL, on the other hand, built a total of 553,887 square metres of airport space. The ground level of the airport is also higher than most of Asia's leading airports at peak hours, according to CAG audit findings. Because of the expanded space, all of the project's other components were enlarged accordingly.

(7) The project was to be funded solely through debt and equity, according to the OMDA. However, the project was also funded by a user development fees on passengers. There was also a funding deficit that was filled through User Development Fees (DF).

4.5 Concluding Remarks

Contract agreements of Delhi and Mumbai airports were analysed using document analysis to understand the contract structure and PPP implication on these airports.

PPP has been proved as an appropriate way for airport development. Delhi and Mumbai airports are examples of the successful PPP implementation in airport development in India. However, some irregularities were found in the contract agreements, which need to be fixed for future development/upgradation of airports. The contract agreements of the airports were not balanced and provided favours to the concessionaires. It is essential to examine and verify the various provisions of OMDA that could not be followed during the contract implementation.

The concession period was extended at the concessionaire's discretion, without any performance review and on the same terms and conditions as before, which is counterproductive to the public interest. Therefore, it is suggested that all partnerships among public and private entities should be based on some essential factors such as traffic-volume, return-on-investment, and a period of break-even. A lengthy concession period with no consideration of any component may result in an unjust financial benefit to the concessionaire.

Allowance to collect the development fees is in contravention of the OMDA. Moreover, it was allowed to meet the required financing for the project cost. Similarly, the project cost of Mumbai airport was increased by more than 100%, and some portion of such funding gap was absorbed through levy of development fees on the passengers and time for extensions were also approved. Moreover, it was allowed to construct more floor area in Delhi airport than specified in the master plan and major development plan. Hence, there is a requirement for a regular monitoring structure that monitor and control such activities.

Reasonable precautions must be taken to commercialize the value in the interest of the public, when it comes to land that government is compelled to share for the airport project.

The outcomes of RO-1 have been considered to draft the list of critical factors of PPP airports. However, these CSFs (i.e., supervision, financial abilities, information disclosure, and legal framework) were further confirmed in the literature-review and an in-depth conversation with the experts in the next Chapter-Critical Success Factors.

Chapter 5. Critical Success Factors (CSFs)

5.1 Critical Success Factors of PPP Airports

Critical Success Factors (CSFs) are the crucial inputs that lead explicitly or implicitly to a project's success. Alias et al. (2014) stated that CSFs are such conditions and characteristics that may have substantial impacts on the project's success if they are managed appropriately. These success factors and their interactions may also lead to inefficiency and ineffectiveness of the project if not taken care of appropriately. The CSFs for PPPs are numerous due to the participation of dissimilar parties, and these CSFs are integrated with each other. In 1979, John F. Rockart and the MIT Sloan School of Management came up with the concept of critical success factors. Initially, it was used from the perspective of project management and information systems (Almarri & Abu-Hijleh, 2017). Thereafter, it was applied in BOT projects by (Tiong et al., 1992). Morledge & Owen (1998) defined the CSFs of a PPP as those factors that need to be conserved for the purpose to improve the project's success ratio so that the goals of its stakeholders are accomplished.

Critical factors of a PPP control the project's accomplishment or its' failure. A public-private partnership project is called successful when it achieves its objectives in terms of delivering excellent outcomes that satisfy the goals of the government, the needs of society, and propitious financial return to the private partner(s). CSFs of PPP in an airport are broadly categorized as; macro factors and project-specific factors, which are dealt with as a functioning policy of PPP in the country/region and PPP contract agreement in the project. Some studies are available wherein CSFs for PPP airports were recognized. But these studies are limited to the CSFs of PPP airports located in South Africa, Greece, and China. There is no such study found in the context of India. Moreover, the studies related to the exploration of the interrelationships between CSFs of PPP airports are missing. Shi et al. (2016) stated that due to the limit of numerous statistical methodologies, the interrelationships between the CSFs of PPPs could not be readily analyzed. Therefore, this study has been taken up for identification and ranking of the CSFs for Indian PPP airport to figure out the most important critical factors along with exploration of the interrelationships among these CSFs. In the study, the estimation of the PPP airport success using Ordinary Least Square (OLS) and Tobit regression models was also conducted. Accordingly, the study was accompanied into two separate phases.

In the first phase, identification and ranking of CSFs have been performed using AHP (Analytical Hierarchy Process). In a second phase, relationships between CSFs have been examined using PLS-SEM (Partial Least Square-Structural Equation Modeling).

Phase-1: Identification and ranking of CSFs

5.2 Data Collection

The outcomes of the RO-1 in terms of contractual issues of the airports were considered to draft the list of initial success factors that are critical in nature and significant to the airport's success or failure. Further, the CSFs were considered from the exhaustive literature review, and a total of twenty-three CSFs was finalized after having detailed discussions with the experts. Thereafter, a comprehensive questionnaire was developed. The questionnaire comprises of two parts; part A for receiving the introduction of the respondents and part B is for receiving the weightage from the respondents on the CSFs. On a five-point likert scale, all of these respondents were asked to express their opinion (weightage) in terms of importance levels ranging from 5-extremely important to 1-extremely unimportant.

A pilot survey was done to check and confirm the content of the questionnaire. Initially, the questionnaire was sent to 15 numbers of industry experts who have relevant experience of more than eight years in the PPP airport projects or airport projects in India. A face-to-face interview was also conducted with two numbers of experts who are presently associated with PPP airports and have relevant experience of more than 12 years in the airport sector. Consequently, the questionnaire was revised following the feedback and suggestions received in the pilot survey.

The final questionnaire was prepared in the google-form, and its link was sent to 200 numbers industry professionals who have minimum relevant experience of 7 years in PPP airport and/or airport projects as a client/consultants/contractor through email/messages from Oct'2019 to Mar'2020. A total of 78 responses were received, that is a 39% response rate, out of which eight numbers responses were not considered as those were incomplete. Hence, the analysis was conducted considering the 70 responses. The profile of the respondents is mentioned hereunder in Table 5.1.

Table 5.1 Respondent's profile

Category of Respondent	Number of Responses received	% of Responses
Client	21	30%
Consultant	24	34%
Contractor	25	36%
Total	70	100%

Source: Author's Compilation

Responses were received from different categories of the respondent i.e., 30%, 34%, and 36% from the Client, Consultant, and Contractor, respectively. Therefore, the responses are diverse in nature and a combination of different ideologies and beliefs.

Further, AHP was adopted to ascertain the utmost influential critical factors for the successful development of PPP airports in India by establishing a hierarchical model based on the critical factors, which are grouped into different levels of hierarchies. The reason for using AHP is due to its advantages over other structured techniques. AHP reduces cognitive errors by simplifying and comparing multiple attributes and confirms the respondent's consistency with respect to the importance (Song & Kang, 2016). It can also consider and compare the qualitative indices.

5.3 Research Methodology

5.3.1 Analytical Hierarchy Process (AHP)

AHP was developed by T.L. Saaty in 1971-1975 at Wharton School (University of Pennsylvania, Philadelphia, Pa). AHP is a method of measurement and has primary applications in multi-criteria decision making, project planning, project monitoring and control, resource management and conflict resolution (Saaty, 1987). It can also be used in the establishment of the measures for physical as well as social domains.

As it is a decision support technique, it helps in ranking the factors according to their priority. At first, there is a need to create a hierarchical model, thereafter provide a nominal value to each tier of the hierarchy and establish a matrix of pairwise comparisons (Taherdoost, 2017). The following are the steps to analyze the data and to obtain:

(1)   Average pairwise comparison matrix

(2)   Synthesized matrix

(3)   Priority vector and normalized ranking vector

(4)   Max. Eigen value of matrix (λ_{max})

(5)   Consistency Index (CI)

(6)   Consistency Ratio (CR)

(7)   Check CR; if CR < 0.1, it is acceptable to pass the judgement.

The pairwise comparisons matrix can be arranged from the weights received through the questionnaire survey:

$$A = \begin{vmatrix} w1/w1 & w1/w2 & w1/w3 & .... & w1/wn \\ w2/w1 & w2/w2 & w2/w3 & .... & w2/wn \\ w3/w1 & w3/w2 & w3/w3 & .... & w3/wn \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ wn/w1 & wn/w2 & wn/w3 & .... & wn/wn \end{vmatrix} \qquad ....$$

(1)

Where wx/wy = relative importance of factor x compared to factor y in the same set level i

n= number of factors in the set being compared concerning an element in the level i-1.

The pairwise comparison matrix (**A**) can be converted into an eigenvalue problem:

$$A.W = n.W \qquad \qquad \dots (2)$$

Where $W = (w1, w2, w3, ..., wn)^{\mathrm{T}}$ = vector of relative weights.

 n = Eigen value and W = Eigen vector of **A.**

W can be evaluated from the eigenvalue problem of (2) and the matrix **A** of relative importance.

5.3.2 Estimation Strategy of the PPP Airport Success

In the second stage, we intend to capture the drivers of PPP airport success. Initially, the following OLS method has been formulated to estimate PPP airport success.

$$Y_{i1} = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \beta_8 X_{i8} +$$
$$\beta_9 X_{i9} + \beta_{10} X_{i10} + \varepsilon_{i1} \qquad \dots (3)$$

Where index of PPP airport success (Y_{i1}) is the dependent variable. The index was formed as given below:

$$Y_{i1} = \sum_{i=1}^{n} w_i y_i / \sum_{i=1}^{n} w_i \quad \forall\, i = 1, 2, \dots, n \qquad \dots (4)$$

$$\text{Where, } \sum_{j=1}^{k} w_j = 1\, \forall\, j = 1, 2, \dots, k\,; \text{ and } y_i = (\bar{y} - y_{ij})/(y_{ij_{max}} - y_{ij_{min}})$$

We used industry professional opinion about success of PPP airport (y_1), industry professional satisfaction related to success of PPP airport (y_2), and industry professional recognition to formulate index of PPP airport success (Y_{i1}) as given in Eq. 4.

Contract implementation (X_{i1}), financial abilities (X_{i2}), information disclosure (X_{i3}), relevant project experience (X_{i4}), profit expectations (X_{i5}), availability of project details (X_{i6}), project complexity (X_{i7}), procurement process (X_{i8}), risk allocation between the parties (X_{i9}), and effective project management (X_{i10}) are used as dependent variables in Eq. 3.

However, in this investigation, our dependent variable Y_{i1} is a censored variable with values restricted to a theoretical range of 0 to 1. As a result, OLS may be improper in that range. Tobit model has been extensively employed in the literature to adjust for such a small range in the dependent variable (Asongu & Andrés, 2017). Therefore, the Tobit model is used to rewrite eq. 3 as shown below.

$$Y_{i1} = \begin{cases} Y_{i1}^* & if\ Y_{i1}^* > g \\ 0 & if\ Y_{i1}^* \leq g \end{cases} \qquad \dots (5)$$

Where Y_{i1}^* is a latent variable and g is a nonstochastic constant.

The econometric specification of the Tobit model can be stated as:

$$Y_{i1}^* = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \beta_8 X_{i8} +$$
$$\beta_9 X_{i9} + \beta_{10} X_{i10} + \varepsilon_{i1};\ \epsilon \sim N(0, \sigma^2) \qquad \dots (6)$$

5.4 Results

5.4.1 Hierarchical Model

A hierarchical model as mentioned in Figure 5.1, is developed on the basis of the critical success factors (CSFs) of PPP. There is an involvement of government body, private partner, public (surrounding to the airport and end-user), cooperative environment (where the partnership is developed), and process (by which the partnership is

implemented) in PPP airport. Accordingly, the identified CSFs (23 numbers) are grouped into five success characteristics (success factors) in the model, namely government's characteristics, private characteristics, public characteristics, cooperative environment, and process characteristics. To make pairwise comparisons easier, components of a similar kind are logically combined into one cluster. The CSFs are clustered into three separate sub-hierarchies (*Level-1, Level-2 and Level-3*):

Level-1: Top of the hierarchy is the main goal to recognize the CSFs of PPP for the development of the airport.

Level-2: Five success factors of PPP for the development of the airport form the 2nd level of the hierarchy.

Level-3: Twenty-three sub-success factors of CSFs occupy the 3rd level of hierarchy under the second level of the hierarchy.

Figure 5.1 Hierarchical Model
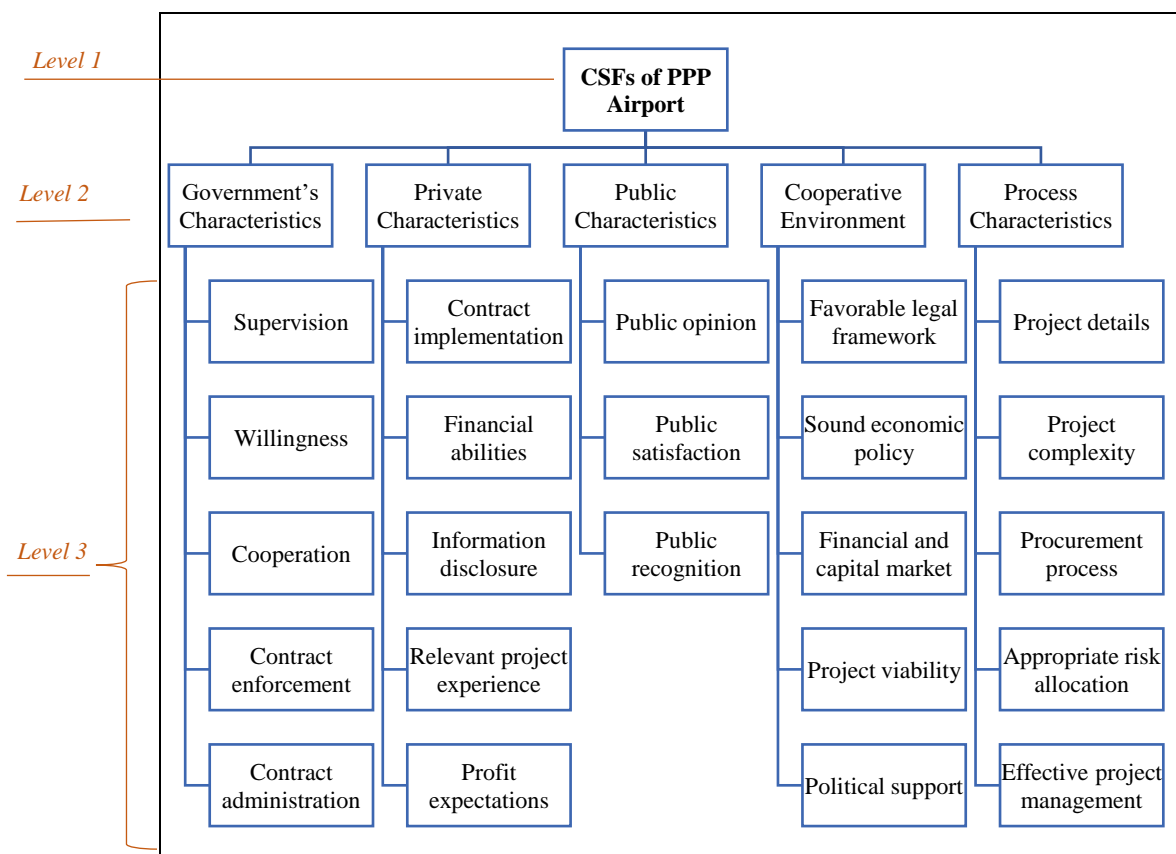
Source: Literature Review and Author's Compilation

The properties of sub-success factors are used to categorise them. The category of government's characteristics includes sub-success variables that are under the government's control. Government's supervision, government's willingness to build the PPP airport, government's cooperation with the private partner, contract enforcement by the government and contract administration of the government, play a vital role in governing the success or failure of PPP airport. Sub-success factors which are controlled by the private party are considered under the private characteristics. contract implementation by the private party, financial abilities of the private party, information disclosure made by the private party at the bidding stage, relevant project experience of the private party, and profit expectations of the private party are critical in nature. Sub-success factors; public opinion, public satisfaction, and public recognition, are considered under the category of public characteristics as these factors depend on the local public and end-user of the airport. Sub-success factors which depend on the surrounding working environment like favourable legal framework, sound economic policy, financial and capital market, project viability and political support to the PPP project are categorized under the cooperative environment. Sub-success factors which are grouped under process characteristics are project details shared by the government body for bidding purpose, project complexity mentioned by the government body, procurement process adopted by the government body for selecting the bidder, appropriate risk allocation between the stakeholders, and effective project management are critical factors that control the success or failure of PPP airport.

5.4.1.1 Calculation of Priority Vector

The pairwise comparison matrix is created using the responses from the respondents (17 numbers) on the questionnaire, and then priority vectors are created using the synthesized matrix. The priority vector of each success factor (SF_1, SF_2, SF_3, SF_4 and SF_5) indicates the order in which the success factors in that matrix are examined.

Table 5.2 Priority vectors of Success Factors

Success Factors (SF)	Code	Priority Vector
Government's Characteristics	SF_1	0.221
Private Characteristics	SF_2	0.216
Public Characteristics	SF_3	0.125
Cooperative Environment	SF_4	0.223
Process Characteristics	SF_5	0.215

Source: Author's Compilation

Priority vector of cooperative environment having the highest value followed by the government characteristics, private characteristics, and process characteristics. Public characteristics have relatively less importance.

For calculating the priority vector of sub-success factors, the steps described in the methodology are followed and detail mentioned in Table 5.3, along with the ranking of the sub-success factors.

Effective project management has the highest value of priority vector, which means it has top priority in comparison to other sub-success factors. Project complexity has the least priority among other sub-success factors, as mentioned in Table 5.3.

Table 5.3 Ranking of Sub-Success Factors (SSF)

Ranking	Sub-Success Factors (SSF)	Code	Priority Vector
1	Effective project management	$SSF_{5.5}$	0.2244
2	Cooperation	$SSF_{1.3}$	0.2141
3	Financial abilities	$SSF_{2.2}$	0.2135
4	Appropriate risk allocation	$SSF_{5.4}$	0.2103
5	Contract implementation	$SSF_{2.1}$	0.2085
6	Financial and capital market	$SSF_{4.3}$	0.2080
7	Public satisfaction	$SSF_{3.2}$	0.2080
8	Sound economic policy	$SSF_{4.2}$	0.2072
9	Procurement process	$SSF_{5.3}$	0.2053
10	Willingness	$SSF_{1.2}$	0.2036
11	Favourable legal framework	$SSF_{4.1}$	0.2008
12	Contract enforcement	$SSF_{1.4}$	0.2003

Ranking	Sub-Success Factors (SSF)	Code	Priority Vector
13	Profit expectations	$SSF_{2.5}$	0.1993
14	Public recognition	$SSF_{3.3}$	0.1986
15	Information disclosure	$SSF_{2.3}$	0.1960
16	Project viability	$SSF_{4.4}$	0.1952
17	Public opinion	$SSF_{3.1}$	0.1934
18	Supervision	$SSF_{1.1}$	0.1930
19	Contract administration	$SSF_{1.5}$	0.1890
20	Political support	$SSF_{4.5}$	0.1888
21	Project details	$SSF_{5.1}$	0.1870
22	Relevant project experience	$SSF_{2.4}$	0.1827
23	Project complexity	$SSF_{5.2}$	0.1729

Source: Author's Compilation

5.4.1.2 Consistency Check

To substantiate the results of the AHP, the consistency ratio (CR) will be calculated next, after calculating the max. eigen value of matrix (λ_{max}) and the consistency index (CI), by applying the following formula:

$$CR = CI/RI$$

$$CI = \frac{\lambda max - n}{n - 1}$$

Table 5.4 will be used to extract the value of RI, which is linked to the dimension of the matrix.

Table 5.4 Value of Random Consistency Index (RI)

Matrix Dimension	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.89	1.12	1.24	1.33	1.40	1.45	1.49

Source: Saaty, 1987

The value of RI depends upon the matrix size. The matrix size of SF_1, SF_2, SF_4, and SF_5 is [5 × 5]. Accordingly, the corresponding RI value for four matrices is considered

1.12. The matrix size of SF_3 is $[3 \times 3]$. Hence, the corresponding RI value is considered 0.58.

CI for the matrix of success factors (SF) found 0.00, then CR is also found 0.00. As it is lesser than 0.1, judgments are acceptable because CR < 0.1 (Velmurugan, et al., 2011). Similarly, CI for matrices of sub-success factors (SSF) is calculated and found that all the matrices are consistent as they have CR values lesser than 0.1.

Therefore, all the judgments related to CSFs of PPP for the development of the airport are acceptable.

The study has identified a total of twenty-three CSFs in five groups ($SF_1, SF_2, SF_3, SF_4, SF_5$) that are critical for the successful development of PPP airports in India. The cooperative environment (SF_4) is the most critical factor among the other four success factors ($SF_1, SF_2, SF_3,$ and SF_5). The SF_4 consists of a favorable legal framework, sound economic policy, financial and capital market, project viability, and political support. Financial and capital market and sound economic policy have the top two priorities in comparison to the other three sub-success factors of SF_4. Similarly, (Shi, et al., 2016) have also summarized in their study that sound economic policy, stable macroeconomic condition, and a favorable legal framework are the critical factors for the implementation of PPP in China.

The government's characteristics (SF_1) is 2nd important factor that is crucial for the accomplishment of PPP airports in India. The sub-success factors of SF_1 are supervision, willingness, cooperation, contract enforcement, and contract administration. cooperation of government having the highest priority vector followed by willingness, contract enforcement, supervision and then contract administration. For the successful development of the PPP airport, cooperative government departments and government supports are mandatory.

The private characteristics (SF_2) is followed by SF_1. The most important sub-success factor of SF_2 is the financial abilities of the private party, then contract implementation, profit expectations, information disclosed by the private party at the time of bid submission, and then relevant project experience of the private party. Financial abilities of the private party, like available funds, funding arrangement, source of additional funds, and cash flow, etc., of the private party, lead to the successful development of PPP airport. Additionally, the private party is solely

accountable for the successful execution of the contract's terms and conditions and the fulfilment of all the contract requirements.

The process characteristics (SF_5) is the 4th important success factor among the other success factors (SF), but effective project management ($SSF_{5.5}$), the sub-success factor of $SF_{5,}$ is the utmost essential factor among the other sub-success factors. Effective project management is significant to the successful development of PPP airport. Appropriate risk allocation between the private party and the government party, procurement process chosen by the government, project details shared by the government are the 2nd, 3rd, and 4th important sub-success factor of $SF_{5.}$ Project complexity is the least important factor among the other sub-success factors.

The public characteristics (SF_3) is the least important success factor as compared to other success factors (SF_1, SF_2, SF_4, SF_5). However, public satisfaction ($SSF_{3.2}$) has the highest value of priority vector than public recognition ($SSF_{3.3}$) and public opinion ($SSF_{3.1}$). It means public opinion about the PPP airport does not make a significant contribution as compared to public satisfaction and public recognition.

After identifying the CSFs of PPP for the successful development of an airport, the success of PPP airport is estimated.

5.4.2 Estimation of Success of PPP Airport

5.4.2.1 Summary of Descriptive Statistics

Descriptive statistics for variables used in stage two are presented in Table 5.5, which directly influence the PPP airport's success ranges from 0.165 to 1 with a mean value of 0.842.

Table 5.5 Summary of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Professional's perception on PPP airport Success (Y_{i1})	70	0.842	0.221	0.165	1
Contract Implementation (X_{i1})	70	3.586	0.577	2	4

Variable	Obs	Mean	Std. Dev.	Min	Max
Financial Abilities (X_{i2})	70	3.671	0.557	2	4
Information disclosure (X_{i3})	70	3.371	0.854	1	4
Relevant Project Experience (X_{i4})	70	3.143	0.889	1	4
Profit expectations (X_{i5})	70	3.429	0.650	1	4
Availability of Project Details (X_{i6})	70	3.214	0.815	1	4
Project Complexity (X_{i7})	70	2.971	0.900	1	4
Procurement Process (X_{i8})	70	3.529	0.829	1	4
Risk Allocation between the Parties (X_{i9})	70	3.614	0.597	1	4
Effective Project Management (X_{i10})	70	3.857	0.391	2	4

Source: Author's Compilation

Effective project management comes out as an important driver for PPP airport success ranges from 2 to 4 with a mean value of 3.857. Similarly, the financial abilities of the private party and contract implementation by the private party also influenced the PPP airport success, which has a range from 2 to 4 but a slight difference in the mean value of 3.671 and 3.586, respectively.

Effective project management, financial abilities, and contract implementation are to be taken care of more precisely as these variables build the professional's perception of the success of PPP airport.

Furthermore, an effort is made to comprehend the impact of these variables on the success of the PPP airport.

5.4.2.2   Drivers of Success of PPP Airport

We have estimated PPP airport success using the OLS and Tobit model and found that our results are robust because there is not much variation between the results of both models. Even we got a better level of significance in the case of the Tobit model, as shown in Table 5.6. Our results in Table 5.6 shows that other things remaining constant, effective project management, have influenced PPP airport success positively at a 1% level of significance (please see Model-2). This is as a result of the

fact that effective project management helps the project to achieve its specific target within time and cost, which leads to project success.

Profit expectations of the private party and the procurement process adopted for the bidding of PPP airport have a statistically positive impact on PPP airport success at a 1% significance level. If the adopted bidding process is transparent, it will favourably affect the PPP airport's success. Similarly, details of correct information shared during the bidding process by the private party have a statistically positive impact on PPP airport success at 5% level of significance because adequate correct information about the private party helps the government to make the right decision. Moreover, if the complexity of the project increases, which means that all aspects of the project are adequately considered then, it helps to build the professional's perception positively towards the PPP airport success at 5% level of significance. The success of any project requires optimum utilization of all of its resources, which leads to complexity and thereby influences the perception of the industry professionals positively.

Table 5.6 Estimation of PPP Airport Success

Professional's Perception on PPP Airport Success (Y_{i1})	OLS (Model – 1)	Tobit (Model – 2)
Contract Implementation (X_{i1})	-0.005 (0.013)	-0.009 (0.017)
Financial Abilities (X_{i2})	0.001 (0.017)	-0.006 (0.021)
Information disclosure (X_{i3})	0.020* (0.012)	0.037** (0.017)
Relevant Project Experience (X_{i4})	-0.012 (0.011)	-0.027* (0.015)
Profit expectations (X_{i5})	0.048*** (0.014)	0.066*** (0.018)
Availability of Project Details (X_{i6})	-0.028** (0.013)	-0.036** (0.017)
Project Complexity (X_{i7})	0.020* (0.011)	0.035** (0.015)
Procurement Process (X_{i8})	0.060*** (0.011)	0.069*** (0.014)
Risk Allocation between the Parties (X_{i9})	-0.027** (0.012)	-0.029** (0.016)
Effective Project Management (X_{i10})	0.042** (0.018)	0.059*** (0.022)

Professional's Perception on PPP Airport Success (Y_{i1})	OLS (Model – 1)	Tobit (Model – 2)
_cons	-0.137*	-0.266**
	(0.083)	(0.108)
Number of obs	70	70
F(10, 59)	9.21	
LR chi2(10)		57.4
R-squared	0.61	

However, risk allocation between the parties has a statistically negative impact on PPP airport success at a 5% level of significance. This is because, in a PPP project, the private party bears the majority of the important risks, and the role of the government is quite restricted. Similarly, project details shared by the government body, and relevant project experience of the private party, negatively affect the PPP airport success at 5% and 10% levels of significance, respectively. However, the financial abilities of the private party and contract implementation by the private party remained insignificant in predicting the PPP airport success.

Therefore, adequate government interventions and regulatory policies are required to manage such factors of the private party, which lead to building the negative perception of industry professionals towards PPP airport success.

5.5 Concluding remarks

There are currently no CSFs for the development of PPP airports in India. This study was conducted to determine the critical factors for the development of PPP airports successfully, in India in order to close this gap. Accordingly, the AHP approach, a decision support technique, was used to rank the critical factors in accordance with the significance of each one. Following that, OLS and Tobit Regression Models were used to estimate the PPP airport's success.

The priority vector is calculated using the AHP, and the CSFs are then given a ranking. The outcome of AHP demonstrates that the top four CSFs are 'effective project management', 'government cooperation], 'financial abilities' and 'appropriate risk allocation'. Project management is the most critical factor needed to successfully oversee in the top priority for project success. Effective project management is a concept and

method that is used in the project from the beginning to the end and has a direct impact on the project's cost and completion time.

To create a strong collaboration between the private and public partners of the PPP airport, government cooperation is crucial. The government should foster an environment where private parties can work together. The government should take a proactive role, particularly during the conceptual stage of the project when the main risks are identified, risks are distributed, and the procurement method is chosen. A local jurisdiction and set of rules that are acceptable to private parties should be developed with the assistance of the government. The government must also provide favourable policy development and implementation to the private partner. The development of PPP airports in India will not be successful without such government cooperation. A clear agenda and objective of the government in collaborating with the private parties also contribute to the success. The private partner's financial ability is their capability to undertake all of the investments necessary for the PPP airport's development. The project's performance is directly impacted by financial abilities. Project failure could be caused by the private partner's insufficient financial resources. As a result, the private partner must have adequate funds to complete the project since they share the risk of financing under the PPP airport. The risk will be given to the party who can handle it most effectively for the least amount of money. The primary way to distribute risks among the public and private parties in an airport PPP is through risk allocation. In order to successfully develop a PPP airport, the parties must allocate the risks among themselves in a way that minimizes disagreements during the project implementation stage and gives each party a clear understanding of their respective obligations.

The result of estimation of PPP airport success using the Tobit regression model shows that effective project management, procurement process, profit expectations, and information disclosure have a statistically positive impact whereas appropriate risk allocation, availability of project details and relevant project experience have a statistically negative effect on the success of the development of PPP airports. Hence, adequate government interventions and regulatory policies are required to manage such factors that negatively contribute towards PPP airport success.

The government and all other PPP airport stakeholders must properly take into account the identified CSFs for the development of PPP airports in India to be successful. The protracted support of regulatory authorities is also necessary, in addition to government support. The regulatory authorities must establish strict rules that will compel the

government to create a supportive legal, political, and economic environment. The implementation of the guidelines shall be the responsibility of the government and it shall be monitored by the pertinent regulatory authorities.

The study has contributions to the existing literature, methodology and practice. The uniqueness of the study is in its identification of the factors in the Indian context that are critical for the successful development of PPP airports. These factors might be taken into consideration by researchers while developing a PPP airport modal for usage in different countries. This study will assist the practitioners/managers who are associated with PPP or PPP airport projects. The study also provides a reference for the administration of the CSFs and assistance to industry experts in addressing the critical factors with appropriate approaches for the development of PPP airports successfully. The study also explained the application of AHP in ranking the CSFs.

This is a unique study, so far, on the identification and ranking of the critical factors for the successful development of airports under public-private partnerships in India using AHP. However, it is accompanied by some limitations. The relationship between the identified CSFs is not established in the study. Future studies could therefore be conducted to investigate how the CSFs are connected to one another. In light of the data collected and the framework developed for the PPP airport in India, additional research might be conducted while taking into account the current model for the development of PPP airports in other countries.

Further, the inter-relationships among the CSFs are also examined in the Phase-2 as mentioned hereunder:

Phase-2: Examining inter-relationships among the CSFs

5.6 Data Collection

The questionnaire, which was finalized in Section 5.2, was considered here, and another pilot survey was conducted to improve the content validity and reliability of the questionnaire. Initially, the questionnaire was sent to 15 industry experts who have experience of more than 15 years in PPP airport projects or airport projects. A face-to-face interview was also conducted with two experts who have work experience of more than 20 years in airport projects and are presently associated with PPP airport projects. Subsequently, the questionnaire was revised as per the feedback received. Thereafter, the

final questionnaire was sent to 320 industry professionals who are/were associated with public-private-partnership projects and/or airport projects through email from December 2019 to October 2020. A total of 182 responses were received, out of which 170 responses were considered due to their completeness.

PLS-SEM (Partial Least Square–Structural Equation Modeling) and the SmartPLS software (version 3.2.2) were used to test the hypotheses and to explore the interrelationships.

5.7 Sample Size

If a study has a small sample size and the models comprise many constructs, along with a large number of items, PLS-SEM is most useful (Fornell & Bookstein, 1982). Power analysis shall be considered by researchers to determine the required sample size for PLS-SEM (Hair, et al., 2019). The model's structure, the expected effect sizes, and the anticipated significance level are considered in the power analysis. Accordingly, the power analysis was applied in the study. Faul et al. (2007) mentioned that G*Power is a free power analysis tool that may be used for a variety of statistical tests. To determine the appropriate sample size, the G*Power software (version 3.1.9.4) was used in this study. The following steps were followed for calculating the sample size using the G*Power software in the study: (i) selecting the appropriate statistical tests for the study, (ii) choosing the type of power analysis, (iii) providing the input parameters for the analysis and (iv) calculating the sample size (Faul et al., 2007). Accordingly, inputs were provided in the software to calculate the sample size by considering the medium effect size, 5% error probability ($\alpha=0.05$), and three predictors (independent variables). The minimum sample size computed was 77. However, it has been suggested by (Cohen, 1992) that in order to have consistent results, the sample size shall be two to three times the minimum sample size computed from the G*Power software. The minimum required sample size is 77, and considering the suggestion of (Cohen, 1992) the required sample size was made $77 \times 2 = 154$ for the study.

Thus, in the study a sample size of 170 > 154 was considered. A total of 170 samples were used to run the SmartPLS software.

5.8 Research Methodology

5.8.1 PLS-SEM

Structural equation modeling (SEM) is a second-generation multivariate technique used to estimate a series of interrelated dependence relationships through combining aspects of multiple regression and factor analysis (Fah & Sirisena, 2014). As regression lacks in handling multicollinearity, SEM was applied in the study due to its effectiveness in dealing with multicollinearity between the factors. SEM was first used in the early 1970s, but it received attention from various researchers in the 1980s. SEM is an extensive statistical technique to test hypotheses for examining the relationships between observed and latent variables (Hoyle, 1995). It enables the incorporation of unobservable variables measured indirectly through the indicator variable (Hair, et al., 2014). There are different approaches available for SEM: Covariance-based SEM (CB-SEM), PLS-SEM, generalized structured component analysis (GSCA), etc. However, PLS-SEM was adopted in the study due to its numerous benefits over other approaches, as well as its effectiveness in analyzing the complex model, including the formative constructs. When formative constructs are included in a structural model, PLS-SEM is the preferred approach (Hair et al., 2019). PLS-SEM has the ability to deal with the problems of multiple regression that occur using other approaches, i.e., a limited number of observations, numerous missing data, and high correlations between predictor variables (Fah & Sirisena, 2014). Moreover, the following advantages of the PLS-SEM approach have been listed by many authors in the literature, which supported the usage of PLS-SEM in the study:

(1) Capability of working even with a small sample size.

(2) Ability to analyze formative constructs.

(3) Ability to work with fewer indicators.

(4) Ability to work with the non-normal distribution of data.

(5) Goodness-of-fit of the PLS path model is not required to be evaluated.

PLS-SEM is a covariance-based structure analysis technique that is more suitable for studies with many latent variables (Vijayabanu & Arunkumar, 2018). PLS-SEM has two sub-models: structural model (inner model) and measurement model (outer model). A structural model shows the relationship between different constructs, while a measurement model describes the relationship between a construct and its indicators (Diamantopoulos et al., 2008). PLS-SEM analyzes the relationships in the structural

model and the measurement model separately, not concurrently (Hair, et al., 2019). The study specified the formative measurement, wherein the direction of the relationship is from its indicators to the construct, which means that the indicators cause the constructs. Indicators of formative constructs are not interchangeable and capture a specific aspect of the construct's domain (Hair et al., 2014). The evaluation of a PLS-SEM model comprises the measurement model and the structural model. The first step is to evaluate the measurement model with reflective or formative parameters, whichever is applicable. If the measurement model meets all the required criteria, then the next step is to proceed to the assessment of the structural model (Hair, et al., 2019). The structural model is evaluated by path assessment, predictive relevance, and explanatory power of the model. The indicator's collinearity, statistical significance, and the relevance of indicators' weights are the formative elements for the evaluation (Hair et al., 2019).

5.8.1.1 Assessment of formative-measurement model

An assessment of formative measures deploys a different set of metrics: the collinearity of the indicators and the significance of the indicators' weights (Chuah et al., 2020). The VIF (variance inflation factor) should be between 3 to 5. Ideally, the VIF values should be close to 3 or lower (Hair et al., 2019).

The indicators' weights, statistical significance, and relevance are checked by bootstrapping. If the BCa bootstrap confidence interval of an indicator's weight does not include zero, this means that the indicator's weight is statistically significant (Hair, et al., 2019).

After assessing the statistical significance of the indicators' weights, the indicator's relevance is evaluated. The standard values of indicators' weights are between –1 and +1; however, on rare occasions, the values lower or higher than the standard values are also acceptable. An indicator's weight close to +1/–1 represents a strong positive/negative relationship, whereas a value close to 0 indicates a weak relationship (Hair et al., 2019).

5.8.1.2 Assessment of structural-model

The statistical significance and relevance of path coefficients (β-value), collinearity (VIF), coefficient of determination (R^2), and a model's predictive relevance ($Q^2_{predict}$) can be evaluated using the PLSpredict software (Samani, 2016). PLSpredict is a suitable and direct approach to assess the out-of-sample predictive capabilities of a PLS path model.

The collinearity of the constructs must be examined before assessing the structural relationships (Hair et al., 2019). It is similar to assessing the collinearity of the formative measurement models, but the only difference is that the scores of latent variables of the predictor constructs are used to calculate the VIF values. The values of the VIF should be between 3 to 5. Ideally, the VIF values, as suggested by (Hair et al., 2019), should be close to 3 and lower.

Path coefficients are assessed for obtaining the structural model's relationships, which represent the hypothesized relationships between the constructs. The standard values of path coefficients are between –1 to +1. However, path coefficients close to +1 represent strong positive relationships and *vice versa* for negative values (Hair, et al., 2014). The significance of a coefficient depends on its standard error, which is estimated by means of bootstrapping. The bootstrap standard error enables the computation of the empirical *t*-value and *p*-value for all structural path coefficients. For a significance level of 5% using the two-tailed tests, the *t*-value should be more than 1.96, and the *p*-value must be smaller than 0.05 (Hair, et al., 2014).

The higher the value of the coefficient of determination (R^2), the greater is the model's explanatory power. The value of R^2 above 0.25 is acceptable, while a value above 0.50 is preferable (Paraschi et al., 2019). The R^2 values of 0.75, 0.50, and 0.25 represent the substantial, moderate, and weak explanatory power of a model (Hair et al., 2019). The coefficient denotes the amount of variance in the endogenous constructs as explained by all of the exogenous constructs linked to it (Hair et al., 2014).

To evaluate the impact of a specified exogenous construct if omitted from the model, the value of f^2 (effect size) is measured. The values of f^2 of 0.02, 0.15, and 0.35 represent small, medium, and high effects, respectively, of an exogenous latent variable, and there is no effect considered if the value of f^2 is less than 0.02 (Hair et al., 2014).

If the value of $Q^2_{predict}$ for all indicators calculated by PLSpredict is greater than zero ($Q^2_{predict} > 0$), then the MAE/RMSE values are compared with the native LM benchmark (Shmueli et al., 2019). If PLS-SEM < LM for a majority/all of the indicators in PLS-SEM, the model has predictive relevance.

5.9 Building of Hypothesized Model

Five latent variables and 23 observable variables were identified from the literature and considered in the study. These latent variables were SF1–Government Characteristics, SF2–Private Characteristics, SF3–Public Characteristics, SF4–Cooperative Environment, and SF5–Process Characteristics.

Table 5.7 Constructs and Indicators (X)

Construct	Indicators
SF1–Government Characteristics	G1–Supervision
	G2–Willingness
	G3–Cooperation
	G4–Contract Enforcement
	G5–Contract Administration
SF2–Private Characteristics	P1–Contract Implementation
	P2–Financial Abilities
	P3–Correct Information
	P4–Project Experience
	P5–Profit Expectation
SF3–Public Characteristics	Pu1–Opinion
	Pu2–Satisfaction
	Pu3–Recognition
SF4–Cooperative Environment	C1–Favorable Legal Framework
	C2–Economic Policy
	C3–Financial Capital Market
	C4–Commercial Viabilities
	C5–Political Support
SF5–Process Characteristics	Pr1–Project Details
	Pr2–Project Complexity
	Pr3–Procurement
	Pr4–Risk Allocation
	Pr5–Project Management

Source: Literature review and author's compilation

Hypothesis were created based on an intensive literature review and a detailed discussion with three industry experts with experience in the field of public-private-partnership airports.

The government has numerous roles and responsibilities in a PPP airport project, especially in protecting social goals. The government is also involved in the effective supervision of the project, together with the contract enforcement and administration. The government's monitoring and supervision are essential to protect the public interest. Generally, the government helps to create such an environment wherein public participation can be augmented in PPP projects (Shi et al., 2016). The government's strategies and prerequisite actions towards the development of PPP airports help the public in building its opinion. Government policies, goals, and cooperation have a direct influence on the procurement process of PPP airport projects.

Hence, the following hypotheses were constructed:

H1: SF1→SF3 (Government Characteristics have a direct influence on Public Characteristics)

H2: SF1→SF5 (Government Characteristics have a direct influence on Process Characteristics)

Public interest is protected by the government. The public is not directly involved in any PPP contracts; even so, the public is an imperative stakeholder. The public's opinion determines whether a public-private partnership airport project succeeds or fails. The public is an end-user who provides feedback in many senses. Therefore, public recognition, opinion, and satisfaction directly affect private characteristics, which are the key elements in forming and maintaining the relationship with other stakeholders of the project.

Hence, the following hypothesis was constructed:

H3: SF3→SF2 (Public Characteristics have a direct influence on Private Characteristics)

It is the role of the government to foster a cooperative environment (Li et al., 2005) in the private party's apprehension of participating in PPP projects can be overcome (Zhang, 2005) (Shi et al., 2016). Such a healthy environment encourages the private

party to take part in PPP airport projects, and it also comforts the public in building its opinion. Economic policies, legal framework, capital market, and appropriate political support provide assistance in maintaining the partnership as sustainable and encourage the private partner for the delivery of high-quality services. Moreover, as recommended by (Shi et al., 2016) in their study, we explored the relationship between Cooperative Environment and Private Characteristics.

Hence, the following hypotheses were constructed:

H4: SF4 → SF2 (A Cooperative Environment has a direct impact on Private Characteristics)

H5: SF4 → SF3 (A Cooperative Environment has a direct impact on Public Characteristics)

H6: SF4 → SF5 (A Cooperative Environment has a direct impact on Process Characteristics)

Figure 5.2 Hypothesized model
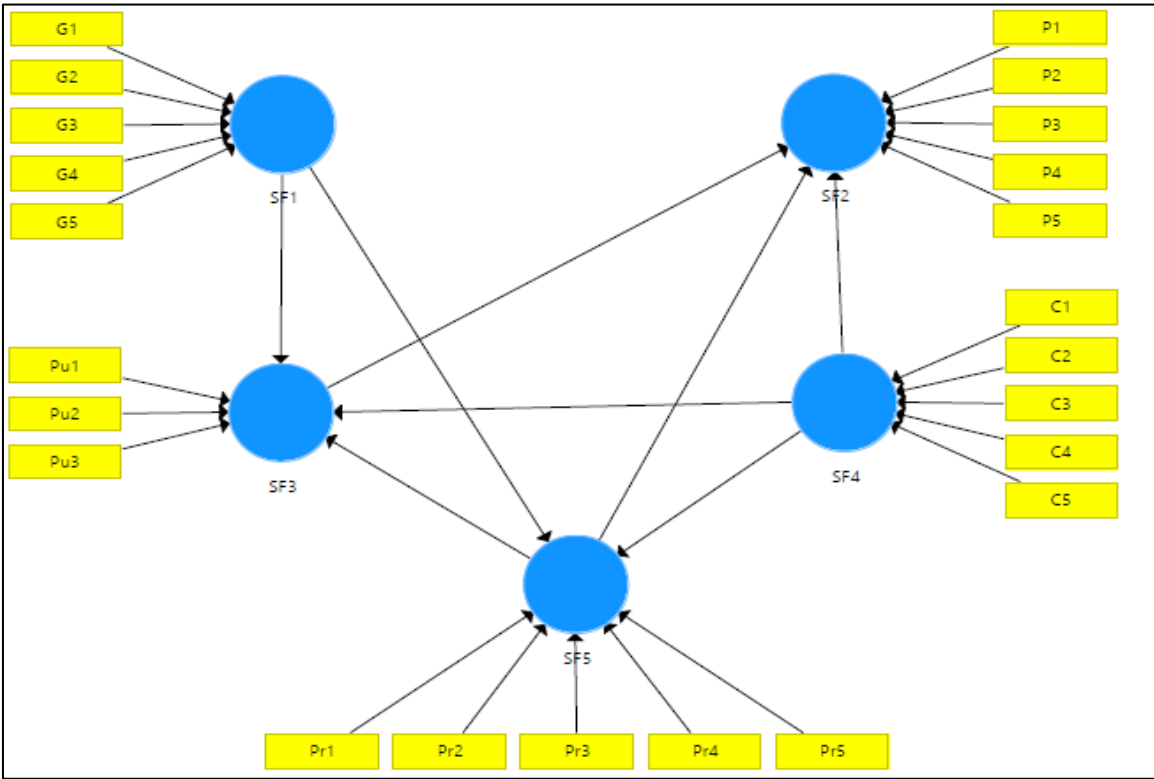
Source: Author's compilation

The participation of the private party in PPP airport projects is inspired by government policies and actions. These participations are made through a specific process of PPPs, which is finalized by the government and regulatory authorities. The project's success or failure is determined by the government's decisions. The types of project risk, risk allocation among the parties, project details that are to be shared publicly and, the procurement methods are fixed by the government after considering many other aspects of the project. These aspects directly affect the private party. Consequently, the private party decides on whether to participate in the project. The government's decisions and actions for private participation in airport projects affect the public interest. This helps the public in building its opinion and then its satisfaction level.

Hence, the following hypotheses were constructed:

H7: SF5 → SF2 (Process Characteristics have a direct influence on Private Characteristics)

H8: SF5 → SF3 (Process Characteristics have a direct influence on Public Characteristics)

5.10 Results

5.10.1 Assessment of measurement-model

The initial step in the analysis was to evaluate the measurement model. The findings of the measurement model evaluation are provided in **Table 5.8**.

The formative measurement model was checked for collinearity issues (VIF-values). The VIF-values of all the indicators are consistently less than the conservative threshold of 3. Therefore, we came to the conclusion collinearity is below the crucial level, and there are no difficulties with collinearity.

Complete bootstrapping of 5000 subsamples with Bias-Corrected and Accelerated (BCa) Bootstrap for 'two tailed' tests with a 95% significance threshold was used to evaluate the indicator's significance and relevance. The outer weights for all the indicators are significant except for indicators C2, G2, P3, and Pr4. As the outer weights of these indicators are not significant, the outer loadings of these indicators were checked. The outer loadings of these indicators are more than 0.50, which shows that these indicators are absolutely important to their constructs. In this situation, these indicators were retained in the model.

The outer weights of indicators Pu2, C4, Pr5, and P5 are close to +1, which shows a strong relationship between these indicators and their respective constructs, i.e., SF3, SF4, SF5, and SF2.

Table 5.8 Results of Measurement Model (X)

Indicator	VIF	Outer weight	*p*-value	95% confidence interval	Outer loading
C1	1.338	0.242	0.003	[0.109, 0.368]	0.629
C2	1.577	0.039	0.707	[–0.135, 0.195]	0.619
C3	1.568	0.234	0.016	[0.081, 0.400]	0.705
C4	1.385	0.559	0.000	[0.417, 0.702]	0.832
C5	1.407	0.286	0.001	[0.161, 0.429]	0.676
G1	1.554	0.319	0.029	[0.076, 0.553]	0.756
G2	1.789	0.003	0.982	[–0.202, 0.215]	0.654
G3	1.657	0.426	0.001	[0.211, 0.616]	0.806
G4	1.974	0.266	0.005	[0.123, 0.436]	0.795
G5	1.639	0.277	0.025	[0.079, 0.483]	0.728
P1	1.478	0.369	0.004	[0.168, 0.594]	0.77
P2	1.323	0.274	0.003	[0.138, 0.434]	0.67
P3	1.613	0.065	0.568	[–0.128, 0.247]	0.594
P4	1.571	0.202	0.089	[0.007, 0.396]	0.642
P5	1.325	0.458	0.000	[0.304, 0.612]	0.793
Pr1	1.635	0.268	0.003	[0.114,0.418]	0.703
Pr2	1.695	0.193	0.034	[0.051, 0.349]	0.609
Pr3	1.612	0.312	0.001	[0.147, 0.450]	0.751
Pr4	1.787	0.084	0.360	[–0.068, 0.235]	0.686
Pr5	1.766	0.492	0.000	[0.324, 0.653]	0.817
Pu1	1.506	0.178	0.062	[0.016, 0.326]	0.692
Pu2	1.469	0.592	0.000	[0.444, 0.735]	0.882
Pu3	1.376	0.447	0.000	[0.300, 0.595]	0.793

Source: Author's compilation

5.10.2 Assessment of structural-model

After the successful assessment of the measurement model, the structural model was first evaluated for collinearity (VIF). The VIF values of the structural model are shown in **Table 5.9**. The minimum VIF value is 1.739, and the maximum VIF value is 2.864

for constructs SF3 and SF5, respectively. The VIF values are lower than the conservative threshold of 3. Therefore, it is concluded that collinearity is not an issue. In the next step, the structural model relationships were evaluated using path coefficients, which represent the hypothesized relationships between the constructs. The significance and relevance of the path coefficients were evaluated using the bootstrapping process. **Table 5.9** demonstrates the results of a complete bootstrapping of 5000 subsamples applying the Bias-Corrected and Accelerated (BCa) Bootstrap for two-tailed tests with a 95% significance threshold. The findings reveal that all of the structural model relationships are significant except for hypothesis H1 (SF1→SF3). The t-value of path SF1→SF3 is 0.287, which is less than 1.96, and also, the path's 95% confidence interval contains zero, i.e., [–0.253, 0.122]. The results of its t-value and 95% confidence interval show that the relationship is not significant and, hence, government characteristics (SF1) do not affect public characteristics (SF3). Therefore, hypothesis H1 is not supported.

Table 5.9 Assessment of Structural Model (X)

Hypothesized path	β	t-value	p-value	95% confidence interval	VIF
SF1 → SF3	–0.032	0.287	0.774	[–0.253, 0.122]	2.325
SF1 → SF5	0.441	6.286	0.000***	[0.324, 0.551]	1.768
SF3 → SF2	0.259	2.301	0.021**	[0.065, 0.434]	1.739
SF4 → SF2	0.311	2.446	0.014**	[0.096, 0.511]	2.284
SF4 → SF3	0.256	2.005	0.045**	[0.050, 0.471]	2.334
SF4 → SF5	0.445	6.119	0.000***	[0.312, 0.552]	1.788
SF5 → SF2	0.246	2.004	0.045**	[0.033, 0.434]	2.526
SF5 → SF3	0.465	3.641	0.000***	[0.249, 0.664]	2.864

Note: ***$p<0.01$, **$p<0.05$

Source: Author's compilation

The t-values ($t < 1.96$), 95% confidence intervals and p-values ($p < 0.05$) for hypotheses H2 (SF1→SF5), H3 (SF3→SF2), H4 (SF4→SF2), H5 (SF4→SF3), H6 (SF4→SF5), H7 (SF5→SF2) and H8 (SF5→SF3) are shown in **Table 5.10**. The findings demonstrate that the paths are significant, and the hypotheses are supported.

The findings of the hypothesis testing are presented in **Table 5.10**.

Table 5.10 Result of Hypothesis Testing (X)

No.	Path	Hypothesis	Result
H1	SF1 → SF3	Government Characteristics have a direct influence on Public Characteristics.	Not Supported
H2	SF1 → SF5	Government Characteristics have a direct influence on Process Characteristics.	Supported
H3	SF3 → SF2	Public Characteristics have a direct influence on Private Characteristics.	Supported
H4	SF4 → SF2	Cooperative Environment has a direct impact on Private Characteristics.	Supported
H5	SF4 → SF3	Cooperative Environment has a direct impact on Public Characteristics.	Supported
H6	SF4 → SF5	Cooperative Environment has a direct impact on Process Characteristics.	Supported
H7	SF5 → SF2	Process Characteristics have a direct influence on Private Characteristics.	Supported
H8	SF5 → SF3	Process Characteristics have a direct influence on Public Characteristics.	Supported

Source: Author's compilation

Furthermore, the model was tested for coefficient of determination (R^2), and the result is shown in **Table 5**.11. Constructs SF1 and SF4 jointly explained 42.5%, 51%, and 65% of the variance in constructs SF3, SF2, and SF5, respectively, thus indicating a moderate explanation power.

Table 5.11 Result of R^2 (X)

Construct	R^2	R^2 Adjusted
SF2	0.510	0.502
SF3	0.425	0.415
SF5	0.651	0.647

Source: Author's compilation

The effect size (f^2) was also calculated, and its result is shown in **Table 5.12**. The values of f^2 show that SF1 and SF4 have a large effect size on SF5. However, there is zero effect size shown of SF1 on SF3 and SF2.

Table 5.12 Result of f² Effect Size

Construct	SF2	SF3	SF5
SF1	-	*0.001*	0.315
SF3	0.079	-	-
SF4	0.087	0.049	0.320
SF5	0.049	0.131	-

Source: Author's compilation

The predictive relevance of the model was analyzed using PLSpredict, and its result is shown in **Table 5.13**. The $Q^2_{predict}$ values for all the indicators of a measurement model were found to be more than zero ($Q^2_{predict} > 0$). Then, the prediction errors were checked on whether they were symmetrically distributed. According to (Shmueli, et al., 2019), including MAE values for prediction statistics is more appropriate in the event of a substantially non-symmetric distribution of the prediction errors. Therefore, the MAE (Mean Absolute Error) values with the native LM benchmark were used.

Table 5.13 Result of PLSpredict (X)

Indicator	PLS MAE	LM MAE	Difference MAE	PLS $Q^2_{predict}$
P1	0.469	0.470	–0.001	0.275
P2	0.544	0.545	–0.001	0.165
P3	0.586	0.611	–0.025	0.109
P4	0.635	0.646	–0.011	0.101
P5	0.522	0.534	–0.012	0.240
Pr1	0.587	0.589	–0.002	0.207
Pr2	0.624	0.602	0.022	0.134
Pr3	0.459	0.467	–0.008	0.357
Pr4	0.498	0.490	0.008	0.367
Pr5	0.367	0.349	0.018	0.486
Pu1	0.583	0.598	–0.015	0.143
Pu2	0.530	0.533	–0.003	0.214
Pu3	0.505	0.483	0.022	0.234

Source: Author's compilation

All the Q^2 values of the indicators are larger than zero, and the MAE values of the PLS-SEM model are lower than the MAE values of LM, indicating that the model generated less errors for all of the indicators. As a result, the model is predictive in nature.

5.11 Analysis

The final SEM model was proposed, as shown in **Figure 5.3**, which represents two types of relationships: a) the relationships between the CSFs and their indicators and b) the relationships between the CSFs. The results of the assessment of the measurement model show that public satisfaction (Pu2) shares a strong relationship with public characteristics (SF3) as compared with its other indicators, i.e., public opinion (Pu1) and public recognition (Pu3). Similarly, commercial viabilities (C4), project management (Pr5), profit expectation (P5), and government cooperation (G3) share strong relationships with cooperative environment (SF4), process characteristics (SF5), private characteristics (SF2), and government characteristics (SF1), respectively.

The results of the assessment of the structural model are discussed hereunder.

5.11.1 Government Characteristics

Government characteristics positively influence process characteristics (H2) (path coefficient: 0.441). The result is also supported by the study by Shi et al. (2016). Proper government supervision ensures the delivery of high-quality services and the protection of the public interest. A government's strong willingness towards the development of PPP airports improves the satisfaction of the partners. A government's decision-making ability affects risk allocation among the parties, procurement process, and project management, which are critical for the successful development of PPP airports. In addition, government policies, regulations, and guidelines on PPPs have consequences on process characteristics.

The results also show that government characteristics do not influence public characteristics (H1) (path coefficient: –0.032). In a PPP airport, the government's role and responsibilities are very limited as compared with a private partner. Therefore, the government's characteristics are not directly perceptible to the public. Moreover, there

is a lack of a system in which the government (as a regulator) collects and evaluates public/customers' feedback.

5.11.2 Private Characteristics

The private partner has a vital influence in the successful development of PPP airports. The roles and responsibilities are huge for the private partner, as the critical risks are borne by the private partner. Private characteristics are positively influenced by public characteristics (H3), cooperative environment (H4), and process characteristics (H7). The cooperative environment has more impact on private characteristics (path coefficient 0.311) as compared with public characteristics (path coefficient: 0.259) and process characteristics (path coefficient: 0.246).

5.11.3 Public Characteristics

Public characteristics have a positive impact on private characteristics (H3) (path coefficient: 0.259). Although the impact is not much stronger, customers' satisfaction and their opinion contribute to achieving high-quality services and better value for money. Similar findings were shown in the study by (Jamali, 2007). Public recognition and satisfaction are essential for the private partner. Similarly, (Boyer et al., 2015) concluded that public involvement has a positive impact on a PPP project in the long run.

5.11.4 Cooperative Environment

The cooperative environment has a comparatively more positive influence on process characteristics (H6) (path coefficient: 0.445) than private characteristics (H4) (path coefficient: 0.311) and public characteristics (H5) (path coefficient: 0.256). A favorable legal framework, political support, economic policies, available financial capital market, and commercial viabilities play a vital role for the private partner in partnering with the government to develop a PPP airport. A favorable legal framework always welcomes private partners to participate with the government. These factors are also the deciding criteria for risk allocation, procurement process, and project management for the development of PPP airports. Government regulations and

policies also affect the private partner's decision in sharing the correct information with the government.

Figure 5.3 Final SEM Model
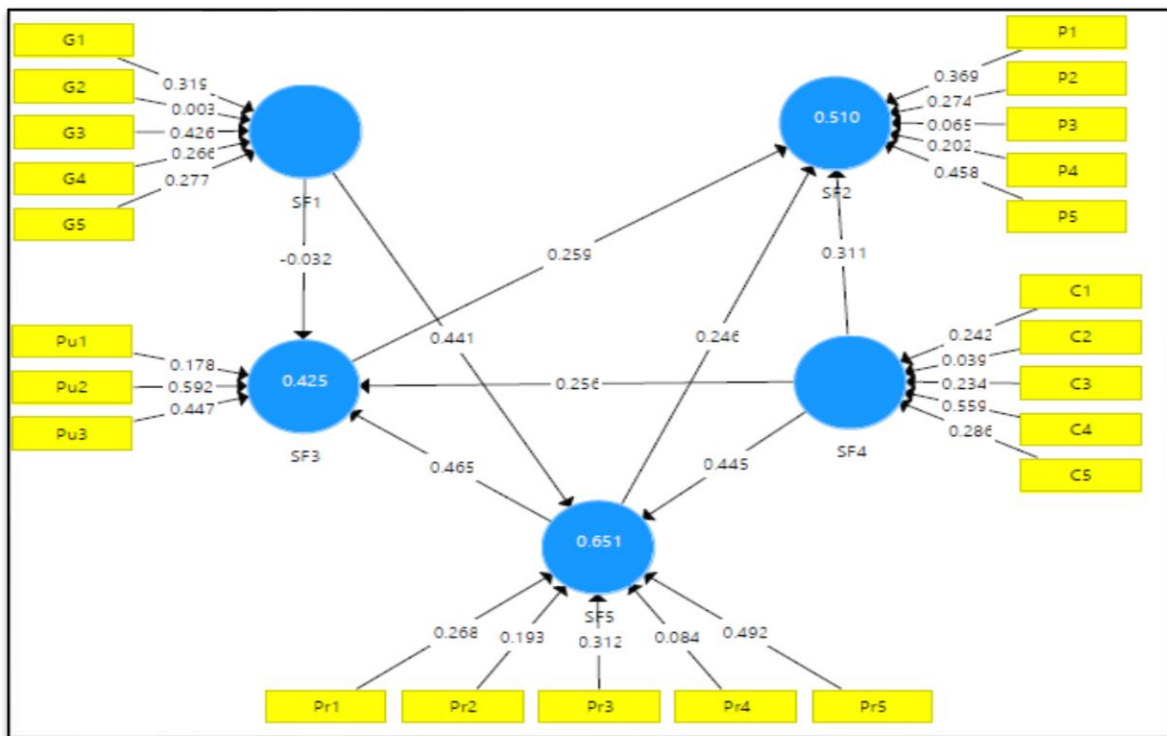
Source: Author's compilation

5.11.5 Process Characteristics

Process characteristics have a positively more impact on public characteristics (H7) (path coefficient: 0.465) and comparatively less impact on private characteristics (H8) (path coefficient: 0.246). However, process characteristics are influenced by cooperative environment (0.445) and government characteristics (0.441).

The project's details, including project complexity, shared by the government (as a regulator) with private partners during the procurement process are noticeable by the public, and a transparent procurement process makes a big impression on the public. An adequate risk allocation is essential for a successful partnership between the government and the private partners. The arrangement of financial resources and the profit expectation by the private partners depend on the amount of critical-risk sharing by the private partners.

5.12 Concluding remarks

The interrelationships between the critical success factors for the PPP airport's development have not yet been analyzed within the Indian context. To fill this gap, the study was conducted to examine the interrelationships between the CSFs for the development of PPP airports in India. Accordingly, the interrelationships between the critical success factors were examined using Partial-Least-Square (PLS), a form of Structural-Equation-Modelling (SEM). The dependent variables in this study were government characteristics and the cooperative environment, and their effects on private, public, and process characteristics were examined. The finding demonstrate that process-characteristics have a greater effect on public-characteristics (0.465) and, similarly, cooperative-environment has a greater effect on process-characteristics (0.445). On the other hand, process-characteristics have a minor effect on private-characteristics (0.246). The study also discovered that efficient government oversight is essential in order to provide high-quality services and public-interest preservation through a PPP framework. Customers' satisfaction and opinions also play a role in providing excellence services and greater value-for-money.

The study has added to the current literature and practice. The relationships highlighted between the critical success factors of PPP airports (in the Indian context) is the study's theoretical distinctiveness. The study explained the relevance of public opinion and satisfaction in PPP airports. It went into detail about the direct impact of government characteristics and the cooperative environment on the PPP airport's process and private characteristics. As the study focused on the institutional factors of PPPs, policymakers are mainly expected to be the beneficiaries. Policymakers should definitely consider the impact of a cooperative environment and accordingly design a favorable legal framework, commercial viabilities, and sound economic policies for successful private participation in PPP airports.

The study will help practitioners/managers who are associated with PPPs or PPP airport projects. The study highlighted the strong and weak relationships between the CSFs. The interrelationships between the CSFs were investigated with a purpose to gain an enhanced knowledge of the mechanism's impact and to provide a clear grasp of how to manage the critical success factors in the development of PPP airports. The study offered a reference for the administration of the CSFs, as well as assistance to industry experts in addressing the CSFs with appropriate approaches for the development of PPP airports.

The study also has methodological contributions. Although PLS-SEM is widely utilized in the social sciences and a variety of business disciplines, it is rarely used in the infrastructure sector. The study used a unique methodology called Partial-Least-Square-Structural-Equation-Modelling (PLS-SEM), to create a formative-formative model for investigating the interrelationships between the institutional factors (PPP's CSFs). This model is also capable of accurately predicting private characteristics, public characteristics, and process characteristics.

This is the first study of its kind to use PLS-SEM to examine the interrelationships between the CSFs for the 'successful development' of PPP airports in India. However, it is accompanied by some limitations. The direct impact of government characteristics on private characteristics was not examined. Therefore, future research may be conducted on the same.

Chapter 6. Sustainable PPP Airports

6.1 Airport's sustainability

The sustainability of an airport is defined as a simultaneous consideration of economic, social, and environmental components. The sustainable development principles provide economic growth while preserving the environment and additionally paying attention to social responsibility. Three main theoretical challenges are involved in making airports sustainable: a) unavailability of critical thresholds of the global environmental system, b) lack of protocols for permissible limits of consumption of natural resources by individual sectors, c) difference in opinions for what shall be sustained (Upham & Mills, 2005). The environmental challenges jeopardize the conditions of robust economic, ecological and social systems (Jenkins, 2011). Moreover, most of the economic activities have an adversarial environmental impact, and to make an airport environmentally sustainable may create an economic burden on the airport and also make it economically unfeasible. Airports having a large capacity of materials and people will be less feasible to achieve sustainability in comparison to the airports having small capacities. In spite of the fact, development of large airports cannot be compromised; a feasible approach is required to make it economic, environmental, and social sustainable.

The involvement of private and public sectors in PPP-Airports is characterized by many dimensions such as contract arrangements, ownership, the structure of management organization, stakeholder's engagement, private sector's behaviour, investment distribution, resource consumption and others.

The sustainability of the airport can be measured by the TBL dimensions; economic performance (E_c), social performance (S), and environmental performance (E_n). Following PPP variables are considered from the literature which affect the sustainability of airports: (i) Private ownership, (ii) Regulatory intervention, (iii) Investment distribution, (iv) Risk sharing, (v) Stakeholder engagement, and (vi) Reputation & credibility.

The study is conducted to analyse the impact of PPP on the sustainability of airports in India.

6.2 Data Collection

An exhaustive literature review was adopted to identify factors of PPP that affect the sustainability of airports. A total of 6 sub-factors (independent variables) were considered for the study. Accordingly, a questionnaire was developed to conduct the questionnaire survey. The questionnaire had two parts: Part A for collecting the general information of the respondents and Part B for getting the weightage for each factor.

A pilot survey was conducted to improve the content validity and reliability of the questionnaire. Initially, the questionnaire was sent to 15 industry experts who have experience of more than 15 years in PPP airport projects or airport projects. A face-to-face interview was also conducted with two experts who have work experience of more than 20 years in airport projects and are presently associated with PPP airport projects. Subsequently, the questionnaire was revised as per the feedback received.

As the study is limited to PPP airports of India, two airports, Delhi International Airport and Mumbai International Airport, were considered for the study. Therefore, the said questionnaire was sent to collect the data for these airports.

The final questionnaire was sent to 140 industry professionals who are/were associated with Delhi International Airport and 125 industry professionals who are/were associated with Mumbai International Airport through email from June 2020 to May 2021. A total of 90 responses were received for Delhi International Airport, and 85 responses were received for Mumbai International Airport.

A Partial Least Square Structural Equation Modelling (PLS-SEM) was used for analyzing the impact of PPP on the sustainability of airports. SmartPLS software (version 3.2.2) was used to test the hypotheses and analysis.

6.3 Sample Size

If a study has a small sample size and the models comprise many constructs, along with a large number of items, PLS-SEM is most useful (Fornell & Bookstein, 1982). Power analysis shall be considered by researchers to determine the required sample size for PLS-SEM (Hair et al., 2019). The model's structure, the expected effect sizes, and the anticipated significance level are considered in power analysis. Accordingly, a power analysis was applied in the study. Faul et al. (2007) mentioned that G*Power is a free power analysis program for different statistical tests. The G*Power software (version 3.1.9.4) was used to determine the appropriate sample size. The following steps were

followed for calculating the sample size using the G*Power software in the study: (i) selecting the appropriate statistical tests for the study, (ii) choosing the type of power analysis, (iii) providing the input parameters for the analysis and (iv) calculating the sample size (Faul et al., 2007). Accordingly, inputs were provided in the G*Power to calculate the sample-size by considering 'F tests', 'Linear-multiple-regression: Fixed model, R^2 deviation from zero', 'medium effect-size (0.15)', 'α=0.05 (5% error probability)', 'Power=80% (0.80)' and 'one predictor (independent variables)'. The minimum sample size computed was 55. However, 90 and 85 samples were considered for the analysis.

6.4 Research Methodology

6.4.1 PLS-SEM

Ref. Chapter 5.8.1 PLS-SEM for description of PLS-SEM method

6.4.1.1 Assessment of measurement-model

Before moving on to the path analysis, it is necessary to assess the measurement model for item reliability (factor loading), construct reliability (rho A, Cronbach's Alpha, Composite Reliability), discriminant validity, and convergent validity (AVE). The factor loadings greater than 0.708 have been considered reliable according to the threshold level (Hair et al., 2014). The cronbach alpha and composite reliability (CR) scores should be greater than 0.70 but less than 0.95. When AVE is more than or equal to the threshold of 0.50, convergence validity is proven (Sarstedt et al., 2017).

6.4.1.2 Assessment of structural-model

The PLSpredict software can be used to assess the statistical significance and relevance of path coefficients (β-value), coefficient of determination (R^2), collinearity (VIF), and a model's predictive relevance (Q²predict) (Samani, 2016). PLSpredict is an appropriate and straightforward approach for evaluating a PLS path model's out-of-sample predicting capabilities.

Before evaluating the structural relationships, it is necessary to examine the collinearity of the constructs (Hair et al., 2019). It is similar to evaluating the collinearity of the formative measurement models, but the sole distinction is that the

VIF values are calculated using the scores of latent variables of the predictor constructs. The VIF should have values between 3 to 5. According to (Hair et al., 2019), the ideal VIF values are those that are close to 3 or lower.

Path coefficients are assessed to derive the relationships of the structural model, which represent the hypothesized relationships between the constructs. Path coefficients typically range in value from -1 to +1. However, path coefficients near +1 represent significant positive relationships, whereas path coefficients near -1 represent strong negative relationships (Hair et al., 2014). The bootstrapping technique is used to estimate the standard error of a coefficient, which determines the coefficient's significance. For all structural path coefficients, the t-value and p-value can be calculated empirically using the bootstrap standard error. The two-tailed tests require the t-value to be greater than 1.96 and the p-value to be lower than 0.05 for a significance level of 5% (Hair et al., 2014).

The higher the value of the coefficient of determination (R^2), the greater the model's explanatory power is. A value of R^2 greater than 0.25 is considered acceptable, whereas a value greater than 0.50 is preferred (Paraschi et al., 2019). The explanatory power of a model is indicated by the R^2 values of 0.75, 0.50, and 0.25, which are respectively strong, moderate, and weak (Hair et al., 2019). The coefficient is a measure of how much variance in the endogenous constructs can be explained by all of the exogenous constructs connected to it (Hair et al., 2014).

To evaluate the impact of a specified exogenous construct if omitted from the model, the value of f^2 (effect size) is measured. The values of f^2 of 0.02, 0.15, and 0.35 represent small, medium, and high effects, respectively, of an exogenous latent variable, and there is no effect considered if the value of f^2 is less than 0.02 (Hair et al., 2014).

If the value of Q^2predict for all indicators calculated by PLSpredict is greater than zero (Q^2predict > 0), then the MAE/RMSE values are compared with the native LM benchmark (Shmueli et al., 2019). If PLS-SEM < LM for a majority/all of the indicators in PLS-SEM, the model has predictive relevance.

6.5 Building of Hypothesized Model

The study took into account four latent variables and twenty-one observable variables that were identified in the literature. List of constructs (latent variables) and indicators (observable variables) are mentioned hereunder in Table 6.1.

Table 6.1 Constructs and Indicators (Y)

Constructs	Indicators
PPP- Public-private partnership	Pp1- Private Ownership Pp2- Regulatory Intervention Pp3- Investment Distribution Pp4- Risk Sharing Pp5- Stakeholder Engagement Pp6- Reputation & Credibility
Ec- Economic Sustainability	Ec1- Financing Ec2- Revenue Ec3- Profit Earned Ec4- Cost Saving Ec5- Job Growth
So- Social Sustainability	So1- Employment Opportunity So2- Household Income So3- Equal Opportunity So4- Service Quality So5- Health & Safety
En- Environmental Sustainability	En1- Air Pollution Measures En2- Noise Pollution Measures En3- Water Pollution Measures En4- Resource Utilization En5- Land Use

Source: Author's Compilation

To develop a hypothesized model first, an extensive literature review was conducted. Accordingly, draft hypotheses were developed. Then detailed discussions were organized with three numbers of industry experts who are/were associated with PPP airport projects. Subsequently, hypotheses were finally constructed.

Ownership under the PPP model has a direct impact on performance since various owners have different aims and incentives. The private partner is primarily concerned with making a profit, whereas the public partner is more anxious with the project's sustainability and influence on the local economy and environment (Ma, et al., 2020). Oum et al. (2008) have concluded that airports owned by a majority of private companies, self-governing bodies, or independent authorities are more proficient than the airports owned by government agencies. They also argued that autonomous airport authorities are almost certain to be more efficient than government-run airports.

Ma et al. (2020) investigated the impact of PPP on project sustainability and financial structure, concluding that there is a good relationship amongst the investment ratio and sustainability of a PPP project. The sustainability of the project can be enhanced if the government invests more. In a PPP project, the partner with the higher investment ratio is more responsible for the project's performance, preparation and implementation of the strategies, and will have more influence over the PPP project. The economic performance of the PPP airports is the major consideration if it is fully invested by private partners, but economic performance would not be a major consideration if it is invested within public budgets. Investment level (volume) affects the airport's sustainability.

The public entity transfers risks to the private partner in a PPP project. Effective risk allocation is necessary for the public sector to achieve a better deal for the public, while efficient-risk allocation is critical for the private sector to ensure that the project is financially feasible and has a favourable risk-return ratio.

Stakeholders are the individuals and/or groups who influence or are influenced by the attainment of the organization's goals. Stakeholders who are engaged in a business are more inclined to participate and support the company's actions and strategies, which has a beneficial impact on its sustainability and progress (Stocker, et al., 2020). The practice of regulating the connection between the company and various stakeholders with a purpose to maximize the efficiency of the firm's initiatives and policies are referred to as stakeholder engagement. This effort is critical to accomplishing the sustainable development goals because it is at the heart of efficacious stakeholder relationship management. The core concern of sustainable development, in particular, is essentially associated with the trade-offs that corporations must make between competing stakeholder interests. The procedure of exchanging information, listening to, and learning from stakeholders is known as the engagement process. Stakeholder involvement has the overarching goal of assisting organisations in achieving corporate strategy and service effectiveness, along with contributing to long-lasting development. Stakeholders can indeed be involved in various forms from facilitating communication to taking part in decision-making processes. The engagement stages are: inform, consult, involve, collaborate, and empower. Furthermore, stakeholders can also be classified according to one of the following dimensions: representation. responsibility, proximity, influence, and dependency.

Figure 6.1 Hypothesized model
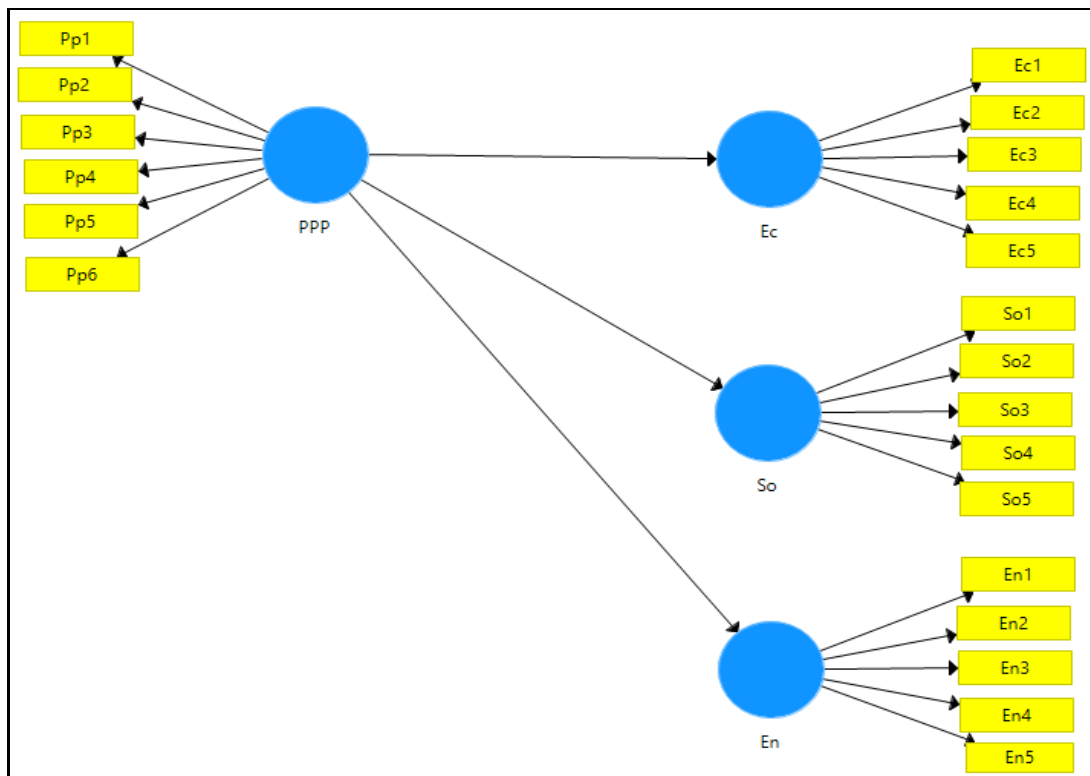
Source: Author's compilation

·Environmental considerations have become a major driving force for regulatory intervention, and it has always had a considerable impact on sustainability (Samesh & Scavuzzi, 2016). When it comes to airport regulation, regulators and decision-makers play a pivotal role in assuring that the societal interest, as well as the surrounding community, are properly considered. The government must take into account the public-protection toward hazardous to the health that possibly will be associated with high-priority activities as part of the policy planning process, and this requires effective coordination between the aviation sector, environmental, and health policymakers, as well as developing policies accordingly in all stages of airport development (regulations for standardisation) and airport operation. By establishing environmental limitations, governments can help to regulate the costs of air travel as well as the negative impacts that would have on human and environmental health. Regulations, licences, and licencing procedures that have to take place in order to function or build an airport do have the authority to direct the airport administrators to implement sustainable procedures.

The PPP sub-factors/indicators; private ownership, reputation & credibility, investment distribution, risk sharing, stakeholder engagement, and regulatory intervention, directly influence airport sustainability (economic, social, and environmental performance). Therefore, the following hypotheses were developed:

H1: PPP→Ec [Public-private partnership positively affects the economic sustainability].

H2: PPP→So [Public-private partnership positively affects the social sustainability].

H3: PPP→En [Public-private partnership positively affects the environmental sustainability].

6.6 Results

6.6.1   Assessment of reflective-measurement model

Analysing the indicator-loadings is the 1st step in evaluating a reflective-measurement model. The results demonstrate that the majority of our model's factor loadings are more than 0.708. Thus, these indicators are reliable. However, there are some indicators that have factor loadings less than 0.708. **Table 6.2** displays the outcomes of the measurement model evaluation. Because the construct possesses discriminant validity, convergent validity, and reliability, these indicators are also kept in the model. The values of AVE are more than 0.50, Cronbach's Alpha, Composite Reliability and rho A, are more than 0.70, which means the construct has reliability and validity. Further, the Heterotrait-Monotrait ratio (HTMT) is utilized to test discriminant-validity.

Table 6.2 Results of Measurement Model (Y)

A. Delhi International Airport

Constructs	Indicators	Indicator Reliability	Convergent Validity	Construct Reliability		
		Factor Loadings > 0.708	AVE > 0.50	rho A > 0.70	Cronbach's Alpha > 0.70	Composite Reliability > 0.70
Ec	Ec1	0.834	0.507	0.82	0.758	0.834
	Ec2	0.836				
	Ec3	0.646				
	Ec4	0.651				
	Ec5	0.548				
En	En1	0.852	0.729	0.916	0.907	0.931
	En2	0.826				
	En3	0.882				
	En4	0.905				
	En5	0.801				
PPP	Pp1	0.766	0.635	0.887	0.883	0.912
	Pp2	0.822				
	Pp3	0.822				
	Pp4	0.879				
	Pp5	0.827				
	Pp6	0.645				
So	So1	0.745	0.564	0.807	0.806	0.865
	So2	0.812				
	So3	0.720				
	So4	0.836				
	So5	0.625				

Source: Author's compilation

B. Mumbai International Airport

Constructs	Indicators	Indicator Reliability	Convergent Validity	Construct Reliability		
		Factor Loadings > 0.708	AVE > 0.50	rho A > 0.70	Cronbach's Alpha > 0.70	Composite Reliability > 0.70
Ec	Ec1	0.814	0.537	0.834	0.766	0.844
	Ec2	0.844				
	Ec3	0.828				
	Ec4	0.707				
	Ec5	0.352				
En	En1	0.911	0.814	0.951	0.943	0.956
	En2	0.89				

	En3	0.932			
	En4	0.929			
	En5	0.846			
PPP	Pp1	0.771	0.653	0.907	0.889	0.917
	Pp2	0.815			
	Pp3	0.905			
	Pp4	0.893			
	Pp5	0.839			
	Pp6	0.581			
So	So1	0.785	0.543	0.794	0.785	0.854
	So2	0.806			
	So3	0.785			
	So4	0.729			
	So5	0.548			

Source: Author's compilation

Table 6.3 Discriminant Validity Results

A. Delhi International Airport

	Ec	En	PPP	So
Ec				
En	0.653			
PPP	0.806	0.659		
So	0.813	0.597	0.629	

Source: Author's compilation

B. Mumbai International Airport

	Ec	En	PPP	So
Ec				
En	0.590			
PPP	0.784	0.472		
So	0.828	0.617	0.615	

Source: Author's compilation

All of the numbers in Table 6.3 are less than 0.85, demonstrating that the measurement-model has discriminant validity and the measurement model's constructs are distinct.

6.6.2 Assessment of structural-model

The structural-model was first evaluated for collinearity (VIF) after the measurement model was fully assessed. **Table 6.4** displays the structural model's VIF values. The minimum VIF value is 1.154 for construct So5 for Delhi International Airport and 1.067 for construct Ec5 for Mumbai International Airport. The maximum VIF value is 3.895 for construct Pp2 for Delhi International Airport and 4.918 for construct En4 for Mumbai International Airport. The VIF values are lower than the value 5. Therefore, it is concluded that collinearity is not an issue.

Table 6.4 Collinearity results (VIF values)

Delhi International Airport		Mumbai International Airport	
Indicators	VIF < 5	Indicators	VIF < 5
Ec1	1.636	Ec1	1.709
Ec2	1.954	Ec2	1.962
Ec3	2.690	Ec3	3.849
Ec4	2.350	Ec4	3.060
Ec5	1.350	Ec5	1.067
En1	2.807	En1	4.847
En2	2.909	En2	3.853
En3	3.159	En3	4.689
En4	3.668	En4	4.918
En5	2.423	En5	3.237
Pp1	2.940	Pp1	2.351
Pp2	3.895	Pp2	2.932
Pp3	2.923	Pp3	4.344
Pp4	3.459	Pp4	3.979
Pp5	2.424	Pp5	2.705
Pp6	1.725	Pp6	1.503
So1	2.003	So1	2.102
So2	2.559	So2	2.410
So3	1.625	So3	1.696
So4	2.990	So4	1.630
So5	1.154	So5	1.483

Source: Author's compilation

Path coefficients, which describe the influence of PPP on airport's sustainability (Ec, En & So), were used to analyse the structural model relationship in the next stage. The

bootstrapping approach was utilized to determine the significance and relevance of the path coefficients.

Table 6.5 Assessment of Structural Model (Y)

A. Delhi International Airport

Hypothesized path	β	*t*-value	*p*-value	95% confidence interval	f²
PPP → Ec	0.714	16.631	0.000***	[0.619, 0.768]	1.037
PPP → En	0.596	8.962	0.000***	[0.466, 0.689]	0.552
PPP → So	0.553	9.041	0.000***	[0.415, 0.631]	0.441

*Note: ***p<0.01*

Source: Author's compilation

B. Mumbai International Airport

Hypothesized path	β	*t*-value	*p*-value	95% confidence interval	f²
PPP → Ec	0.693	19.027	0.000***	[0.618, 0.743]	0.926
PPP → En	0.497	7.484	0.000***	[0.377, 0.597]	0.328
PPP → So	0.507	9.157	0.000***	[0.395, 0.583]	0.346

*Note: ***p<0.01*

Source: Author's compilation

Table 6.5 indicates the results of a complete bootstrapping of 5000 subsamples using Bias-Corrected and Accelerated (BCa) Bootstrap for two-tailed tests with a 95% significance threshold. All of the structural model relationships are significant, according to the findings.

The *t*-values ($t > 1.96$), *p*-values ($p < 0.05$), and 95% confidence-intervals for hypotheses H1 (PPP→Ec), H2 (PPP→En), and H3 (PPP→So) are presented in **Table 6.5**. The findings support the hypotheses and show that the paths are significant. **Table 6.6.** indicates the outcome of the hypothesis testing.

As all the hypothesis are supported, the impact of PPP on the airport's sustainability are also represented through path-coefficients and 't' values. Higher the path-

coefficients and 't' values represent the higher impact of PPP on that sustainability, i.e., Ec/En/So

Table 6.6 Result of Hypothesis Testing (Y)

No.	Path	Hypothesis	β	Results
H1	PPP→Ec	Public-private partnership positively affect the economic sustainability	0.693*** (19.027)	Supported
H2	PPP→En	Public-private partnership positively affects the environment sustainability	0.497*** (7.484)	Supported
H3	PPP→So	Public-private partnership positively affects the social sustainability	0.507*** (9.157)	Supported

*Note: ***p<0.01, t-values are given in the parenthesis.*

Source: Author's compilation

Furthermore, the model was tested for coefficient of determination (R^2), and the result is shown in **Table 6.7**. Constructs 'PPP' explained 50.9%, 35.6% and 30.6% of the variance in constructs 'Ec', 'En', and 'So', respectively, for Delhi International Airport. Thus, indicating a moderate explanation power. However, construct 'PPP' explained 46.3%, 19.6%, and 27.6% of the variance in constructs 'Ec', 'En', and 'So', respectively, for Mumbai International Airport.

Table 6.7 Result of R^2 (Y)

A. Delhi International Airport

	R^2	R^2 adjusted
Ec	0.509	0.504
En	0.356	0.348
So	0.306	0.298

Source: Author's compilation

B. Mumbai International Airport

	R^2	R^2 adjusted
Ec	0.463	0.457
En	0.196	1.457
So	0.276	2.457

Source: Author's compilation

The effect size (f^2) was also calculated, and its result is shown in **Table 6.5**. For both airports, the values of f^2 show that 'PPPs' have a substantial effect-size on 'Ec'. However, there is less effect size shown of 'PPP' on 'So' for Delhi International Airport. For Mumbai International Airport, there is less effect size shown on 'En'.

PLSpredict was used to determine the model's predictive-relevance and the results are indicated in **Table 6.8**. The $Q^2_{predict}$ values for all the indicators of a measurement model were found to be more than zero ($Q^2_{predict} > 0$). Then, the prediction errors were checked on whether they were symmetrically distributed. As stated by (Shmueli et al., 2019), in the event of a highly non-symmetric distribution of the prediction errors, the consideration of MAE values is more appropriate for prediction statistics. Therefore, the MAE (Mean Absolute Error) values with the native LM benchmark were used.

Table 6.8 Result of PLSpredict (Y)

| Indicators	PLS MAE	LM MAE	difference MAE	PLS Q^2_predict
Ec2	0.649	0.667	-0.018	0.305
Ec1	0.642	0.631	0.011	0.496
Ec4	0.982	0.978	0.004	0.071
Ec5	0.668	0.682	-0.014	0.158
Ec3	0.740	0.745	-0.005	0.053
En3	0.731	0.754	-0.023	0.239
En2	0.971	1.010	-0.039	0.142
En5	0.730	0.734	-0.004	0.223
En1	0.773	0.774	-0.001	0.275
En4	0.778	0.766	0.012	0.319
So5	0.722	0.693	0.029	0.222
So3	0.692	0.618	0.074	0.090
So1	0.778	0.779	-0.001	0.105
So4	0.625	0.657	-0.032	0.142
So2	0.786	0.775	0.011	0.142

Source: Author's compilation

All the Q^2 values of the indicators are exceeding zero, and the MAE values of the PLS-SEM model are under MAE values of LM, i.e., the model generated lower errors for most of the indicators. Therefore, the model has predictive relevance.

6.7 Analysis

The final SEM model, which is a representation of influencing airport sustainability, is shown in **Figure 6.2**.

The results of the assessment of the measurement model for Delhi International Airport show that risk sharing (Pp4), investment distribution (Pp3), stakeholder engagement (Pp5), regulatory intervention (Pp2), and private ownership (Pp1) shows strong relationships with PPP. However, reputation & credibility (Pp6) has a very poor relationship with PPP. Therefore, reputation & credibility does not measure PPP very well. Financing (Ec1) and revenue (Ec2) show strong relationships with economic sustainability. Service quality (So4) and household income (So2) show strong relationships with social sustainability. Resource utilization (En4), water pollution measures (En3), and air pollution measures (En1) show strong relationships with environmental sustainability.

Figure 6.2 Model of influencing airport sustainability

A. Delhi International Airport
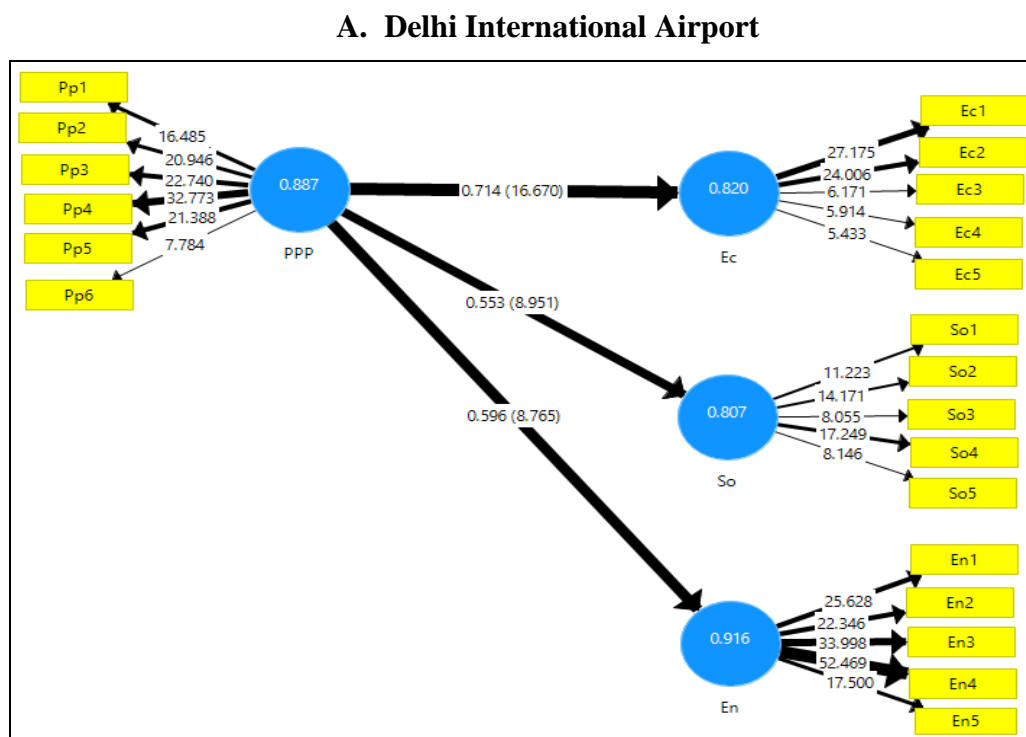
Source: Author's compilation

Similarly, the results of the assessment of the measurement model for Mumbai International Airport show that investment distribution (Pp3), risk sharing (Pp4),

stakeholder engagement (Pp5), regulatory intervention (Pp2), and private ownership (Pp1) shows strong relationships with PPP. However, reputation & credibility (Pp6) has a very poor relationship with PPP. Therefore, reputation & credibility does not measure PPP very well. Revenue (Ec2) and financing (Ec1) show strong relationships with economic sustainability. Equal opportunity (So3) and household income (So2) show strong relationships with social sustainability. Water pollution measures (En3), resource utilization (En4), and air pollution measures (En1) show strong relationships with environment sustainability.

B. Mumbai International Airport
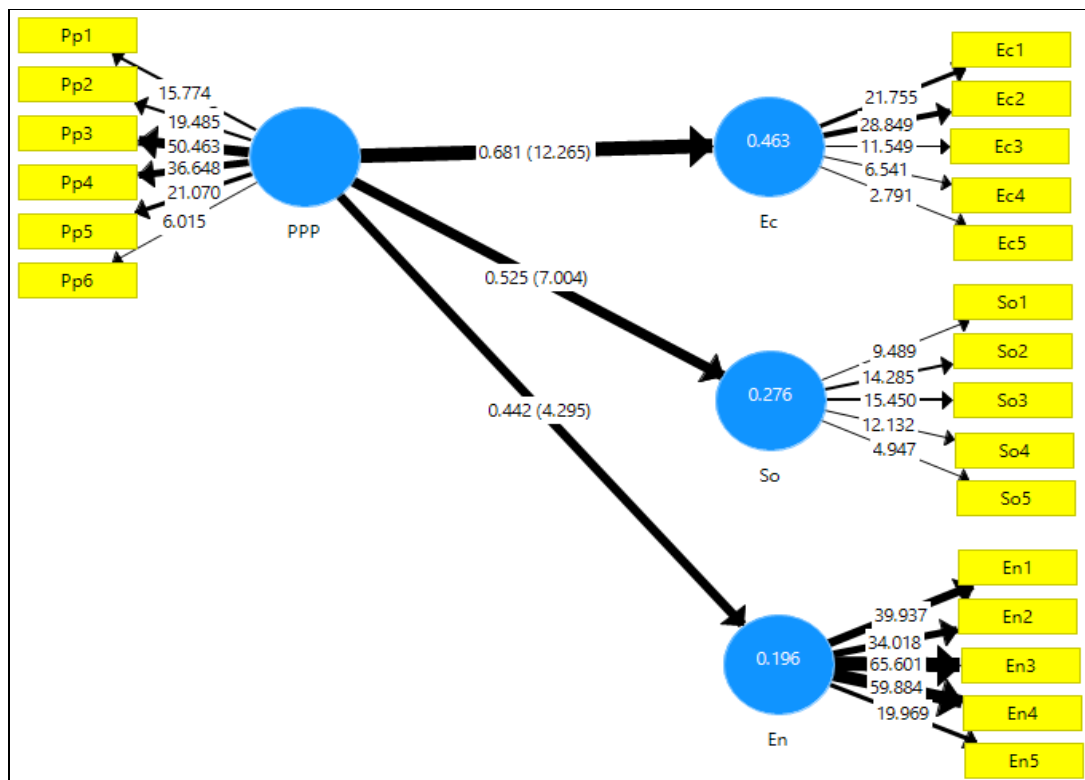
Source: Author's compilation

The findings of the assessment of the structural-model are discussed hereunder.

There is more impact of PPP on eonomic sustainability than environmental sustainability and social sustainability for Delhi International Airport as well as Mumbai International Airport. It can be concluded that due to PPP, both the airports are economic sustainable than environmental and social sustainable.

The involvement of public-private partnerships in airport development provides required financing that is a responsibility of the private partner. Revenue generated by the airports is also increased. The airports which were making losses under the ownership of AAI are making profits under PPP. Due to the adoption of the latest and modern technologies in the airports and the implantation of the strategies, the airports are able to make huge cost savings. A considerable number of employments were created as a result of the development of airports, which contribute to the GDP. In comparison to economic sustainability, however, there is less emphasis on social sustainability and environmental sustainability.

6.8 Concluding remarks

The impact of public-private partnerships on the sustainability of airports has not yet been analyzed in the Indian context. To fill this gap, the study was conducted to analyze the impact of PPP on the economic, social, and environmental sustainability of airports. As the study is limited to the Indian context, two PPP airports, Delhi International Airport and Mumbai International Airport, were considered for the study. The expert's opinions for both the airports were recorded through separate questionnaire surveys. The received data were analyzed using Partial Least Square (PLS), a form of Structural Equation Modelling (SEM). The findings demonstrate that public-private partnerships have a direct and positive impact on the economic sustainability of Delhi International Airport (16.670) and Mumbai International Airport (12.265). However, there is comparatively less influence found on the social sustainability and environmental sustainability of Delhi International Airport (So 8.951, En 8.765) and Mumbai International Airport (So 7.004, En 4.295).

To achieve social sustainability and environmental sustainability equally along with economic sustainability, there shall be direct involvement of the government in developing and implementing the strategies. There shall be involvement of regulatory authorities who control the activities of JV and provide a motivation to achieve social as well as environmental sustainability. Proper government supervision is also needed to deliver high-quality services and the protection of the public interest under a PPP mechanism. Additionally, achieving high-quality services and greater value for money depends on customers' satisfaction and opinion.

The study has contributed to the existing literature and practice. The uniqueness of the study is to analyze the impact of public-private partnerships on economic sustainability, social sustainability, and environmental sustainability for PPP airports (for the Indian context). The study explained the importance of regulatory intervention in achieving the social and environmental sustainability of PPP airports. It elaborated the direct impact of private ownerships, regulatory intervention, investment distribution, risk sharing, and stakeholder engagement on economic, social, and environmental sustainability. As the study focused on the institutional factors of PPPs, policymakers are mainly expected to be the beneficiaries. Policymakers should definitely consider the impact of PPPs and accordingly design a favourable legal framework, commercial viabilities, and sound economic policies for successful private participation in PPP airports.

The study will benefit practitioners and managers involved in PPPs or PPP airport projects. PPP's impact (both positive and negative) was underlined in the study. The study will provide a better grasp of the mechanism's influence, as well as a clear explanation of how the components and their indicators are managed in the development of PPP airports. There are additional methodological contributions in the study. Although PLS-SEM is widely utilized in the social sciences and a variety of business disciplines, it is rarely used in the infrastructure sector. The study used a novel approach called Partial Least Square-Structural Equation Modeling (PLS-SEM) to develop a reflective-formative model for examining the effects of institutional factors.

This is a unique study, so far, on analyzing the impact of public-private partnerships on the sustainability of PPP airports in India using PLS-SEM. However, it is accompanied by some limitations. The direct impact of the public entity and/or private partners on the sustainability of the airport was not examined. As a result, additional research could be done in the future.

Chapter 7. Summary and Recommendations

The application of PPP has been used in the development of different types of infrastructures, including airports. The involvement of the private sector in the development of airports has allowed the government to provide world-class airport infrastructures despite its financial constraints. It also improves a country's global competitiveness and attracts foreign investment. The advantage of a PPP is that the private entities create world-class infrastructure using modern technology and skills transfer while the government bears no financial risk. The risk-sharing mechanism depends on the contract agreements signed amongst the government and private parties with respect to the mutually agreed-upon remuneration.

As of now, PPP seems to be a thriving option for developing airports in India. In accordance with a report published in the Indian Express on 9th April 2018, the NITI Aayog stated that Indian airports are performing better in the private hands after an evaluation of the infrastructure sector for the fiscal year 2015-16; 'privatized airports had greater customer-satisfaction when contrasted to airports operated primarily by the Airport Authority of India'. However, the world has also noticed some failures of private participation in airports through PPP like Costa Rica Juan Santamaria International Airport (SJO). Private participation in public airport business always remains debatable, and management complications arise due to conflict in objectives. EI-Gohary et al. (2006) have admonished that participation of private parties may raise critical sustainability-related issues due to its profit-making mindset, which are not normally met while procuring the project through the traditional route. Some failures of airport development through the PPP model dragged the attention and arisen of the sustainability issues in the PPP airport worldwide provided the reason to conduct this study.

The study's main goals were to look into the contract structure of PPP airport, examination of the interrelationships among CSFs of PPP airport, and to analyze the impact of PPP on the sustainability of airport. The study looked at two major PPP airports, Delhi International Airport and Mumbai International Airport, and used document analysis methodology to analyze their contract agreements. For these two airports, primary data were collected via a questionnaire survey and expert's interviews and CSFs were identified and ranked, as well as the interrelationships among these CSFs were examined. Further, the impact of PPP on the airport's economic, social, and environmental sustainability was also looked into. Identification and ranking of CSFs were identified using Analytical Hierarchy Process (AHP),

and their interrelationships were examined using Structural Equation Modelling (PLS-SEM). The impact of 'private ownership', 'regulatory intervention', 'investment distribution', 'risk sharing', 'stakeholder engagement', and 'reputation & credibility' on 'economic sustainability', 'social sustainability' and 'environmental sustainability' was analyzed by Partial-Least-Square–Structural-Equation-Modeling (PLS-SEM).

The contract structure of Delhi International Airport and Mumbai International Airport follow the structure of the project consortium wherein the contracts between AAI and DIAL (JV) and AAI and MIAL (JV) were signed for Delhi and Mumbai Airports, respectively. The lead party of the JV/consortium is the party having more share percentages in the consortium. According to the shareholding structure of DIAL (as per shareholding agreements dated 4th April 2006), GMR Infrastructure Limited (31.10%) is the lead member in the Delhi International Airport. Similarly, as per the shareholding structure of MIAL (with reference to shareholding agreements dated 4th April 2006), GVK Airport holdings Pvt. Ltd. (37%) is the lead member in the Mumbai International Airport. However, members of the joint venture are allowed to transfer their shares as per Sub-Clause No. 2.5 JVC Ownership Structure of the OMDA agreement.

Delhi and Mumbai airports are examples of successful PPP implementation in airport development in India. However, some anomalies in the contract agreements were found, which will need to be addressed in the future for development or upgradation of airports through PPP. The contract agreements of these airports were not balanced and the concessionaires received preferential treatments. Because this study did not cover all of the provisions of the OMDA for these two airports, another study may be undertaken to analyze the numerous provisions of the OMDA and to check the sections that were not adhered to during the contract execution.

Critical success factors were identified using AHP for Delhi and Mumbai airports. The results of AHP show that effective project management, government cooperation, financial abilities and, appropriate risk allocation are the top four CSFs. Project management that is the most critical factor, is required to supervise effectively in the top priority for achieving success in the development of PPP airport. Effective project management is a concept and technique that is applied to a project from its beginning to completion and has a direct influence on the project's time and cost to complete. Government cooperation is essential to develop a strong collaboration among the public partner as well as private partners of the PPP airport. The government should work with private parties to promote a cooperative environment. The

government to perform a pro-active role specifically in the conceptual phase of the project wherein the major risk identification, risk allocation and, procurement methods are decided. The government cooperation should also be there in developing the local regulations and jurisdiction, which shall be acceptable to the private parties. For the successful development of PPP airport in India, there shall be an appropriate consideration of the identified CSFs, by the government and all other stakeholders of PPP airport. Along with government support, the protracted support of regulatory authorities is also required. The regulatory authorities must provide necessary recommendations for the government to provide a favourable legal, political and commercial environment for the private party. The implementation of the guidelines will be the responsibility of the government.

Further, the interrelationships among these identified CSFs were examined using the PLS-SEM method. The factors, i.e., government characteristics and cooperative environment, were the dependent variables, and their impacts on the private characteristics, public characteristics, and process characteristics were examined. The findings reveal that process characteristics have a greater effect on public characteristics than private characteristics and that cooperative environment has a greater effect on process characteristics than private characteristics and public characteristics. Process characteristics, on the other hand, have a minor effect on private characteristics. The study also discovered that efficient government oversight is essential in order to provide high-quality services and public-interest preservation through a PPP framework. Customers' satisfaction and opinions also play a role in providing excellence services and greater value-for-money. The study explained the importance of public opinion and satisfaction in PPP airports. It elaborated the direct impact of government characteristics and cooperative environment on the process characteristics and private characteristics of PPP airports. As the study focused on the CSFs of PPPs, policy makers are mainly expected to be the beneficiaries. Policy makers should definitely consider the impact of a cooperative environment and accordingly design a favorable legal framework, commercial viabilities, and sound economic policies for successful private participation in PPP airports.

The impact of PPP on the sustainability of Delhi and Mumbai airports was examined through the PLS-SEM method. The findings reveal that public-private partnerships have a direct and favourable influence on the economic sustainability of both Delhi and Mumbai International Airports. However, there is comparatively less influence found on the social sustainability and environmental sustainability of Delhi International Airport and Mumbai International Airport. To achieve social sustainability and environmental sustainability equally along with economic sustainability, there shall be direct government involvement in developing and

implementing the strategies. There shall be involvement of regulatory authorities who control the activities of JV and provide a motivation to achieve social as well as environmental sustainability. Under a PPP framework, effective government oversight is also essential to deliver high-quality services and defend the public interest.

Sustainable airports can be developed by keeping the critical factors under control, as shown by the lessons learnt from Delhi International Airport and Mumbai International Airport, where environmental and social sustainability lag significantly behind economic sustainability.

Ultimately sustainable airports are essential that conceivably develop by earnestly considering the ensuing components of sustainability:

(1) Policy formulation: Policy statements, trade policies, and regulations for sustainability, benchmarking, design factors for airport and aircraft, technological breakthrough, security, safety, administration of resource, effective usage of airport capacity, and consolidated transportation planning

(2) Finance: Prospective financing, rate of return, concessions/tenants, financiers, regulating agency.

(3) Social conscience: Civic participation, betterment of living standard, equality in airport access, employment generation, human rights protection, innocuous life.

(4) Environment: Atmospheric pollution, noise emissions, pollution of hydrosphere, conservation of water, solid waste management, dryland management, and energy.

(5) Quality of service: Trustworthiness, receptiveness, guarantee, palpability, promptness, modernization, and gratification.

A future sustainable airport can be developed by taking into account the aforementioned components. Furthermore, there shall be an appropriate consideration of the identified CSFs, by the government and all other stakeholders of PPP airport. Along with government support, the protracted support of regulatory authorities is also required. The regulatory authorities are to provide necessary recommendations for the government to offer a favourable legal, political and commercial environment for the private party. The guideline's implementation will be the responsibility of the government. The identified CSFs in the study may assist the government body and the private party in the successful development of the airport in India. The study also presents the strong and weak relationships between the CSFs. The interrelationships between the CSFs were investigated with a purpose to provide a greater knowledge of the mechanism's impact and to provide a clear grasp of how to manage the

critical success factors in the in the development of PPP airports. The study provided a reference for the administration of the CSFs, as well as assistance to industry experts in addressing the CSFs with appropriate approaches for the development of sustainable PPP airports.

7.1 Contribution to literature

- The study has added to the current body of knowledge. The peculiarity is that it looked into the contract structure of PPP airports which had never been looked into before.
- The study has empirical contributions as it explained the importance of public opinion and satisfaction in PPP airports and elaborated the direct impact of government characteristics and cooperative environment on the process and private characteristics of PPP airports.
- As the study focused on the factors of PPPs, policymakers are mainly expected to be the beneficiaries. Policymakers should definitely consider the impact of a cooperative environment and accordingly design a favorable legal framework, commercial viabilities, and sound economic policies for successful private participation in PPP airports.
- There are additional methodological contributions in the work. Although PLS-SEM is widely utilized in the social sciences and a variety of business disciplines, it is rarely used in the infrastructure sector.
- The study built a formative-formative model using a novel methodology, i.e., the Partial Least Square–Structural Equation Modeling (PLS-SEM), for exploring the interrelationships between the critical success factors of PPPs. This model can also be used to predict private characteristics, public characteristics, and process characteristics sufficiently well.

7.2 Limitations of the study

- Contract agreements of the airports were analyzed using document analysis which was focused on the issues highlighted in the business problem. Therefore, the study explored only the issues that were highlighted, and a detailed review of the contract agreements of PPP airport is yet to be done.

- o The direct impact of government characteristics on private characteristics was not examined.
- o The study is limited to only six observable variables, which were used to analyze the impact of PPP on airport sustainability.

7.3 Scope for future research

- o A study for the detailed review of the contract agreements of PPP airports can be conducted.
- o The direct impact of government characteristics on private characteristics can be examined for PPP airport.
- o The impact of the public partner of the PPP on airport sustainability can be analyzed.
- o Only two Indian PPP airports were taken into account for the study. However, PPP was used to develop five international airports. The other three PPP airports, namely the cities of Bengaluru, Hyderabad, and Cochin might be researched further.

References

ACRP REPORT 80. (2012). Guidebook for incorporating Sustainability into Tradional Airport Projects. *Airport Cooperative Research Program.*

Adler, N., Ulku, T., & Yazhemsky, E. (2013). Small regional airport sustainability: Lessons from benchmarking. *Journal of Air Transport Management*, 22-31.

Agarchand, N., & Laishram, B. (2017). Sustainable infrastructure development challenges through PPP procurement process: Indian perspective. *International Journal of Managing Projects in Business.*

Ahmadabadi, A. A., & Heravi, G. (2018). The effect of critical success factors on project success in Public-Private Partnership projects: A case study of highway projects in Iran. *Transport Policy; Elsevier.*

Aje, O., & Adeniyi, O. (2012). Performance indicators for Public-Private Partnership (PPP) in Infrastructure. *International council for research and innovation in building and construction.*

Alias Z, Zawawi EMA, Yusof K and Aris NM (2014). "Determining critical success factors of project management practice: A conceptual framework". *Procedia—Social and Behavioral Sciences*, 153: 61–69. https://doi.org/10.1016/j.sbspro.2014.10.041

Alinaitwe, H., & Ayesiga, R. (2013). Success factors for the Implementation of Public-Private Partnership in the Construction Industry in Uganda. *Journal of construction in Developing Countries.*

Almarri K and Abu-Hijleh B (2017). "Critical success factors for public private partnerships in the UAE construction industry—A comparative analysis between the UAE and the UK". *Journal of Engineering, Project, and Production Management*, 7(1): 21–32.

Al-Saadi R and Abdou A (2016). "Factors critical for the success of public-private partnerships in UAE infrastructure projects: Experts' perception". *International Journal of Construction Management*, 16(3): 234–248. https://doi.org/10.1080/15623599.2016.1146110

Amaeshi, K. M., & Crane, A. (2006). Stakeholder engagement: A mechanism for sustainable aviation. *Corporate Social Responsibility and Environmental Management*, 245-260.

Ameyaw, E. E., & Chan, A. P. (2015). Evaluation and ranking of risks factors in public-private partnership water supply projects in developing countries using a fuzzy synthetic evaluation approach. *Expert System with Application: ScienceDirect.*

Anton, J. J. (2016). Adverse Selection. *The Palgrave Encyclopedia of Strategic Management.*

Arowoshegbe, A., & Emmanuel, U. (2016). Sustainability and Triple Bottom Line: An overview of two interrelated concepts. *Igbinedion University Journal of Accounting*, 88-126.

Asongu, S., & Andrés, A. (2017). The impact of software piracy on inclusive human development: evidence from Africa. *International Review of Applied Economics, 31*(5), 585-607. doi:10.1080/02692171.2017.1296414

Ayo-Vaughan, E. A., Poon, J., & Ibem, E. O. (2019). Critical Success Factors for Public-Private Partnerships (PPPs) in Airport Infrastructure in Lagos, Nigeria. *International Journal of Civil Engineering and Technology (IJCIET)*, 2441-2453.

Babatunde, S. O., Opawole, A., & Akinsiku, O. E. (2016). Critical Success Factors in Public-private partnership (PPP) on infrastructure delivery in Nigeria. *Journal of facilities management*, 212-225.

Bashiri, M., Ebrahimi, S., Fazlali, M., Hosseini, S. J., Jamal, N., & Salehvand, P. (2011). Analytical comparison between BOT, BOOT and PPP project delivery systems. Research Gate.

Bezera, G. C., & Gomes, C. F. (2018). Performance measurement practise in airports: Multidimensionality and utilization pattern. *Journal of Air Transport Management*, 113-125.

Blieck Y, Kauwenberghs K, Zhu C *et al*. (2019). "Investigation of the relationship between success factors and student participation in online and blended learning in adult education". *Journal of Computer Assisted Learning*, 35(4): 476–490.

Boons, F., Buuren, A. v., & Teisman, G. (2010). Governance of sustainability at airports: Moving beyond the debate between growth and noise. *Natural Resources Forum 34*, 303-313.

Boyer EJ, Van Slyke DM and Rogers JD (2015). "An empirical examination of public involvement in public-private partnerships: Qualifying the benefits of public involvement in PPPs". *Journal of Public Administration Research and Theory*, 26(1): 45–61.

Boynlon, A., & Zmud, R. (1984). An Assessment of Critical Success factors. Sloan Management Review, 17-27.

Bullen, C. V., & Rockart, J. F. (June 1981). A Primer on Critical Success Factors.

Cahill, C., Palcic, D., & Reeves, E. (2017). Commercialisation and airport performance: The case of Ireland's DAA. *Journal of Air Transport Management*, 155-163.

Campos, M. L., Morini, C., Moraes, G. H., and Inacio Jr, E. (2018). "A performance model for Pubic-private partnerships: the authorized economic operator as an example". *RAUSP Management Journal*, 53(2): 268-279. https://doi.org/10.1016/j.rausp.2017.07.002

Carlucci, F., Cira, A., & Coccorese, P. (2018). Measuring and Explaining Airport Efficiency and Sustainability: Evidence from Italy. *MDPI; Sustainability*.

Carnis, L., & Yuliawati, E. (2013). Nusantara: Between sky and earth could the PPP be the solution for Indonesian airport infrastructures? *Case Studies on Transport Policy; Elsevier*, 18-26.

Chan, A. P., Lam, P. T., Chan, D. W., Cheung, E., & Ke, Y. (2010). Critical Success Factors for PPPs in Infrastructure Developments: Chinese Perspective. *Journal of Construction Engineering and Management; ASCE*, 484-494.

Chao, C. C., Lirn, T. C., & Master, L. H. (2017). Indicators and evaluation model for analyzing environmental protection performance of airports. *Journal of Air Transport Management*, 61-70.

Chaudhuri, S. (2011). Impact of privatization on performance of airport infrastructure projects in India: a preliminary study. *Int. J. Aviation Management*, 40-57.

Chen YQ, Zhang YB, Liu JY and Mo P (2012). "Interrelationships among critical success factors of construction projects based on the structural equation model". *Journal of Management in Engineering*, 28(3): 243–251.

Chou, J. S., & Pramudawardhani, D. (2014). Cross-country comparisons of key drivers, critical success factors and risk allocation for public-private partnership projects. *International Journal of Project Management - Elsevier*.

Chuah S H-W, El-Manstrly D, Tseng M-L and Ramayah T (2020). "Sustaining customer engagement behavior through corporate social responsibility: The roles of environmental concern and green trust". *Journal of Cleaner Production*, 262: Article 121348. https://doi.org/10.1016/j.jclepro.2020.121348

Cohen J (1992). "Quantitative methods in psychology: A power primer". *Psychological Bulletin*, 112(1): 1155–1159.

Cruz, C. O., & Sarmento, J. M. (2017). Airport privatization with public finance under stress: An analysis of governmnet and investor's motivations. *Journal of Air Transport Management; Elsevier*, 197-203.

Cruz, O. C., and Marques, R. C. (2011). Contribution to the study of PPP arrangements in airport development, management and operation. *Transport Policy*, 18(2): 392-400. https://doi.org/10.1016/j.tranpol.2010.12.001

Cui, C., Liu, Y., Hope, A., & Wang, J. (2018). Review of studies on the public-private partnership (PPP) for infrastructure projects. *International Journal of Project Management, Elsevier*.

Diamantopoulos A, Riefler P and Roth KP (2008). "Advancing formative measurement models". *Journal of Business Research*, 61(12): 1203–1218.

Du J, Wu H and Zhao X (2018). "Critical factors on the capital structure of public-private partnership projects: A sustainability perspective. *Sustainability*, 10(6): Article 2066

Elkington, J. (1997). Cannibals with forks; The Triple Bottom Line of Sustainable Development. *Capstone publishing, Oxford*.

EI-Gohary, N. M., Osman, H., & EI-Diraby, T. E. (2006). Stakeholder management for public-private partnership. *International Journal of Project Management*, 595-604.

Emmanuel OO (2013). "Critical success factors (CSF) determining the implementation of public-private partnership projects". *Covenant Journal of Research in the Built Environment (CJRBE)*, 1(2): 41–66.

Engel, E., Fischer, R., & Galetovic, A. (2018). The joy of flying: Efficient airport PPP contracts. *Transportation Research Part B - Elsveir*, 131-146.

Epstein, W. N. (2013). Contract Theory and the Failures of Public-Private Contracting. *SSRN*.

Eshtaiwi, M., Badi, I., Abdulshahed, A., & Erkan, T. E. (2017). Determination of key performance indicators for measuring airport success: A case study in Libya. *Journal of Air Transport Management*.

Fah LY and Sirisena A (2014). "Relationships between the knowledge, attitudes, and behaviour dimensions of environmental literacy: A structural equation modeling approach using SmartPLS". *Jurnal Pemikir Pendidikan* (*Journal of Educational Thinkers*, 5: 119–144.

Fasone, V., Guiffe, T., & Maggiore, P. (2012). Multi-Airport System (MAS) as a Way of Sustainability for Airport Development: Evidence from an Italian Case Study. *Procedia-Social and Behavioral Science*, 95-105.

Faul F, Erdfelder E, Lang A-G and Buchner A (2007). "G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences". *Behavior Research Methods*, 39(2): 175–191.

Fornell C and Bookstein FL (1982). "Two structural equation models: LISREL and PLS applied to consumer exit-voice theory". *Journal of Marketing Research*, 19(4): 440–452. https://doi.org/10.1177/002224378201900406

Freestone, R. (2009). Planning, Sustainability and Airprot-Led Urban Development. *International Planning Studies; Routledge (Taylor & Francis Group)*, 161-176.

Gerber, P. (2002). Success factors for the privatization of airports - an airline perspective. *Journal of Air Transport Management*, 29-36.

Gleave, S. d. (2012). *Study to access the potential for enhanced private participation in the maritime and air transport sectors in Africa.* Tunisia: ICA; The Infrastructure Consortium for Africa.

Gupta, R. (2015). "Issues in airport infrastructure development under public private partnership". *International Journal of Business and Management Invention (IJBMI)*, 4(6): 66–77.

H. Oum, T., Yan, J., & Yu, C. (2008). Ownership forms matter for airport efficiency: A stochastic frontier investigation of worldwide airports. *Journal of Urban Economics*, 422-435.

Habets, J. (2010). Incomplete Contracts and Public-Private-partnerships: A case study of the Dutch infrastructure Policy. *Erasmus University Rotterdam*.

Hair JF, Risher JJ, Sarstedt M and Ringle CM (2019). "When to use and how to report the results of PLS-SEM". *European Business Review*, 31(1): 2–24.

Hair JF, Sarstedt M and Ringle CM (2019). "Rethinking some of the rethinking of partial least squares". *European Journal of Marketing*, 53(4): 566–584.

Hair Jr. JF, Hult GM, Ringle CM and Sarstedt M (2014). *A Primer on Partial Least Square Structural Equation Modeling (PLS-SEM)*. Thousand Oaks, CA, USA: Sage Publications.

Hart, O. (2003). Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships. *The Economic Journal*, Vol. 113, No. 486, pp. C69-C76.

Hassert, S. C. (2017). Airport World; The Magazine of the Airports Council International. ACI

Henry Alinaitwe, & Robert Ayesiga. (Jan'2013). Success Factors for the implementation of Public Private Partnership in the Construction Industry in Uganda. *Journal of Construction in Developing Countries*.

Hoyle RH (1995). "The structural equation modelling approach: Basic concepts and fundamental issues". In: Hoyle RH (Ed.), *Structural Equation Modeling: Concepts, Issues, and Applications*, pp. 1–15. Thousand Oaks, CA, USA: Sage Publications.

Hsueh, C. M., & Chang, L. M. (2017). Critical success factors for PPP infrastructure: Perspective from Taiwan.

Hussain, M. Z. (2010). *Investment in Air Transport Infrastructure.* Washington: The International Bank for Reconstruction and Development/ The World Bank.

Hwang B-G, Zhao X and Gay MJS (2013). "Public private partnership projects in Singapore: Factors, critical risks and preferred risk allocation from the perspective of contractors". *International Journal of Project Management*, 31(3): 424–433. https://doi.org/10.1016/j.ijproman.2012.08.003

In, S. Y., Casemiro, L. A., & Kim, J. (2016). Decision Framework for Private Participation in Airport Development: The Case of Incheon International Airport in South Korea.

In SY, Casemiro LAS and Kim J (2017). "A decision framework for successful private participation in the airport sector". *Journal of Air Transport Management*, 62: 217–225. https://doi.org/10.1016/j.jairtraman.2017.05.001

Jain, R., Raghuram, G., & Gangwar, R. (2007). Airport Privatization in India: Lesson from the Bidding Process in Delhi and Mumbai. *Indian Institute of Management Ahmedabad, Research and Publication Department, IIMA Working Papers*.

Jenkins, W. (2011). The Spirit of Sustainability. *Berkshire Publishing Groups LLC*, 380-384

Kaszewski, A. L., & William, S. R. (2004). Enhancing the sustainability of airport development. *Sustainable Development*, 183-199.

Kearins, K., & Fryer, M. (2011). Relating Sustainability Theory to Practice at Auckland Airport: An Engaged Scholarship Endeavour Involving Students. *Corporate Social Responsibility and Environmental Management; Wiley Online Library*, 151-161.

Kumar, A., Dash, M. K., & Sahu, R. (2018). Performance Efficiency Measurement of Airports: A Comparative Analysis of Airports Authority of India and Public-Private Partnership. *International Journal of Strategic Decision Science*, 19-37.

Kuznetsova, O. (2014). Moral Hazard. *Wiley Encyclopedia of Management*.

Kyei, O. R., Chan, A. P., & Ameyaw, E. E. (2017). A Fuzzy Synthetic Evaluation Analysis of Operation Management Critical Success Factors for Public Private Partneship Infrastructure Projects. *Benchmarking: An International Journal - Emrald Insight*.

Lawrence TB and Shadnam M (2008). "Institutional theory". In: Donsbach W (Ed.), *The International Encyclopedia of Communication*. Hoboken, NJ, USA: John Wiley & Sons.

Lee, Y.-K., & Park, J.-W. (2016). Impact of a sustainable brand on improving business performance of airport enterprises: The case of Incheon International Airport. *Journal of Air Transport Management*, 46-53.

Li B, Akintoye A, Edwards PJ and Hardcastle C (2005). "Critical success factors for PPP/PFI projects in the UK construction industry". *Construction Management and Economics*, 23(5): 459–471.

Liu, J., Peter, E. L., Smith, J., Regan, M., & Davis, P. R. (2014). Life Cycle Critical Success Factors for Public-Private Partnership Infrastructure Projects. *Journal of Management in Engineering - ASCE*.

Liu, T., Wang, Y., & Wilkinson, S. (2016). Identifying critical factors affecting the effectiveness and efficiency of the tendering process in Public-Private Partnerships (PPPs): A comparative analysis of Australia and China. *International Journal of Project Management; Elsevier*, 701-716.

Lo Storto, C. (2018). Ownership structure and the technical, cost, and revenue efficiency of Italian airports. *Utilities Policy; Elsevier*.

Longhurst, J., Gibbs, D. C., Raper, D. W., & Conlan, D. (1996). Towards sustainable airport development. *The Environmentalist 16*, 197-202.

Lossa, E., & Spagnolo, G. (2007). *Contract Design in Public-Private Partnerships; Report prepared for the World Bank.*

Ma, H., Zeng, S., Lin, H., & Zeng, R. (2020). Impact of Public Sector omn Sustainability of Public-Private Partnership Projects. *Journal of Construction Engineering and Management*, 04019104 (1)-(10).

Macaio, R., Ribeiro, J., & Costa, J. (2015). Understanding pitfalls in the application of PPPs in transport infrastructure in Portugal. *Transport Policy*.

Manzoor, K. P. (2010). Airport Privatization in India: Importance and Challenges. *The IUP Joirnal of Infrastructure*, 58-70.

Maseko, M. (2014). Analysis of critical success factor for public-private partnership in infrastructure development in South Africa. *The 6th International Platinum Conference, 'Platinum-Metal for the Future', The Southern African Institute of Mining and Metallurgy*, 129-142.

Mause, K. (2019). Governing public-private partnerships: The problem of low-cost decisions. *Journal of Infrastructure, Policy and Development*, 3(2): 261-270. http://dx.doi.org/10.24294/jipd.v3i2.1154

Mohr, J., & Spekman, R. (1994). Characteristics of Partnership Success. Strategic Management Journal, 135-152.

Morledge R and Owen K (1998). "Critical success factors in PFI projects". *Proceedings of the 14th ARCOM (Association of Researchers in Construction Management) Annual Conference*, 2: 565–574.

Nijkamp P, van der Burch M and Vindigni G (2002). "A comparative institutional evaluation of public-private partnerships in Dutch urban land-use and revitalisation projects". *Urban Studies*, 39(10): 1865–1880. https://doi.org/10.1080/0042098022000002993

Olaniyi Aje, & Onaopepo Adeniyi. (January 2012). Performance indicators for Public-Private Patnership (PPP) in Infrastructure. *International Council for Research and Innovation in Building and Construction*, 462-471.

Oto, N., Cobanoglu, N., & Geray, C. (2012). Education for sustainable airports. *Procedia: Social and Behavioral Science*, 1164-1173.

Oum, T. H., Yan, J., & Yu, C. (2008). Ownership forms matter for airport efficiency: A stochastic frontier investigation of the worldwide airport. *Journal of Urban Economics*, 422-435.

Panayides PM, Parola F and Lam JSL (2015). "The effect of institutional factors on public-private partnership success in ports". *Transportation Research Part A: Policy and Practice*, 71: 110–127.

Paraschi EP, Georgopoulos A and Kaldis P (2019). "Airport business excellence model: A holistic performance management system". *Tourism Management*, 72: 352–372. https://doi.org/10.1016/j.tourman.2018.12.014

Pena, A. F. (2013). Public-Private Partnerships in the airport sector; Structured Guidelines for PPP Implementations. Extended Abstract submitted as in integrant part of the thesis to obtain the MSc. Degree. Lisbon, Lisbon, Portugal.

Peter Gerber. (2002). Success factors for the pivatisation of airports - an airline perspective. *Journal of Air Transport Management*, 29-36.

Provan, K. G., & Kenis, P. (2008). Modes of Network Governance: Structure, Management, and Effectiveness. *Journal of Public Management Research and Theory*, 229-252.

Rodrigues, R., Pacheco, & Fernandes, E. (2006). Management style and airport performance in Brazil. *Journal of air transport management*, 324-330.

Romero, F. V., & Liyanage, C. (2016). Evaluating success in PPP road projects in Europe: a comparison of performance measurement approaches. *Transportation Research - Procedia*, 372-381.

Rossi M and Civitillo R (2014). "Public private partnerships: A general overview in Italy". Procedia—*Social and Behavioral Science*, 109: 140–149.

Rouf, M., and Akhtaruddin, M. (2018). Factors affecting the voluntary disclosure: a study by using smart PLS-SEM approach. *International Journal of Law and Management*, 60(6): 1498-1508. https://doi.org/10.1108/IJLMA-01-2018-0011

Saaty, R. W. (1987). The Analytic Hierarchy Process-What it is and How it is used. *Pergamon Journals Ltd*, 161-176.

Sabatino, S. D., Solazzo, E., & Britter, R. (2011). The sustainable development of Heathrow Airport: model inter-comparison study. *Int. J. Environment and Pollution*, 351-358.

SAGA. (2009). Sustainable Aviation Resource Guide. *A rproduct of the sustainable aviation guidance alliance*.

Samani SA (2016). "Steps in research process (Partial Least Square of Structural Equation Modeling (PLS-SEM))". *International Journal of Social Science and Business*, 1(2): 55–66.

Sambrani, V. N. (2014). PPP from Asia and African Perspective towards Infrastructure Development: A Case Study of Greenfield Bangalore International Airport, India. *Procedia-Social and Behavioral Science*, 285-295.

Samesh, M. M., & Scavuzzi, J. (2016). Environmental Sustainability Measures for Airprots. *MCGill*.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partical Least Squares Structural Equation Modeling. *Springer International Publishing AG*, 1-40.

Scott, R. E., & Triantis, G. G. (2005). Incomplete Contracts and the Theory of Contrcat Design. *Case Western Reserve Law Review*, 187-201.

Sengur, F. K. (2011). privatization and Regulation: A Review of Airport Inductry Practices. *Research Gate*.

Setiawan, M., Surjokusumo, S., Ma'some, D., & Johan, J. (2018). Business Centre Development Model of Airport Area in Supporting Airport Sustainability in Indonesia. *Journal of Physics: Conference Series*, 1-8.

Shen, L., Tam, V. W., Gan, L., Ye, K., & Zhao, Z. (2016). Improving Sustainability Performance for Public-Private-Partnership (PPP) Projects. *MDPI*, 1-15.

Shi S, Chong H-Y, Liu L and Ye X (2016). "Examining the interrelationship among critical success factors of public private partnership infrastructure projects". *Sustainability*, 8(12): Article 1313. https://doi.org/10.3390/su8121313

Silva, C. M., Neto, P., Maria, F., & Leonardo, C. P. (2016). Pro-competition rules in aiport privatization: International experience and the Brazilian case. *Journal of Air Transport Management*, 9-16.

Singh, D. P. (2016). Role of Greenfield Airports in Greening Indian Economy - analysis. *Eurasia Review*.

Singh, D. P., Dalei, N. N., & Raju, T. B. (2016). Forecasting investment and capacity addition in Indian airport infrastructure. *Journal of Air Transport Management*, 218-225.

Singh, D. P., Dalei, N., & Raju, T. B. (2015). Airport Privatization and Economic Regulation: An Indian Experience. *International Journal of Multidisciplinary Research and Development*, 414-418.

Shmueli G, Sarstedt M, Hair JF *et al.* (2019). "Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict". *European Journal of Marketing*, 53(11): 2322–2347.

Song, B., & Kang, S. (2016). A Method of Assigning Weights Using a Ranking and Nonhierarchy Comparison. *Advances in Decisions Science*, 9 pages.

Stadtler, L. (2012). Designing public-private partnerships for development. *M@n@gement vol. 15*, 77-100.

Starkie, D. (2018). The Airport Industry in a Competitive Environment: A United Kingdom Perspective. *International Transport Forum*.

Stocker, F., Arruda, M. P., Mascena, K. M., & Boaventura, J. M. (2020). Stakeholder engagement in sustainability reporting: A classification model. *Corporate Social Responsibility and Environmental Management*, 1-10.

Tang, L., Shen, Q., Skitmore, M., & Cheng, E. W. (Apr'2013). Ranked Critical Factors in PPP Briefing. *AJournal of Management imn Engineering @ ASCE:*, 164-171.

Taherdoost, H. (2017). Decision making using the Analytical Hierarchy Process (AHP); A step by step approach. *International Journal of Economics and Management Systems*.

TEO, T. (2009). Examining the relationship between student teachers' self efficacy beliefs and their intended uses of technology for teaching: A structural equation modelling approach. *The Turkish Online Journal of Education Technology (TOJET)*, 8(4): 7-15.

Thomas, S. N., Wong, Y. M., & Wong, J. M. (2010). A Structural Equation Model of Feasibility Evaluation and Project Success for Public-Private Partnership in Hong Kong. *IEEE Transactions in Engineering Management*.

Tiong, R. L. (1996). CSFs in Competitive Tendering and Negotiation Model for BOT projects. Journal of Construction Engineering and Management, Vol 122, Issue 3.

Tiong RLK, Yeo K-T and McCarthy SC (1992). "Critical success factors in winning BOT contracts". *Journal of Construction Engineering and Management*, 118(2): 217–228.

Tolić MS, Vojvodić K and Martinović M (2012). "Private sector participation in the airport industry". *Public Sector Economics*, 1068–1212.

Ulku, T. (2015). A comparative efficiency analysis of Spanish and Turkish airports. *Journal of Air Transport Management*, 1-13.

Upham, P. J., & Mills, J. N. (2005). Environmental and operational sustainability of airports; Core indicatos and stakeholder communication. *Benchmarking: An International Journal*, 166-179.

Vasigh, B., & Haririan, M. (1996). Airport Privatization: A Simple Welfare Analysis. *Journal of Economics and Finance*, 89-95.

Velmurugan, R., Subramanian, S., & Manavalan, R. (2011). Multi-criteria decision making to select a suitable method for the preparation of nanoparticles using an analytical hierarchy process. *Pharmazie*, 836-842.

Vijayabanu C and Arunkumar S (2018). "Strengthening the team performance through personality and emotional intelligence: Smart PLS approach". *Scientific Annals of Economics and Business*, 65(3): 303–316.

World Bank Report. (2014). *Public-Private Partnership Reference Guide; Version 2.0.* New York, Washington, DC: The World Bank Publications.

Yescombe ER (2007). *Public-Private Partnerships; Principles of Policy and Finance.* Elsevier.

Young In, S., Casemiro, L. A., & Kim, J. (May 2017). A decision framework for successful private participation in the airport sector. *Journal of Air Transport Management*, 217-225.

Yuan, J., Zeng, A. Y., J. Skibniewski, M., & Li, Q. (2009). Selection of performance objectives and key performance indicators in public-private partnership projects to

achieve value for money. *Construction Management and Economics; Routledge, Taylor & Francis Group*, 253-270.

Zhang, P., Wang, L., & Wu, Y. (n.d.). Sustainability performance evaluation model on PPP projects. *MDPI*.

Zhang X (2005). "Critical success factors for public-private partnerships in infrastructure development". *Journal of Construction Engineering and Management*, 131(1): 3–14. https://doi.org/10.1061/(ASCE)0733-9364(2005)131:1(3)

Zou W, Kumarswamy M, Chung J and Wong J (2014). "Identifying the critical success factors for relationship management in PPP projects". *International Journal of Project Management*, 32(2): 265–274. https://doi.org/10.1016/j.ijproman.2013.05.004

Annexure-1

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
A	**PPP for Airport Development**			
1	Adetayo Adeniran	2018	1. Service quality in the private operated terminal is found better than service quality in public operated terminal. Also, the users are more satisfied with services provided in the private operated terminal. 2. Concessioning of airports are recommended to enhance the efficiency of airport operation and management in Nigeria.	Types of 'concessioning' (PPP model) not discussed in the study. Also, factors/reasons for the delivery of 'quality services' in PPP airports are not discussed in the study.
2	D.P. Singh, N. Dalei, T. Bangar Raju	2016	The passenger terminal throughput must be raised to 866 million passengers, and the cargo terminal throughput must be extended to 7.53 thousand MT cargo, necessitating a huge spend of about US$25.94 billion.	How to expand the existing capacity of airports and how to meet the required investment is not discussed. The contractual model for capacity addition in Indian Airports is not discussed in the study.
3	Richardo Rodrigues Pacheco, Elton Fernandes	2006	1. In pre-privatization stage, after changing managerial style, there was improve in the Financial Performance of Airports in Brazil between 1998 to 2001. 2. There was also an increase in passenger	The study focused on pre-privatization stage when it was getting prepared for privatization. There is no analysis available for the comparative

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			movement, but cargo movement stagnated, even declined slightly. 3. There was an increase in spending and operational expenditure but shrank in employee numbers.	performance of pre & post-privatization of airports.
4	George C.L. Bezera, Carlos F. Gomes	2018	Performance of Brazilian airports are measured in Operational aspects, Safety, Economic-financial, Operational and Service quality dimensions, which takes more time, resources and required information are not easily available.	Type of Airports (Public owned/ private owned) are not clearly mentioned. Performance dimensions are not studied for PPP airports.
5	Catriona Cahill, Donal Palcic, Eoin Reeves	2017	1. To ascertain the impact of commercialization on the DAA's productiveness and performance, a thorough investigation is carried out. 2. The growth of total factor productivity (TFP) was positive in half of the years following commercialization, but TFP dropped overall.	The study is limited to performance analysis based on Environmental as well as managerial factors of the airport. Other factors are not considered in the study to evaluate the performance.
6	Anil Kumar, Manoj Kumar	2018	1.The research is based on measurement of performance of privately owned airports viz.	1.The length of runways, terminal size, and number of check-in counters are all

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
	Dash, Rajendra Sahu		Delhi airport, Bangalore airport, Cochin airport, and Nagpur airport as well as AAI-owned airports viz. Chennai airport, Amritsar airport, Guwahati airport and Trichy airport. 2. Privatized airports have a mean efficiency rating of 0.83, whereas AAI airports have a mean efficiency rating of 0.79, indicating that airports under private ownership are more proficient on average than public-owned airports.	used to evaluate performance. Other aspects such as operating costs, revenues, and ownership are not taken into account when determining efficiency. 2. Although Delhi, Bangalore & Cochin Airports have different PPP models, the comparative analysis for performance efficiency are not discussed.
7	Tejashree Barde, Aristeidis Pantelias, Vedran Zerjav	2016	1. Performance levels of five PPP airports in India are measured and compared while addressing areas such as operations, economics, customer service, environmental issues, safety & security. 2. Airport terminal & airside operations are contingent on each other and affect the airport utilisation and productivity.	The performance of PPP airports is examined on the basis of operator perceptions. The perspectives of users, carriers, and retailers are not taken into account.
8	Manuj Ohri	2015	1. Although Govt. has developed Delhi, Mumbai, Hyderabad & Bangalore airports by PPP models, It seems that Govt. is in the	1. Detailed comparative studies for different PPP models are missing with reference to Indian PPP Airports.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			learning stage of airport privatization and experiencing different models of PPP. 2. BIAL is only scheduled to handle 7% of the traffic at Heathrow Airport in London. However, it covers 1.4 times the area.	2. Analysis for Indian PPP Airports and Overseas PPP airports are not done.
9	Sumana Chaudhuri	2011	Because various owners pursue different goals and have different incentives, ownership has an impact on company performance.	The ownership structure of Indian PPP Airports is not analysed, and also the study for evaluating economic benefits of Indian PPP Airports is missing.
10	Carlos Pestana Barros, Peter U.C. Dieke	2007	Italian airports have rather strong managerial abilities, with the majority of them being VRS-efficient.	Other characteristics are not taken into account while analysing the effectiveness of airports because the study focuses solely on cost.
11	Anne Graham	2005	The techniques of Benchmarking have been firmly recognized in recent years within the aviation, and there has been considerable development within the area of airport benchmarking.	Benchmarking for commercialisation and privatization stage of airport are not discussed.
12	Dariusz Tloczynski	2018	The privatisation of regional airports is reliant on local government, which poses	Different types of privatization are discussed, but different modes of PPP is

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			risks for investors and public organisations that own or co-own airlines on the one hand.	not studied. Moreover, Impact of 'change in ownership' is also not discussed.
13	Richard Florida, Charlotta Mellander, Thomas Holgresson	2014	The existence of an airport indicates that the region is larger and more developed. Airports have an impact on regional development via "moving people" and "moving commodities." According to our findings, it is not only about having an airport; it's also about the scale and scope of its operations, with bigger airports showing a higher positive impact on regional development.	The implications of 'airport ownership' on regional development are not explored in the study. Only the size and scope of the airport are taken into account.
14	Anne Graham	2015	Airport privatisation enhances management efficiency and quality, provides needed investment, strengthens state financial gains, and reduces government interference. However, it transformed public dominance into a private domination, which did often not behave in the collective interests of airport travellers. It also means higher flight fares, lower service quality and underinvestment, a lowering of basic standards when private	Benefits and drawbacks of different PPP models (BOO, BOOT, BOT), which have already been used in Indian Airports, are not discussed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			administrators dominate and look for benefit expansion, and the deficiency of government authority over a public resource.	
15	Caio Mario da Silva Pereira Neto, Paulo Leonardo Casagrande, Filippo Maria Lancieri	2016	The study focuses on 'Airport Competition while Privatizing Multi Airports,' and the government should design regulatory restrictions (to limit/restrict cross-ownership) that record for the presence of competition among airports, as well as these limits, should be meticulously planned and intended to meet their goals. Designing particular bidding rules/policies might increase potential competitiveness among airports.	Role of independent regulatory to enhance the competition in airport privatization is not discussed.
16	Bijan Vasigh, Mehdi Haririan	1996	Although privatisation of airports is advocated due to its numerous benefits, the government should not privatise an airport unless it results in a positive impact in society's welfare (W).	Privatization of airports is recommended, but the model of privatization that provide benefits, is not discussed. Also, Society's Welfare (ΔW) is not analysed for different PPP models.
17	Hans-Arthur Vogel	2011	1. F.Y. 2003 through 2009 are the years under consideration. This research looked at seven	Effects of economic regulation on airport's profitability are not studied, and

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			different airports and 3-different airport systems (Aeroports de Paris, Aeroporti di Roma, and BAA-British Airport Authority). 2. Airport management can maximise the valuation margin between the return rate and its weighted average price by properly phasing investment operations, balance sheet gearing, and capital expenditure financing.	also, the detailed analysis for financial benefits of PPP in airport's context is not discussed.
18	D.P. Singh, N. Dalei, T. Bangar Raju	2015	Privatization and regulation are good for increasing capacity, improving infrastructure quality, and increasing resource efficiency, but price control should be implemented to keep them within the limit in such a way that pricing matches the Indian cost structure and can attract investment in airport infrastructure.	1. The reasons for the improvement in efficiency in the use of resources after privatization were not studied. 2. Privatization of Indian Airports through the PPP model was not discussed.
19	Rajiv Gupta	2015	1. AAI has the lowest shareholding in four PPP airports but is involved in major decisions taken by the airport. 2. Author reveals a mismatch between capacities, area constructed and investment.	A detailed study has not been done for analysing the conditions, scope, size and cost of the PPP Airports in reference to the Concession Agreement.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			3. There were flaws in the Concession Agreement of PPP Airports. Hence, huge financial gaps were identified in Delhi & Mumbai Airports, changes in scope & cost overrun were reported for Mumbai & Delhi Airports, the shareholding structure was changed in Bangalore airport, and Real-estate development exploitation was identified in Delhi & Mumbai Airports.	
20	Abu Naser Chowdhury, Po-Han Chen, Robert L.K. Tiong	2011	In the PPP system, HubCo (SPV), Government of Pakistan, Equity-holders, and MDBDs are four key players. They encircle the rest of the group.	Comparative analysis of PPP Models is not conducted by using Network theory.
21	Carlos Oliveira Cruz, Rui Cunha Marques	2011	Different private-sector involvement models are examined. If the full capabilities of sector involvement are to be achieved, risk transfer and mitigation is the most crucial aspect of PPP project design and development. The three main risks in airport expansion,	The research does not address the formation of a successful partnership. Furthermore, the advantages of PPP structures in airport development have not been investigated.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			administration, and functioning are production risks, commercial risks, and context risks.	
22	Matteo Rossi, Renato Civitillo	2014	1. Ownership of capital assets, investment responsibility, risk assumption, and contract duration are the primary differences amongst PPP models. 2. Administrative issues, financial issues, legislative concerns, legal system issues, private system issues, and return of operations are all factors that contributed to Italy's less successful and efficient PPP than other countries.	The structural arrangement of different PPP models based on ownership, investment & risks is not discussed.
23	Vinod N. Sambrani	2014	Factors that lead to the success of the BIAL PPP: a strong-private-consortium, the central and regional governments work together as a single organisation and as a single point of access. Throughout construction, there were no major changes. A fair concession charge, a stronger commitment to investment opportunities, Tariffs are under the	Change in shareholding structure in BIAL is not studied. Also, the applied model BOOT in BIAL is not discussed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			supervision of an independent regulator with established standards; associated infrastructure (railways, roadways, ATC, and so on) should be included in the airport project; To improve the airport's attraction and profitability, the city/economic zone around it is being planned.	
24	Marjan Bashiri, Shabnam Ebrahimi, Maryam Fazali	2017	The importance of government's action and inputs in the successful implementation of PPP were discussed. It is stated that the government shall create and implement the PPP policies as well as the adequate regulatory framework play a key part in the achievement of the goal of PPP airports. The author also emphasised the adverse impact of selecting and allocating the inaccurate risk, to incompetent parties that may cost hugely.	A detailed study on Independent regulatory for successful implementation of PPP is not conducted, and guidelines for selecting accurate PPP models are not discussed.
25	Graeme Hodge, Carsten Greve	2011	The varied meanings of success are based on how each person views success. Whether seen from a societal standpoint (including political, programme, and procedural	A single framework (considering all the factors) to evaluate the success of PPP is not discussed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			challenges), a project or activity standpoint, or in terms of how organisations worked to invent, collaborate, and evolve in order to meet goals.	
26	Soh Young In, Luiza A.S. Casemiro, Julie Kim	2017	It is investigated how alternative proprietorship and administrative structures aid the public-sector in achieving its goals. The important factors in structuring private participation are (i) ownership type, (ii) the procedure for changing this ownership, and (ii government regulations imposed after the fact. While guaranteeing private lenders that their investment anxieties would be met, the government should exercise an appropriate amount of regulation to protect consumers from monopolistic power abuse.	Different type of contract structure and ownership control on airport's PPP model is not studied.
27	Manzoor K P	2010	1. Private participation helps low income countries like India to make big investments in the airports to meet its growing air travel demand, and private management can	1. Performance of Post-privatization of Airports are not comparatively discussed. Hence, learning from previous experience cannot be

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			provide good facilities and services for passengers at airports. 2. Low-cost airports provide a profitable environment.	concluded. 2. Development of low-cost airports through privatization is not studied.
B	**Critical Success Factors of PPP**			
28	Mukesh M. Pandey, Dr. D.P. Singh, Dr. R. Jayaraj, Dr. Damodharan	2018	The major success elements for the establishment and maintenance of a Low-Cost Regional Airport were identified and analysed in this study. The most essential factors for low-cost airport development are the terminal building design and the Airport Authority's marketing policies, according to the findings.	Evaluation of comprehensive functional success factors and strategic critical factors related to airport development is not discussed.
29	Peter Gerber	2002	It is determined that privatisation can only be successful if the government establishes a sufficient framework of regulation before privatisation, which must safeguard the interests of consumers and ensure airline involvement as key consumers.	The structure and role of independent regulatory authority in the privatization of airports are not studied, which influence the success of PPP projects.
30	Rajkumar K, Selvakumar C,	2016	There are seven CSFs that have an impact on the accomplishment of PPP projects in India.	Critical success variables for various project phases have yet to be identified.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
	Sharavana kumar P S		CSFs that have been identified are frequent in all types of Indian PPP projects.	The association between the CSFs that have been found has not been investigated.
31	Olaniyiaje, Onaopepo Adeniyi	2012	1. The indicators produced in the study represent the environment of PPPs, and they are based on the capacities of the parties on the ground. 2. The indicators are a set of measurements that stakeholders in public-private partnerships (PPPs) can use to choose the best foundation for their entire programme of PPP projects.	Identified performance indicators (PIs) are general in nature, and detailed study is not conducted for specific infrastructure projects, i.e. PPP Airport projects.
32	Robert Osei-Kyei, Albert P.C. Chan, Ernest Effah Ameyaw	2017	The five CSF groupings recognised for understanding organizational PPPs are: efficient delivery of service and suitable judicial system, simplified fee structures and steady project monitoring, effective contract-claim management, appropriate project stakeholder framework, and safety and environmental regulation. The most	Identification of CSFs is limited to the operational stage of Infrastructure projects, and Inter-relationships among identified factors are also missing.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			important CSFG, however, is simplified fee structures and steady project monitoring. Both governmental agencies and private operators will benefit significantly from the findings.	
33	Reetika Sehgal, Ashish Mohan Dubey, Nidhi Tiwari	2015	The study finds 20 characteristics as predictors of PPP's effectiveness, which have been categorised into five categories: A positive macroeconomic environment, project execution capability, competent contracting, a steady sociopolitical backdrop, and government control are all important factors. The determinants were then broken down into a variety of variables.	Type of Infrastructure projects was not known while identifying the CSFs for PPP. A set of identified CSFs may not be applicable for all types of Infrastructure projects, it may vary as per project Characteristics.
34	Xueqing Zhang	2005	The five fundamental CSF characteristics are (1) commercially viable, (2) appropriate risk-sharing using reliable contractual structures, (3) reasonable financial framework, (4) robust concessionaire consortium with solid	Inter-relationship between CSFs are not studied. How these factors affect each other are also not analysed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			technical capability, and (5) favourable economic climate.	
35	Shiying Shi, Heap-Yih Chong, Lihong Liu, Xiaosu Ye	2016	Adequate risk distribution and service price are essential aspects that play a big role in the PPP project execution. These parameters also aid in the analysis of project feasibility and discounted cash flow, as well as the evaluation of performance efficiency and PPP partner satisfaction.	In the study, the PPP factors are not discussed for different phases of project, i.e. contacting, execution, operation and also, Success factors and their relationship are not analysed for PPP Airport projects.
36	Robert Osei-Kyei, Albert P.C. Chan,	2015	Fifty-seven numbers of CSFs were identified from twenty-seven publications. The study provided the ranking of CSFs and listed the 'financial/commercial risk category' in the top criticality. They also specified that the legal and socio-political category, and the technical category also have critical impacts.	The study is limited to Water Supply Projects of Hong Kong, UK & Australia for identifying CSFs for PPP in Infrastructure Projects. However, inter-relationship between CSFs are not studied.
37	LiYaning tang, Qiping Shen, Martin Skitmore,	2013	The four main types of elements include acquisition variables, share-holder variables, hazard variables, and financial concerns. Demonstrations of how PPP can deliver	Identifyed CSFs are general in nature and common for all types of Infra. Projects. However, the Inter-relationship between CSFs are not examined.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
	Eddie W.L. Cheng		the best deal seem to be the most critical element for a PPP briefing's success.	
38	Junxiao Liu, Peter E.D. Love, Jim Smith, Michael Regan, Peter R. Davis	2014	The critical areas of operation management actions in a PPP project's many life-cycle phases are defined using Project Management Critical Success Factors (PMCSFs), which can serve as an informative guideline. PMCSFs for the PPP Planning Phase, PMCSFs for the PPP Procurement Phase, and PMCSFs for the Partnership Phase.	Critical Success Factors are identified only for the Project Management stage of PPP, and no relationship is studied between the identified (PMCSFs). Testing and validation of the presented framework are not done. That may be conducted.
39	Jui-Sheng Chou, Dinar Pramudawardhani	2014	5-Key-drivers and 17-CSFs were successfully identified, with Taiwan exhibiting more key drivers than Indonesia. According to the findings, different countries have different CSFs, with the most prominent CSF in Indonesia differing from Taiwan and China. Some CSFs, on the other hand, are the same for all countries.	5-Key-drivers and 17-CSFs were successfully identified, with Taiwan exhibiting more key drivers than Indonesia. According to the findings, different countries have different CSFs, with the most prominent CSF in Indonesia differing from Taiwan and China. Some CSFs, on the other hand, are the same for all countries.

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40	S. Thomas Ng, Yoki M.W.Wong, James M. W. Wong	2010	A comprehensive evaluation framework is produced for decision-makers to assess the preliminary viability of a PPP project, and a model is created by balancing the objectives of the administrator, private entity, and society to reach at a viable and mutually advantageous project.	Evaluation factors are identified for project success while considering the satisfaction of stakeholders. However, other dimensions of project success, i.e. economically, environmentally, socially, are missing in the study.
41	Chuen-Ming Hsueh, Luh-Maan Chang	2017	A supportive legal framework, a favourable investment climate, the assortment of acceptable public-private partnership projects, and public assistance were the four main variables that were categorised into 26 CSFs of PPP in Taiwan.	All Infrastructure projects have critical success factors (CSF), but the relationships between them are absent.
42	Afeez Olalekan Sanni	2016	The study indicated that if the government could focus on identified CSFs during the implementation process, more developmental projects might be implemented using PPP. The 07 CSFs which have been identified are managerial emphasis, allocation of risk and monetary reforms, democratic reform and	The success of PPP ventures in developing countries is the only CSF that has been identified. Furthermore, no research has been done on the relationships between the detected CSFs.

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			political support, concise construction duration, positive social-economic determinants, supplying socially necessary service, and project assessment.	
43	Solomon Olusola Babatunde, Akintayo Opawole, Olusegun Emmanuel Akinsiku	2012	Construction of roads, trains, and airports are the most appropriate for PPP implementation, whilst educational projects, real-estate development, and recreational, touristy, and artistic initiatives are the least appropriate. A competitive bidding system, a comprehensive and reasonable costing, a suitable structure, adequate allocation of risk and risk transfer, and governmental involvement through an assurance are among the nine CSFs identified by PPP. All of these things are beneficial: political support, macroeconomic stability conditions, solid economic strategy, and accessibility to adequate financial system.	CSFs are not studied separately for Road, Rails & Airports projects. Moreover, relationships between CSF are also missing.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
44	Rauda Al-Saadi and Alaa Abdou	2016	1. Thirteen critical success factors (CSFs) were identified as critical for PPP implementation in infrastructure projects. 2. Stakeholders in the private and public sectors have differing perceptions of the prominence of CSFs. 3. Due to the absence of uniform bidding legislation and PPP contract management in the UAE, there really is no defined briefings method available. Consequently, the UAE's PPP project briefing process is currently afflicted by various roadblocks.	1.The differences and similarities in public and private sector opinions on how to rank the CSFs were not examined in depth. However, only 4-CSFs were identified as having a difference of opinion. 2. The study was conducted in the United Arab Emirates; a similar study might be conducted in Indian airports.
45	Marcus Jefferies	2006	Bidding risk, Streamline approval and negotiating process, Business diversification, and Streamline finance process were recognised as essential success criteria that up to the actual operations and strategies phase of the project life cycle, it appeared to be among the most essential. The Super Dome Model looks to represent the current benchmark for BOOT projects in	Only one case study of the Sydney Super Dome project has identified CSFs. Furthermore, the inter-relationships amongst the detected CSFs are not investigated.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			Australia, as well as a model for future PPP projects.	
46	Henry Alinaitwe, Robert Ayesiga	2013	CSFs are identified by taking into account the perceptions of the private, financial, and public sectors. The most important cross-cutting characteristics are a competitive bidding process, a well-organized private entity, the number of trained persons to involve in PPP project delivery, and efficient administration.	A PPP model for which CSFs are examined, not mentioned in the study and inter-relationships among CSFs are also not studied.
47	M. Maseko	2014	Operational and economical viability of the project, stringent contract administration to ensure contract performance, and a highly skilled and experienced private partnership with technological abilities are among the 20 CSFs rated according to their importance. Furthermore, primary stakeholders are educated on some guidelines for the fruitful implementation of PPP infrastructure projects in South Africa.	Most of the identified CSFs are transitional and will be limited to a shorter time periods. However, inter-relationship between identified CSFs are not studied.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
48	Effan Ernest Ameyaw, Albert P.C. Chan	2015	The study creates a list of forty risk factors with twenty-two CSFs based on industry experts' evaluations, and additionally divides them into 3-categories (socio-political and legal, commercial, and technological). These indicators are used to assess the likelihood and severity of water supply PPP initiatives in underdeveloped nations.	Identified CSFs belong to only Water Supply projects. However, the Inter-relationship between CSFs are not examined.
49	Albert P.C. Chan, Patrick T. I. Lam, Daniel W. M. Chan, Esther Cheung, Yongjan Ke	2010	The discovered CSFs will help to clarify how to regulate the various critical variables that determine the success of public-private partnership projects. Government-engagement through a guarantee, a stable political and social climate, governmental and private partners have a joint duty, a steady macroeconomic climate, prudent government oversight, and a transparent and efficient procurement procedure are all crucial CSFs.	Identified CSFs are general in nature and common for all types of Infra. Projects. However, the Interrelationship between CSFs is not examined.
50	Bing Li, A. Akintoye, P. J.	2007	For the UK construction industry, the following CSF groups have been identified:	1. Study is based on UK construction industry. Type of Infrastructure project

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
	Edward, C. Hardcastle		The following CSF groups have been discovered for the UK construction industry: efficient procuring, construction management ability, government grant, suitable financial environment, and accessible credit system. A robust private consortia, efficient allocation of risk, and an accessible capital sector are three characteristics that stand out as particularly important in the successful implementation of new UK PPP/PFI projects.	is not specified. 2. Response rate was very low @ 12%. 3. Inter-relationship between factors are not established.
51	Sungmin Yun, Wooyong Jung, Seung Heon Han, Heedae Park	2012	Based on the proposal style, CSFs are divided into four categories: project execution abilities, institutional collaboration, government management and coordination, sharing of risks and mitigating approach, and government financial assistance. Whereas 'Project execution abilities' is the most important factor in solicited-projects and the 3rd most important in unsolicited-projects, 'Sharing of risk and mitigation approach is	1. The study focuses on CSFs from an organisational standpoint. 2. The report does not specify the type of infrastructure project. 3. There is no development of inter-relationships between factors. 4. The findings are not further validated.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			the most crucial component in unsolicited-projects and the 4th most important in solicited-projects.	
52	Khalid Almarri, Bassam Abu-Hijleh	2016	For the United Arab Emirates and the United Kingdom, nine similar CSFs were discovered: 1. The commitment of both public and private parties; 2. Appropriate risk-assignment; 3. A diligent and capable government agency; 4. A procurement process that is transparent and open; 5. A robust private partnership; 6. Competitive bidding; 7. Political support; 8. A comprehensive benefit-cost analysis; and 9. Efficient Management. The rankings for positions 1, 2, 3, 7, 8, and 9 are comparable for the United Arab Emirates and the United Kingdom and, with a little variance in factors 4, 5 and 6.	Findings are limited to UAE & UK construction industry. Moreover, inter-relationships between identified CSFs are not studied.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
53	Felix Villalba-Romero, Champika Liyanage	2016	1. Nine Key Performance Indicators were established, as well as twenty-nine Performance Measures. 2. They also came to the conclusion that the critical areas and features of PPP must be addressed in conjunction with the PPP process in order to fully comprehend the evaluation of a PPP project's success or failure from a global perception.	The Performance Measurement System is tested on 13 road projects. Hence, studies are limited to road projects only. The same may be tested on rail or airports projects.
C	Sustainable airports			
54	Jing Du, Hongyue Wu, Xianbo Zhao	2018	The study proposes a novel approach to combining PPP with sustainability in order to accomplish optimum capital structure selection while generating healthy PPP projects. The study also highlighted seven essential aspects that determine the financial structure of PPP projects from a sustainability standpoint (project condition, benefit, risk, cost, government backing, ability, and external situation).	The impact ownership under public or private sector and involvement of private sector on the long-term sustainability of PPP projects has not been investigated.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
55	James Longhurst, David C. Gibbs, David W. Raper, D.E. Conlan	1996	An Airport can be sustainable if: engages an exchange with its clients, offers association to the local area in the acknowledgement and remediation of natural issues, can address the issues of its client, enters the discussion about the personal satisfaction at the neighbourhood, public and worldwide level, tries to screen its effect upon the climate, puts forth strategy objectives to lessen its ecological effect, is wary about the effect of new improvement upon the current climate, is willing and ready to deliver data about its natural effect and is one who is trying to be sustainable airport.	1. Terminology of sustainable development is not defined. 2. Application of sustainable development principles are not broadly discussed a variety of spatial scales.
56	Silvana Di Sabatino, Efisio Solazzo, Rex Britter	2011	The impact of emissions from aircraft surrounding the Heathrow Airport has been assessed using the Emission and Dispersion Modelling System (EDMS).	Road network (linked to airport) were considered for emission checking, but buildings surrounding the airport are excluded from the study, which make a significant impact.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
57	Kenneth M. Amaeshi, Andrew Crane	2006	1. Effective stakeholder involvement must include the following primary elements: issue/stakeholder identification and prioritisation, implementation, evaluation, and ongoing relationship management. 2. The model ought to truly be setting delicate and reflect neighbourhood airport improvement challenges.	Stakeholder participation for the development of sustainable airports using public-private partnerships has not been thoroughly investigated.
58	Andrea L. Kaszewski, William R. Sheate	2004	They have specified the concepts to improve and maintain the sustainability of an airport considering the airport structure. Their concept represents a four-course of action consisting of the physical infrastructure components of an airport, which are; BAU, GTP, GAP and a suitable combination of GTP and GAP. 1. BAU is a business as usual planning for surface transportation, 2. GTP is a green transportation planning, 3. GAP is a green architecture planning and 4. A combination of GTP and GAP along with the adoption of modern technologies	The analysis is limited to solely greenfield airports, and the study does not address the sustainability of PPP airports.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
59	Ching-Cheng Chao, Taih-Cherng Lirn, Hing-Chun Lin Master	2017	The study's findings provide advice for airport management in analysing the performance of their facilities in terms of carbon reduction, environmental protection, and energy conservation. Sixteen indicators are derived from four kinds of dimensions/indicators: Green air terminal plans (GA), energy conservation and carbon reduction in air terminal jobs (EC), inexhaustible asset utilisation (UR), and air terminal ecological maintainability the executives are all examples of green air terminal plans (AE). Energy-saving controls, open-air terminal access, and aviation carbon emissions executives, on the other hand, are all very simple.	The effect of ownership on the airport's 'environmental protection performance,' as well as the CSFs for accomplishment in 'environmental protection performance,' are not examined.
60	Nicole Adler, Tolga Ulku, Ekaterina Yazhemsky	2013	Privately subcontracted administration and maintenance related to regulation of incentives may execute much improved and have shown to be more reliable than airport groups operating under budgetary constraints.	Critical Factors which affects the sustainability of small and regional airports are not studied and also the Impact of Airport Ownership (public or private) in airport sustainability are not discussed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
61	Yung-Kil Lee, Jin-Woo Park	2016	1. It was observed that public communication, perspicuity, and civic conscience have a substantial effect on sustainable brands, as well as a significant mediating effect on improving airport business performance efficiency. 2. Both the protracted branding and the performance to characterize the airport organisation can be improved when social media is used as a platform for two-way communication.	The study excludes international airports, which have unique operating characteristics, and it is also confined to only three criteria that influence long-term brand sustainability.
62	Nurhan Oto, Nesrin Cobanoglu, Cevat Geray	2012	The term "environmental bioethics" was brought forward. The findings were based on a case study of Turkish Airports' Ankara Esenboga International Airport (ESB) [BOT Model], in which sustainability was accomplished through sustainable schooling and preparing of staff, clients, partners, and the overall population.	The role of stakeholders in airport sustainability is not examined, nor is the application of "Environmental bioethics" in developing sustainable airports.
63	Fasone V., Giuffe T., Maggiore P.	2012	1. A good MAS may greatly contribute to the airport's sustainability as a company and as a piece of infrastructure, but only if it is backed	The MAS framework is not explored to see if it is applicable to airports with various ownership. Furthermore, the

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			up by a well-coordinated management strategy. 2. MAS can assist organisations in improving their financial and economic effectiveness, as well as the competitiveness of their infrastructure. "The set of two or more main airports that service commercial traffic within a metropolitan region" is how the Metropolitan Area System (MAS) is defined (Bonnefoy 2010).	influence of MAS on the sustainability of various privately held airports is not addressed.
64	MI Setiawan, S Surjokusumo, DM Ma'some, J Johan	2018	Business Centre Development in the airport area, which is created through a public-private partnership, is linked to airport management and has an impact on the expansion of commercial properties in the airport region. Commercial property development, construction, and execution are the responsibility of the government and private partners.	The aspects that contribute to the success of the 'Business Centre Development Model' in terms of airport sustainability have not been investigated.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
65	Ismael Cremer, Stephen Rice, Alexander Michaels, Korhan Oyman	2015	The study helps in understanding how passengers perceive the level to which an airport is sustainable, and it is identified a relationship with respect to the consumer's score on the scale and their willingness to pay.	The study is limited to only Commercial Airports of the USA, wherein scale was built-up using the perception of US participants. Participants of other demographic area are not considered for the study, which may affect the outcome.
66	Paul J. Upham, Julia N. Mills	2005	core arrangement of markers has been characterised for natural and operational sustainability of air terminals, including the number of urban transit vehicles, aircraft advancements, dynamic power consumption, ephemeral contaminant fluxes, flying commotion emissions, and so on.	The study is limited to medium to large airports, and also ownership pattern of airport is not considered. Moreover, the proposed indicators are not separately supplemented by social and economic indicators.
67	Shengqin Zheng, Ke Xu, Qing He, Shaoze Fang and Lin Zhang	2018	1. The coerciveness of rules and regulations can boost actual private sector behaviour toward sustainability. Furthermore, public sectors can impose essential standards and oversight on private sectors to help them perform better in terms of sustainability.	Required regulation for Private Sector to perform sustainable development is not discussed. Moreover, the discussion on required Regulatory body is also missing.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			2. The private sector is required to engage in CSR, which encompasses a wide range of issues such as pollution, safety, and environmental protection. By doing so, the private sector's perceived behavioural control and behavioural intention will improve, allowing for more sustainable behaviour.	
68	Maha Mousavi Sameh & Juliana Scavuzzi	2016	GHC emissions, noise pollution, land use, garbage, and congestion are all primary environmental challenges linked with airport operations, according to the findings. Such environmental challenges can be addressed by implementing new methods and technologies.	The research focused entirely on environmental sustainability. There is no consideration of the impact of economic and social sustainability on environmental sustainability.
69	Damilola S. Olawuyi	2016	Environmentally friendly technology are widely available, accessible, and affordability are all factors in reducing aircraft emissions, according to the researchers (EST).	The study does not take into account the effects of PPP on sustainable development.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			Access to EST is further hampered by a slew of regulatory and institutional hurdles.	
70	Marlies Hueskes, Koen Verhoest, Thomas Blick	2017	The document analysis demonstrates that, in the procurement of Flemish PPP projects, sustainability issues play only a modest part. Furthermore, the consideration of sustainability was taken into account, which is primarily concerned with the environment and overlooks the societal dimensions of sustainability.	The research is confined to looking at sustainability from the standpoint of the public sector. The sustainability aspect is incorporated by public procurers in tender documents, while private parties' perspectives are not taken into account.
71	Seyhani Koc, Vildan Durmaz	2015	12 economic indicators, 34 environmental indicators, and 46 social indicators are included in the GRI Sustainability Reports guideline. The findings reveal that top-performing airports are concerned not just with the most effective utilization natural assets and inputs, as well as economic and social changes.	There is no discussion of the specifics of how to improve the quality of corporate sustainability reporting for PPP airports.
72	Kate Kearins and Martin Fryer	2011	The airport's approach has gained from involved scholarship, and it will continue to do so as the company assesses its	When evaluating the impact of engaged scholarship, private ownership is not taken into account.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			performance, setting a new objectives, and analyses them over time.	
73	Amanpreet kaur, Sumit Lodhia	2017	According to the study, stakeholder engagement is important throughout the sustainability reporting and accounting procedure, along with the creation of strategies, programs, and metrics, and also the assessment of sustainability practices and the compilation of sustainability reports.	The importance of stakeholder engagement in ensuring the airport's sustainability is not addressed.
74	Fabio Carlucci, Andrea Cira, and Paolo Coccorese	2018	According to the findings, airport size, low-cost carrier participation, and cargo volume all have a major impact on technical efficiency of Italian airports. It's also been established that deregulation and privatisation of air transportation can help smaller airports become more efficient and sustainable.	The impact of private ownership and investment distribution is not considered in the study.
75	Amos Ojo Arowoshegbe, Uniamikogbo	2016	It is determined that the TBL and sustainability are used as tools to assess the	The study is not considered the implication of TBL on the sustainability of PPP airport.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
	Emmanuel, Atu Gina		impact of corporate activities on social equity, the economy, and the environment.	
76	Nilesh A. Patil, Dolla Tharun & Boeing Laishram	2015	A PPP-specific framework is being created to enable the adoption of sustainability considerations into the procuring procedure and to make procurement management decisions to support sustainable development.	The study does not take into account the influence of private ownership and investment dispersion.
77	Frank Boons, Arwin van Buuren and Geert Teisman	2010	The author looked at the systemic underpinnings of the narrow discourse about sustainability before proposing ways to extend the debate about airport sustainability by creating organizational spaces for a responsive and constructive dialogue.	The impact of dynamics on the framing of sustainability, as well as the extent to which the process of sustainable development can be led by modifying particular system properties, have not been investigated.
78	Murat Pasa Uysal, M. Ziya Sogut	2017	The study's goal was to determine how much energy the Istanbul Airport could save in the future. They came to the conclusion that energy management in airports requires a holistic and integrated approach. Using enterprise design, around 70% of the airport's	The evaluation and implementation of the projected EA in the PPP airport have yet to be completed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			energy consumption might be reduced in the terminal buildings (EA).	
79	Nicholas A. Ashford, and Ralph P. Hall	2011	The paper discusses important concerns related to long-term sustainability. Policy actions are needed to raise capacity, improve willingness, and improve opportunity, according to the findings. It will also serve as a catalyst for transforming the current industrial condition into one that is more sustainable. Moreover, for long-term growth, it is vital to promote breakthrough advancements through environment, health, security, financial, and labour force regulation.	Government initiatives and stakeholder participation for sustainable development are not taken into account.
80	Anna Wojewnik-Filipkowska, and Joanna Wegrzyn	2019	PPP contracting is compatible with long-term urban-development, according to the study, and the PPP framework when integrated with stakeholder approach, mandated an assessment that harmonized the interest of many stakeholder all along triple bottom line of sustainable development.	The interrelationships among the PPP aspects that have a substantial impact on sustainability are not investigated, and multiple stakeholders are not incorporated in the analysis.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
Literature Review for Theory of Underpinning				
81	Wendy Netter Epstein	2013	Even if the administration is sufficiently interested about delivering superior service, managing the private service provider is challenging if competitive markets are inadequate, tasks and intended outcomes are difficult to articulate, and monitoring is both complex and expensive. These problems, on either side, can be dealt with and alleviated via a contract framework.	There is no discussion of a detailed contract mechanism or contract structure to handle the PPP concerns that arose during implementation.
82	Philippe Aghion, Richard Holden	2011	The author discusses the 'implementation criticism' after discussing the incomplete contract method in businesses' concerns. It is also discussed how proprietorships might deal with incomplete contracts in the transportation sector.	In order to handle incomplete contracts, the function of government ownership was not addressed.
83	Robert E. Scott, George G. Triantis	2005	The authors have thoroughly discussed 'Incomplete Contract Theory,' and have clearly argued that it has different meanings for economists and lawyers. If a contract does not include descriptions of the party's	The issue of holdups under Incomplete Contracts is not addressed.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
			obligations in every potential state of the world, it is considered an incomplete contract by the Lawyer. Similarly, for the Economist, if a contract fails to establish an proficient collection of the obligations in every potential state of the world, it is considered an incomplete contract. They've also talked about contract renegotiation, which is an important aspect of contract theory.	
84	Oliver Hart, John Moore	1998	The authors created a simple version of the basic model wherein the ideal contract is slightly incomplete, well with the extent of partial incompleteness relying on the parties' capacity to specify the nature of trade. If the parties' responsibilities are well defined and the renegotiation takes place on date-one, the best contract may be the "complete contract" (under the presumption of non-responsibility). However, the way in which the contract is carried out is inefficient ex-ante.	Non-commitment assumptions, which make an optimal contract a "full contract," are not examined.

S.no.	Name of Author	Year of publication	Finding in Literature	Research Gaps
85	Patrick W. Schmitz	2001	Incomplete-contracts, hold up concerns (symmetric-information and asymmetric-information), and asset ownership have all been covered by the author (The property-rights approach, property-rights approach's robustness). In addition, strict liability and safety standards in the sense of an unified minimum standard are thoroughly examined.	There are no general standards of regulation that could result in anything resembling what liability can achieve.
86	Nicolai J. Foss, Peter G. Klein	2016	Contracting, firm boundaries, and organisational structure, Strategy formulation, entrepreneurial, governance practices, financial structuring, public-governance, and stakeholder theory are just a few of the topics covered, and other topics, have all been explored by Hart and Holmstrom. Despite the fact that Holmstrom created the contemporary principal-agent theory, Hart is mainly thought to have contributed to the company's "incomplete contracting" or "property rights" approach.	While summarising Hart and Holmstrom's works, the author did not go into detail about the Hold-up problems.

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87	Oliver Hart	2002	A simple incomplete contractual model was built to analyse PPPs, and theoretical thought on public versus private ownership was examined. According to the concept, the decision between PPP and customary arrangement depends on whether it is more straightforward to lay out agreements for administration arrangement than for building arrangement.	Only public and private ownership are examined in this study. There is no mention of the PPP contract structure.
88	Liliana Basile and Raffaele Trani	2008	1. Using incentive restrictions as a preamble to improve information may not be the best technique. 2. As long as relationship-specific investment situations arise, an incomplete contracting framework is a ground-breaking epitome in the sense that it allows for the exploration of issues that could not even be proposed in a complete contract context, such as the recognition of non-contractible inefficacy and the possibility of non-contractual elucidations to such inadequacies.	When looking at the Incomplete Contract and Complete Contract models, only specific investment conditions were taken into account. Other PPP aspects such as investment distribution, risk sharing, regulatory intervention, shareholder participation, and so on are not covered in the study.

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89	Steven Y. Wu	2014	The study examines and sums up strategic worries in accepted agreement hypothesis that limit the hypothesis' capacity to really reproduce central attributes of rural agreements.	There is no discussion of empirical procedures for testing contract theories and predictions.
90	Regien Sumo, Wendy Van Der Valk, Arjan Van Weele, Geert Duysters	2016	The author came to the conclusion that Performance-Based Contracts have a low term specification since they state the performance to be achieved rather than the inputs and processes to be used. They also found an inverted U-shape in the connection between low term specificity and inventiveness.	Innovation as a positive performance consequence is the subject of the study. Other outcomes, such as financial performance, contentment, and so on, were not taken into consideration in the study. Furthermore, the contract structure and its impact on the outcome are not addressed.
91	Maria Alessandra Rossi	2014	The meaning of Contractual Incompleteness, The Holdup Problem, the Theory-of-Firm and Incomplete-Contracts and, Transaction Cost and Institutions, Corporate Finance, Incomplete Contracts and Innovation, Incomplete Contracts and International Trade, and Economics-of-Contract	Incomplete Contract and Private Ownership, as well as Incomplete Contract and Contract Structure, are not described in the study.

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			Regulation and law are all explained by the author.	
92	Dori Kimel	2007	The author came to the conclusion that contracts are frequently made at arm's length, outside of the context of an existing, substantial, personal relationship between the parties, and without a promise by the parties to form such a relationship in the future.	Contract structure and the influence of relationships amongst contract parties are not explored while analysing the empirical view.
93	Martin Hogg	2009	It is determined that the mixed kind of Scottish contract-law, which was created primarily through Stair's works, is the source of Scottish contract theory. The author also claimed that some of the advantages afforded by the Scottish framework could be used to the Common Law's future development, despite the fact that the Common Law has traditionally been wary of legal borrowings from its nearest neighbour.	The research is solely based on the Mixed Legal System. Other aspects of the Contract Theory, such as regulatory intervention, private ownership, and so on, are not taken into account.
94	Asheem Shrestha, Jolanta	2019	Traditional risk models, according to the research, are designed to determine hazards	The focus of the research was on the negative consequences of risks. The study, on the other hand, ignores the

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	Tamosaitiene, Igor Martek, M. Reza Hosseini, David J. Edwards		and then make suggestions on how these risks should indeed be distributed.	positive effects of risk. Furthermore, there is no mention of the shareholder's participation in risk management.
95	Klaus M. Schmidt	2017	Hart and Holmstrom's assistances to Contract-Theory, as well as many other contributions, are listed under the research, including Theory of Incomplete Markets, Monopolistic Competition, Adverse Selection in the Market for Corporate-Control-Market and Labour-Market, and Competition Incentives.	The research focuses on Hart and Holmstrom's contributions to Contract Theory. Their other contributions, on the other hand, are not examined in depth.
96	Chao Li, Zhijian Qiu	2019	The authors developed a consistent method to estimate a multi-agent interaction within the context of adverse selection, both with and without moral hazard. They also reached the conclusion that the disappearance of competitive equilibrium would lead to market moral hazard and	The proposed model considers only two types of agents, which is unrealistic, and the study does not take into account the principal's continuing payment.

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			adverse selection, and that if equilibrium position does exist, that must be a splitting equilibrium.	
97	Robert Puelz	1997	In the stylized scenario, where managerial contracts are aimed to prevent accidents, the author confirmed the predictions established for incentive contracting. Furthermore, the model suggests that greater loss reporting will result in a step-function penalty, with more expensive, more trustworthy audits being utilised to prevent ex-post exaggeration of the loss.	The influence of private ownership on the suggested model was not considered in the study.
98	Yonghong An, Xun Tang	2019	A paradigm is proposed that maintains a dynamic data format while endogenizing a buyer's initial agreement specification.	There is no mention of the effect of incomplete contracts on the mechanism's efficiency.
99	Sergio Domingues, Dejan Zlatkovic	2015	A comparison of a case study of nine European PPP Projects with literature is used to clarify and summarise the ramifications of contractual renegotiation. The authors came to the conclusion that using contractual suppleness to uncertain	There is no research on the impact of social-economic communication systems and contract flexibility.

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			conditions is a smart approach. In addition, the effective communication structure allows for a faster reaction to unforeseen circumstances, renewing the parties' dedication to a win-win venture.	
100	Gonzalo Ruiz Diaz	2016	The study revealed that factors such as demand risk, project scale, funding source, and technology had a substantial impact on governments' decision to include economic control elements in PPP contracts.	The study does not take into account other PPP characteristics such as ownership, investment distribution, or shareholding pattern. Furthermore, the inter-relationships between the components are not investigated.
101	Joel Habets	2010	In comparison to traditional procurement methods, the author determined that PPP offers several important benefits. However, there is a trade-off between the project's quality and the cost associated with it. A crucial role is played by risk allocation. If the increased risk is moved to the private party, the quality will improve along with the insurance rates, but the negotiation costs will be underestimated.	In Dutch, the Harts' approach was evaluated for all sorts of PPP contracts. There will be no study to test Harts' model in PPP airport contracts.

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102	Madhav Dar	2019	The author found that a prevalent tendency in North India is that builders make promises, collect money from buyers for their projects, and then delay delivery for long periods of time, usually 3-4 years, beyond the claimed schedule for delivery. There is also concern that some of the monies invested in one project would be diverted to other initiatives. Furthermore, in the instance of DLF, the case was before the Supreme Court and was being reviewed.	The conclusions were drawn based on the information available. There was no primary data collected or analysed.
103	Laure Athias, Raphael Soubeyran	2012	At the point when the advantages of variation are huge, it is socially desirable over make an agreement that puts expectation risk on the private supplier, while when the advantages of cost-cutting endeavours are huge, it is socially desirable over put expectation risk on the public power.	The influence of shareholder participation in risk allocation is not taken into account.