CRITICAL SUCCESS FACTORS FRAMEWORK FOR POWER SECTOR PROJECTS

A
THESIS
SUBMITTED TO

GALGOTIAS UNIVERSITY
GREATER NOIDA

IN FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY
IN
MANAGEMENT

By
ACHINTYA GAHTAK

Regd. No. – 204340178

DEPARTMENT OF SCHOOL OF BUSINESS, GALGOTIAS UNIVERSITY

UNDER THE GUIDANCE OF DR. ADARSH GARG, PROFESSOR,
SCHOOL OF BUSINESS, GALGOTIAS UNIVERSITY

CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis, entitled "CRITICAL SUCCESS FACTORS FRAMEWORK FOR POWER SECTOR PROJECTS " infulfillment of the requirements for the award of the degree of Doctor of Philosophy in Faculty and submitted in Galgotias University, Greater Noida is an authentic record of my own work carried out during a period from February, 2017 to May, 2020 under the supervision of Dr.ADARSH GARG.

The matter embodied in this thesis has not been submitted by me for the award of any other degree of this or any other University/Institute.

(Achintya Ghatak)

This is to certify that the above statement made by the candidate is correct to the best of our knowledge.

(Dr. Adarsh Garg)
Supervisor
Deptt. of School of Business

ABSTRACT OF THESIS

Organizations strive for different and new methods to enhance the likelihood of project success. Project success has varied definitions but most commonly adopted across the literature reveals project success if it is delivered within time, budget and quality to meet the organizational goal. Established organizations define the project-specific success criteria as per the organizational needs, which is mostly experimental and not readily available to organizations to apply directly. The objective of the thesis is to identify the critical success factors of Power Transmission (PT) projects and study their direct and indirect impact as a critical success factors (CSFs) framework for PT projects in the Indian context. While there are frameworks available for project management, but no specific framework is in place for PT projects.

The power sector is the engine of social-monetary development and the contemporary human advancement of any country. Looking at the significance of the power sector, all countries exclusively and swiftly wrap up the projects successfully and India is not behind the set goal of the power sector. Power Transmission is an imperative practice of the power projects which makes the connection between the power generating stations and the distribution points. Power transmission constitutes an essential part of power projects which, in turn, are more like construction projects. PT project is often influenced by the factors that help project teams to achieve the organizational strategic goals. Thus, the success of power projects becomes a major concern with the increased boundary and volume of the power transmission sector in the recent decade, especially in India.

The Indian power transmission sector has experienced a robust development over the most recent five years. The state and the centre utilities, and the private sector mainly dominate the power sector with the private sector leading the PT projects. Though the current five-year plan of the period (2017-2022) has a lot of scope for PT projects in India with a projected investment of INR 2.6 lakh crore, yet there is a need to ensure the success of such projects. The critical success factors are designated as the importantvariables for the project

success which in turn is aligned with the strategic objectives so as to bring value to the organization. Research concerning the identification of critical factors with their impact on the success of the PT project together as a framework would help the project teams reaching their proposed objectives with more noteworthy efficacy.

With this background in mind, the current research has been carried out on identification of CSFs and impact of them on PT projects withdata collected from 207 project management professionals as respondents from 14 public and private Power sector companies in India (with 69 percent valid response rate).The statistical results of the study have identified Strategy, Risk, Contract, Stakeholder, and Information Technology as the major critical factors forthesuccess of PT projects. The importance of identified factors and their impact has been studied. The strength of the relationshipamongidentified CSFs has also revealed along with the impact on project success as mediating and moderating factors.

Based on the findings of the study, recommendations have been made to emphasize on Strategy, Risk, Contract, Stakeholder, and Information Technology as the most CSFs in PTs project in the Indian setup. There is a strong need to establish the practice of making these CSFs as the essential and strategic part of PT projects for intended success with greater efficacy as just the awareness of these CSFs is not sufficient. Future researchers should extend the scope of the research framework to establish in PT projects that are being executed/to be executed in other geographical setups as well. This would help in standardizing the project management framework, specifically, for PT projects.

DEDICATION

This research is dedicated to my father and heavenly mother who sacrificed their comfort and resources to make sure what I am today. Special dedicated to my wife Chaitali and Son Adhyayan for encouraging me all the way at the expense of their quality time.

ACKNOWLEDGE

First, I would like to thank my parents for his unwavering commitment to my well-being and without whom, I can do nothing.

I would like to express my gratitude to my supervisor, Professor Adarsh Garg for her support, patience, motivation, advice, commitment and all the hours spent throughout the research helping me fine tune the writing of the research. I could not have asked for better advisors for my research.

I would like to thank all the participant of this research, who willingly gave their time to participate and freely shared their wealth of expertise and experience in the research area with me.

I especially want thank my wife and son for their continuous support, patience and encouragement. Also, I want to thank my friends, colleagues for their support.

TABLE CONTENT

List of Figures

LIST OF TABLES

LIST OF ABBREVIATIONS

ASP	Active Server Page
BIS	Business Intelligent System
BOT	Build Operate Transfer
CAGR	Compound Annual Growth Rate
CSFs	Critical Success Factors
CSF	Critical Success Factor
CSR	Corporate Social Responsibility
DDC	Direct Digital Controls
DSS	Decision Support System
DOD	Department of Defense
EPC	Engineering Procurement Construction
FTP	Fast Track Program
EM	Energy Management
EFA	Exploratory Factor Analysis
ENR	Engineering News Report
ESS	Energy Support System
EMCS	Energy Management and Control System
IT	Information Technology
ICT	Information Communication Technology
KPI	Key Performance Indicator
KMS	Knowledge Management system
Kwh	Kilo Watt Hour
KW	Kilo Watt
MRA	Multiple Regression Analysis
MSW	Municipal Solid Waste
MIS	Management Information System
Mwh	Mega Watt Hour
MW	Mega Watt
MVA	Mega Volt Ampere
NMS	Network Management System
PS	Project Success
PT	Power Transmission

PCA	Principle Component Axis
PPP	Public Private Partnership
PMI	Project Management Institute
PMASP	Project Management Active Server Page
PMBOK	Project Management Body of Knowledge
PM	Project Manager
PT	Power Transmission
RII	Relative Importance Index
ROW	Right of Way
RA	Regression Analysis
RM	Risk Management
SCM	Supply Chain Management
SEM	Structural Equation Model
SPSS	Statistical Packages of Social Studies
SPM	Software Project Management
TL	Transmission Line
TLs	Transmission Lines
Twh	Tetra Watt Hour
TW	Tetra Watt
VIF	Variance Influence Factor
VR	Virtual Reality
WBS	Work Breakdown Structure
WWW	World Wide Web
WPMS	Web Based Project Management System

CHAPTER 1

INTRODUCTION

1.1 “NATURE OF STUDY”

Due to uncertainty, the dynamic environment and exchange in the market have created stress on the current management structure utilized by businesses. The traditional management structure in an industry is rather bureaucratic and departs from the dynamic surroundings; wherein training flows vertically and upward with employees being departmentalized. Therefore, the conventional structure of management has been changed through project management, which is pertinent to its expected outcome to reply quickly to the needs of the business enterprise. The project management idea is applied to numerous industry sectors, including banking, information technology, hospitals, accounting, pharmaceuticals, power, and other infrastructure.

The project management is considered as a temporary endeavor with a well-defined period in conjunction with different parameters. Project management acts as an essential function to attain the agency or enterprise goals, which are in turn attributed to project success. Something unique is created by the sum of activities of the project. “A project is a temporary effort undertaken to generate a unique product, service, or result” (PMI 2017).

1.1.1 Project Management

Project management is the practice of initiating, planning, executing, controlling, closing the teamwork to meet definite goals with specific success criteria in a particular time. The primary project management challenge is to accomplish all the project goals within the given constraints (Phillips, 2003). The need for project management is vital in terms of working with stakeholders, specific project needs, the project’s activity, project’s outcome, and primary constraints such as scope, time, quality, and budget (PMI, 2010).

Project management is practised since the Egyptian epoch. Though, in the mid-fifties, the groups started making use of formal project control equipment and strategies in complicated projects. The recentmethods of project management have their origins in at the same time but faced particular troubles in making plans and manipulating in initiatives America. The first case involved the United States military to control contracts of the Polaris Missile project. The contracts emphasized research, development as well as manufacturing of unique parts with informal execution. This excessive uncertainty might be attributed to inaccurate planning for time and price. Hence, finishing time depended totally on probability. Estimations of time are based on constructive, pessimistic, and maximizing likelihood. Thetime scenarios are mathematically evaluated to find the likely final touch date. The method is known as the Project Evolution and Review Technique.In the beginning, the PERT technique does not think exactly the details and times of all the events.

The second case concerned a private zone by the name of 'E. I du Pont de Nemours' organization. They tried to make prime chemical vegetation in the U.S. This endeavor looked for accuracy in time and value estimates. The method applied by the organization came into being as PPS. PPS with reasonable estimates of the price and time is a more definitive approach than PERT. This, later, became the popular method in construction work as CPM.

The need for a better-pronounced structure for infrastructure in the 19th century gave birth to project management, as recognized today. Examples are the building of Trans-continental Railroad, restructuring of Southern states after its devastation of the American Civil War.

While there might not have been projecting management, scope or workload considerations in the beginning, leadership is undoubtedly at play. However, with practice come the process and refinement, as we shall see to move forward.

The primary purpose of using a project management framework is to increase organizational value (Dalcher, 2012). Use of framework can assist the organizations by enhancing the efficiency of human efforts with much higher effectiveness.Therefore, a project's success can be measured by achieving the expected results efficiently in the short term and effectively in the medium and the long term (Jugdev et al. 2001; Muller and Jugdev, 2012). Therefore, a valuable project is the one that satisfies customer needs, aligns the project output with the organization's strategy, and gives an ROI (Thomas and Mullaly, 2008).

1.1.2 Best Practices of Project Management

The word 'best practice' is commonly used by many professionals to address those practices which lead to success in their profession. There does not exist a single 'best practice' that is accepted by all the practitioners in the USA, Europe, Asia, Australia, or Africa, nor should there be, due to the large deviation in the cultures, needs, and viewpoints. Projects with different cultural backgrounds have to be planned and executed in that specific context. Nevertheless, research in any situation will be beneficial in related backgrounds.

Diverse organizational bodies have standardized some practices for the management of projects. ANSI, ISO, IPMA, PMI play a significant role to upgrade the process of project management.

The organizations find it complex to select and apply the standard or project management guidelines due to the existence of heterogeneity. They face a challenge while identifying such standard which are:

a) extensively in practice, for establishing a consensus among diverse projects and
b) pertinent to the specific needs of different projects executed by the organization to achieve maximum effectiveness with higher efficiency.

Some of the best practices of project management with wide acceptance and usage are as follows:

- ICB distributed by IPMA.
- ISO issued a standard of quality management for projects i.e. ISO 10006 Standard.
- PMI issued Organizational PMM model.
- PMBOK Guide by PMI and as ANSI standard for project management.
- The British Office of Government Commerce developed a project management standard-PRINCE.
- ENNA issued P2M.
- The European Commission issued PCM guidelines.

All over the world, there is some unity among the practitioners and the project managers (PMs) in identifying the processes of project management. These include the processes of gathering, analyzing, designing, implementing, system integration, commissioning, and project closure. Further, the project management maturity, concerning these processes, involves a progressive improvement of an organization-wide project management method, practice, strategy and decision-making process. The suitable level of maturity will differ for each organization based on its precise goals, strategies, resource capabilities, scope, and needs.

1.1.3 Project Management Practices in India

Project management practice in India differs due to projectsize,theuncertainty of the project involved as well as different setup of sectors and organizations (Public or Private).Majority of project management practices is set-up in the capital-intensive sectors (e.g. Power, Steel, and EPC) or sectors like IT, which involve multifaceted or complex projects. The private sector reports a higher level of induction of project management than the public sector. However, gradually, public-sector companies are proceeding by putting importance on training programs and strengthening their existing project management units and

professionals. Project management in India has various voids and gaps. The government is also having a formal, procedural, and regulatory involvement in project management. It also highlights how good practices in some projects have led to great success and growth in certain backgrounds.

Regardless of its world-wide growth, project management is little apparentformally, inthe Indian construction sector with a lack of adequate planning for competence and professionalism (Sreepuram and Rao, 2006). Particularly, due to the new expansion of construction effort in India, consideration to project management has turned into a catastrophe, and organizations are being reluctant towards the modern project management tasks (Sreepuram and Rao, 2006). Many of the power sector construction projects are comparable, however, each facility is unique in its way. Under power sector construction projects, Power Transmission (PT) projects have a certain set of objectives and limitations, in addition to being expensive.

The current study emphasizes on PT projects that are uncertain with diverse nature. The majority of the projects fail to meet the agreed schedule, cost and quality targets. Despite its uncertain nature, identification and management of critical factors can improve the probability of the project success. In power transmission projects, project success falls under the head of business and organization. To achieve business goals, project success cannot always be defined with respect to cost, time and quality. The deficient identification and management of critical success factors can put power transmission projects in jeopardy.

1.2 “POWER SECTOR”

The power sector isthebackbone of the industry, supplying vital energy to diversified customers worldwide. In developed economies with established power marketplaces, investment is driven by the transition of fuel and energy sources, increased environmental legislation, an ever-ageing generation fleet and transmission/distribution infrastructure. In comparison, developing countriesstill expand their power centres to meet the demand for

power-deficit regions. For these reasons, the power sector continues to have the most significant investments and several projects in the industrial world.The global research teams identify and regularly update critical details regarding project spending in the industry as well as pre-commissioned, commissioned, and decommissioned plants around the world, in addition to identifying and tracking relevant information on capital and maintenance project events. Thus, vital information on equipment in existing power stations is generated. This includes information for the production and T&D sectors as well as emerging segments such as battery storage and micro-grids.

The power sector is a combination of three segments as described below and shown in Figure 1.1:Power Generation; Power Transmission (Line & Substation); and Power Distribution.

Producing electrical power using any energy conversion method is known as power generation. The transmission systems are the central trunk of the electricity grid. The electric power generated from power generation plants to the distribution systems accumulates the method to transport electricity to several end-users (Warkentin-Glenn 2006). The electricity is dispatched and disseminated to the consumers using the available transmission and distribution (T&D) system. The T&D system needs a unique infrastructure, which is very costly. In construction projects, electrical installation is among the range of essential and specialist trades at work (YikandLai, 2008).

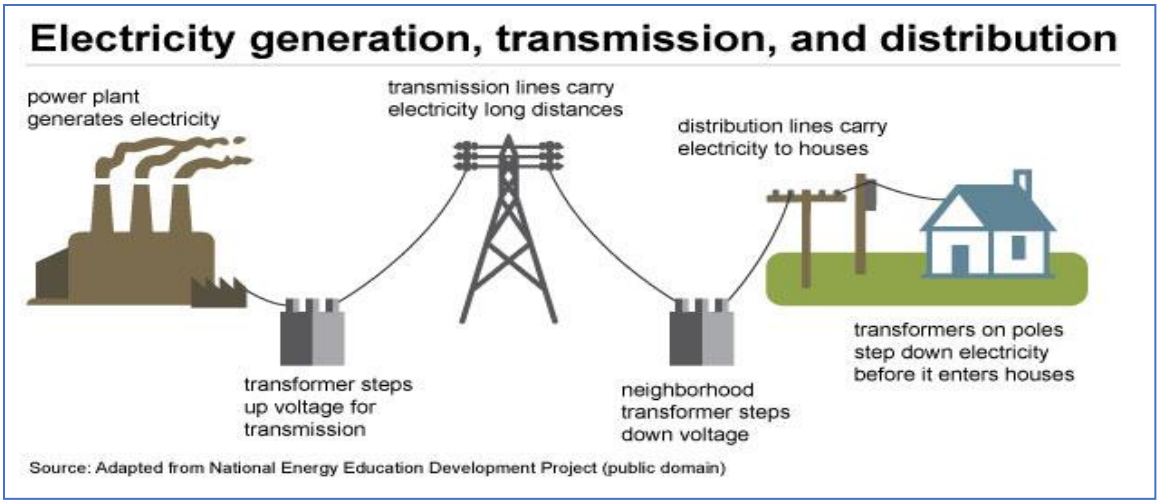

Figure-1.1: Segments of Power Sector

1.2.1 Power Sector in India

India is the world's 3rd largest nation in generation and 4th largest in consumption of electricity (CEA, 2018). Sustainable economic growth and the drive to provide power to all drive the need for electricity in the country. India's power demand has significantly increased due to the worldwide movement to electricity transportation and manufacturing sectors. India is creating a substantial stray around providing reliable access to power for more than a billion people. This is one of the biggest opportunities to empower people all over India, and we are the bonanza to be a citizen of India in this revolution.

On the generation side, India has the vision to blend a further 225 GW of renewable energy into the grid by 2022, on top of the current generation capacity of 350 GW. The scale and speed of renewable integration in the country are unprecedented. Electricity consumption is a key indicator of economic growth. India's per capita power utilization increased from 348 KWH in 1992 to 1181 KWH in 2019, with CAGR, 19 percent (CEA 2019). To keep this pace the power generation capacity has increased 69.1 GW in 1992 to 368.69 GW in 2020 with CAGR,23 percent (CEA, 2020). However, the sector faces several challenges due to the financially stressed assets, constraints in the supply of fuels, the financial health of distribution companies and a vast number of underutilized assets. Table-1.1, Figure 1.2

and Figure 1.3 show the installed power transmission lines and substations, power consumption and growth of power generation in India, respectively.

Table-1.1: Installed Power transmission lines (c. Km) and distribution capacity (MVA) as on 31 January 2020, In India

Capacity	Substations (MVA)	Transmission lines (circuit km)	c.km / MVA ratio
HVDC ± 220 kV & above	24,000	15,556	0.648
765 kV	220,750	43,939	0.199
400 kV	326,028	183,738	0.564
220 kV	360,437	179,768	0.499

Source: Central Electricity Authority, India, 2020

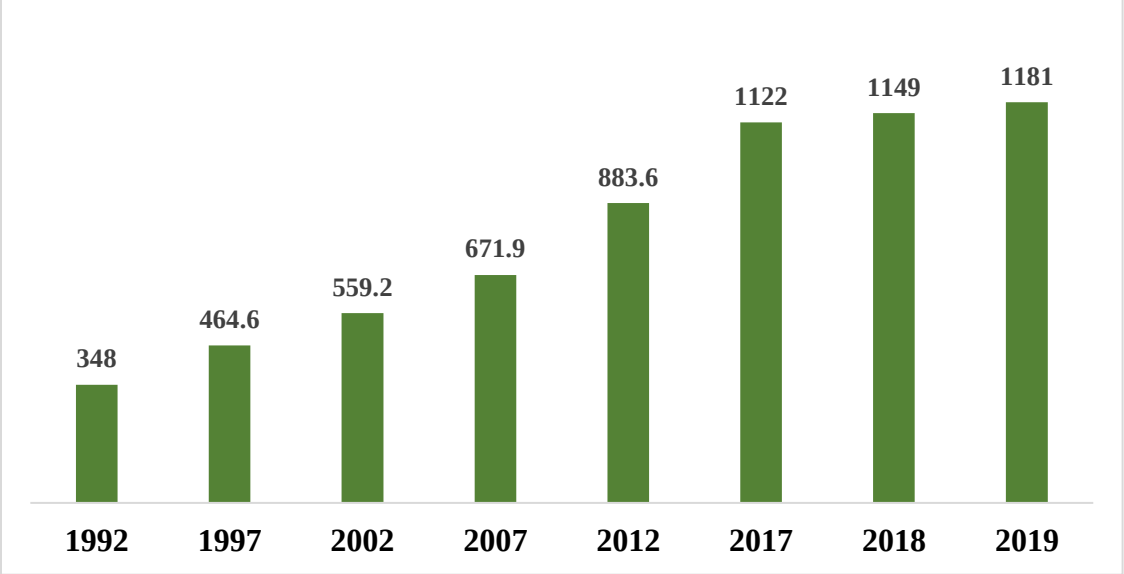

Figure-1.2: IndianPer capita Electricity intake (Kwh)

(Source: CEA, India,2019)

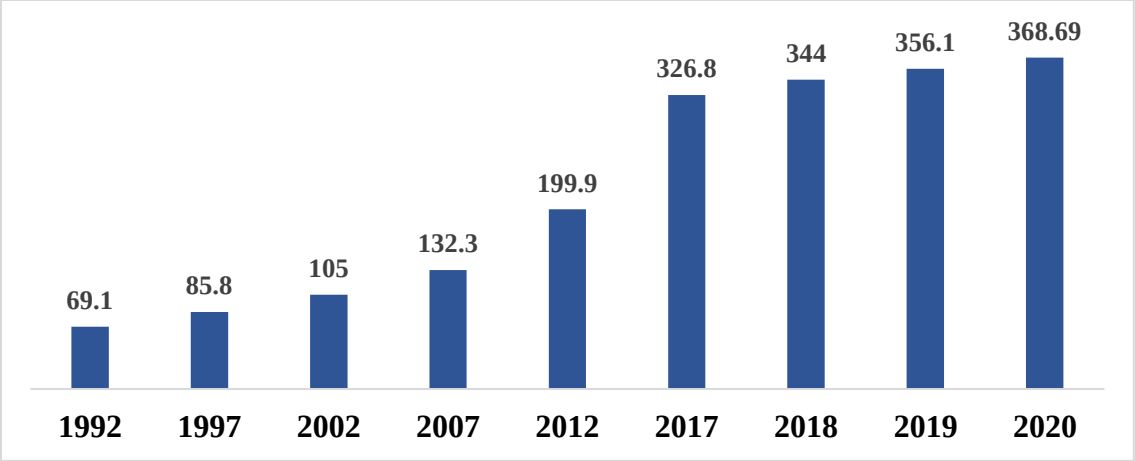

Figure-1.3: Growth of Power Generation in GW-India

Source: Central Electricity Authority, India, 2020

Indian transmission sector has seen robust growth in the last five years. The power transmission sector mainly dominates state and centre utilities and private companies. In contrast, currently, out of total transmission capacity, merely 3-4% is controlled by the private sector. As estimated by CEA in 2018, INR 2.6 lakh crore investments will be made between FY 18 and FY 22, as shown in Table-1.2.

Table-1.2: Projected Investment in Power Transmission sector in India between FY 18-22

Total Investment	2.6 lakh crore
Transmission Line	100000 Circuit KM
Substation: Transformer Capacity	200000 MVA

Source: Central Electricity Authority, India, 2018

Power transmission projects in India are a manifest to achieve a double-digit growth rate and enhance citizens' social comfort. Generation, transmission and distribution sectors collectively make a complete power value chain (Singh, 2006). In terms of power

consumption, India is behind China (with a production of 6,015 Twh*) and the US (4,327 Twh) butleads Russia, Japan, Germany and Canada. With the deregulation, the commitment of the Indian power sector goal "power accessible to all," lies with Central and State utilities. One of the significant steps is to link generation and transmission responsibilities to both state and central government (Shukla and Thampy, 2011). These vital steps have lightened some immediate apprehensions, but long-term sustainability needs further quarrying of the modification process. Despite the market restructuring and policy reforms, there exist substantial shortages in the system's network and troubles in the transmission sector (Bhattacharyya, 2007). The country's solar power generation capacity has risen 32 times in just six years, from 0.5 MW in 2011 to 16 GW in 2017. However, the transmission infrastructure is far from prepared to channel the type of solar power being added into the grid (Energy world, 26th December 2017). Power transmission line growth with 7 percent CAGR and substation growth 11 percent CAGR is shown in Figure-1.4, from 2012 to 2019.

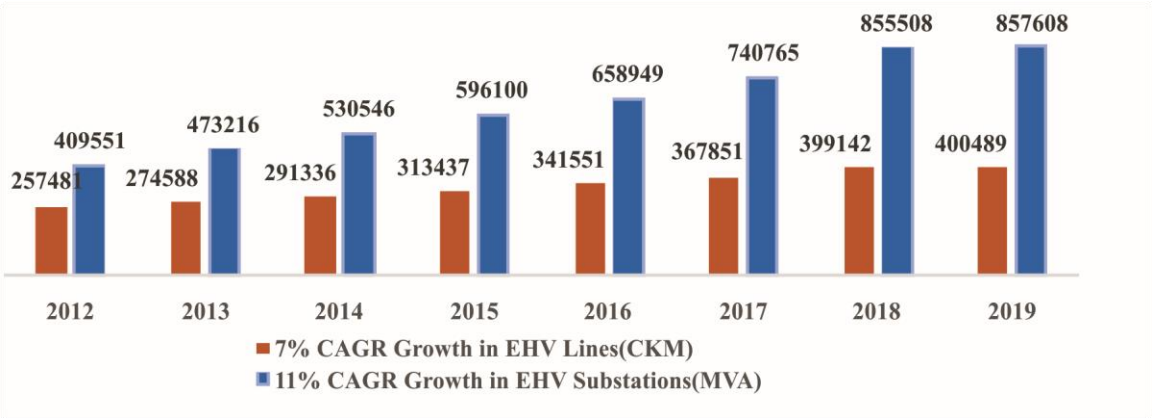

Figure-1.4: Growth of EHV Lines and Substations

(Source: Ministry of Power and CEA, India, 2019)

*1TWh =1000000 MWh

India is the second-largest, by population, a country in the world and first when examining its rural population which amounts to 68.84% of its total 121crore people (Census 2011). Arguably the spotlight of the world economy has been and still is on China as the main driver of global development. However, there is no doubt that as the Chinese economy has already started slowing down India attracts attention as the next development superpower (Pappas& Chalvatzis, 2017). Installed and demand capacity of power shown in Figure-1.5.

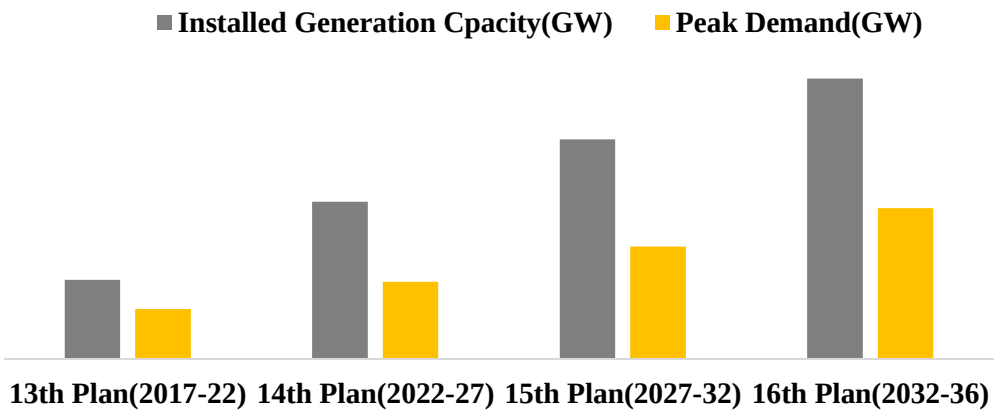

Figure-1.5: Installed Capacity vs Demand in GW

(Source: Central Electricity Authority, 2016).

1.2.2 Characteristics of Power Transmission projects in India

Power transmission is the heart of the power industry. The importance of power transmission projects (lines and substations) around the globe is noteworthy due to the increasing demand for power. Power Transmission (PT) projects are dynamic by nature and involve significant complications. These projects face uncertain paths since project approval and design. The projects are constructed at points of highly variable topography, different weather conditions, and significantly sensitive environmental circumstances. They also face national and intermediary stakeholder issues, challenges of regulatory procedures, offshore procurement of equipment, and a significant amount of public opposition. One of the notable challenges in power transmission projects is that they are

typically cross land with different owners. There are numerous risks, such as social, cultural, political, regulatory, environmental, financial, and technical, that influence power transmission projects.

Station/substation construction projects share some crucial features with non-power construction projects. Examples of such projects include construction of a pump house, control room building, converter rooms, generator rooms (for high-voltage direct current transmission), guardrooms, staff quarters, and dormitory buildings. The similar influence factor, ROW (Right of Way) is valid for highway projects, underground pipeline projects, oil and gas projects like power transmission lines and substation underground cabling work. Activities like land acquisition, land, construction, and equipment installation are similar in power generation &transmission projects.

The PT sector is a progressively vital part of the electricity supply system. This area requires constant attention to keep pace with global development. The increasing need for electricity and problems in developing new electricity sources has reinforced the need for transmission capabilities. This requirement can be accomplished most efficiently by transmitting at very high voltages. PT projects require careful planning because they are situated in isolated areas, away from existing infrastructure such as water and electricity supplies. Thus, obliviously managing a power transmission project is challenging. Transmission planning in a reorganized electricity market has become increasingly intricate (Wu et al. 2006). Ciupuliga and Cuppen (2013), express that it takes a long time to plan the procedures for new transmission lines.

1.3 “RESEARCH AREA AND BACKGROUND”

The compelling circumstances and growing competition impress many Engineering Procurement Construction (EPC) ventures to rethink the steps of sustaining a business. The economic development of any country is mainly dependent on the expansion of its infrastructure, and India is no exception. India is also searching in the direction of greater awareness of the sustainable growth of the economy in a furnished environment. Today,

India has developed amongst the fastest growing world economies and is poised to grow at 7.5 percent in 2019 and 7.7 percent in 2020 as per International Monetary Fund (IMF). With investment prediction amounting to INR 50 Lakh crore, there has been a substantial impetus to deliver projects and programs effectively (PMI and KMPG, 2019).

The natural resources for electricity generation in India are unevenly dispersed and concentrated in a few pockets. Transmission, an essential element in the power delivery value chain, facilitates evacuation of power from generating stations and delivery to the loading centres. For efficient dispersal of power to deficit regions, strengthening the transmission system network, augmenting the National Grid, enhancing the Interstate power transmission system, the network is required. Over the years, an extensive transmission linesnetworkis developed for evacuating electricity produced by different power stations and distribute to the users. The nominal range of Extra High Voltage used in the power industry is ±800 kV HVDC & 765 kV, 400 kV, 230/220 kV, 110 kV, and 66 kV AC lines. The rapid increase in energy demand in India saw many hurdles in achieving the sustainable and healthy development of the economy and society, such as the energy shortage, structural imbalances, low efficiency, and severe pollution.

The PT system must have sufficient capacity to transmit bulk power to obtain its best benefit. This might lead to a substantial rise in PT projects for transmitting the electricity to the distribution utilities, in future.

Doing projects without methodical project management forms an unrealistic economy. Every organization owns specific goals and projects help them achieve strategic goals. Project management is crucial because it confirms the need for precision in project planning so that organizations fit within the broader context of CSFs frameworks, which includes the emphasis on identifying critical success factors. Power sector companies dealing with PT projects link the project’s factors with business strategy to obtain foreseeable project success and, thus, the business goals.

1.4 “PROBLEM STATEMENT”

Bringing successful projects is very crucial across all industries as the operational efficiencies and strategic advantages are the engines that drive innovations from concept to commercialization. Projects have gradually been converted to a common way to deliver strategic and tactical advantages, by an organization. In the competition to maximize business value, organizations have turned to implement project management to help them gain competitive advantages. However, many projects around the world keep failing, resulting in a loss of millions of dollars for organizations (Kejuo, 2012), and power sector projects also face this challenge.

In India, the power sector has successfully restructured its minimum cost development plan, and yet the country is facing power shortages, high cost of power, and project delays. This continuing challenge has motivated the practitioners of project management to find the critical factors that can be considered vital to experience a project success, keeping in view the high investment and diverse challenges of power transmission projects.

Delays in setting up of thermal power plants, hydropower projects, grid strengthening, and transmission network have spiked costs of power projects by nearly 18% to Rs 4 lakh crore. Of the 121 projects being implemented by the Centre, 48 are facing cost overrun (Financial Economics, New Delhi, July 13, 2018). The overall cost of implementation for 1,304 infrastructure projects at the centre, worth Rs 150 crore and above, are now estimated to be at Rs 18.4 lakh crore from their initial valuation of Rs 1, 6.2 lakh crore. Only 321 such projects are on schedule. The power sector accounts for 9.3% of the number of projects under implementation and 21.8% of the projects by value (Financial Economics, New Delhi, July 13, 2018).

Limousin (2016), says: “The power and utility sector are in the concealed problem due to symptoms cost overruns and late delivery”. Companies should take immediate action on these concerns in the new age of infrastructure investment or risk sacrificing the full

economic and social benefits megaprojects offer. Value enhances by the leveraging leading practices and innovations." (T & D world Dec 07, 2016)

The real bottleneck: Inrecent GDP loss of US $68 billion*, power transmission sector is seen as one of the major hindrances to overcome electricity shortage. As per FICCI and Booz &Co, (September 26, 2013), 120 projects were delayed due to problems in getting the ROW and forest clearance, which may impede the economic growth of India. According to the Central Electricity Authority (CEA) report, transmission projects of 220 kV and above in India typically take around five to six years from concept to commissioning stage, which is below the global benchmark.

In the developing world, Pheng et al. (2005), have looked at the working environment vital to ensure the project success and examines how it impacts the competency of the project managers. In Vietnam, a study was carried out by Nguyen et al. (2004), in Vietnam, to find the factors which resulted insuccessfulmassiveconstruction projects. They foundtheproject manager and team, sufficient funding, commitment, and communication. Iyer et al. (2006), have studied schedule performance of construction projectsexecutedin India. They found that the commitment of partners; competency of owners; conflict factors have the capability to increase project output while others: deficient competency of the project manager; challenging socioeconomic setup with the vagueness of project stakeholders maintains the schedule performance at its existing level.

Pillai (2001), has studied time and cost overrun of 16 projects in Kerala state in India. Three of the projects namely Idukki Stage: I & II (390 MW) and Idamalayar (75 MW) power plant have cost overrun ranging from 115 percent to 285 percent while time overruns ranged from 2 years to 9 years.

In power transmission projects, EPC contractors try to make their utmost revenue and profit during the creation of market demand. Construction projects may vary in scope, time,

*1 US $= 75.59 INR as on 20/05/2020
1 billion=100 crore

purpose, uncertainty, complication, pace, and some other dimensions (Aziz, 2013). This is broadly acknowledged that scheduling of construction project hassignificance in project management for its impact on project performance (Luu et al. 2009). Delays are very frequent in construction projects which result in a substantiallossfor project stakeholder. The delays lead to the following results (Majid, 2006):

- Late project completion
- Increased budget
- Disruption of work
- Productivity loss
- Claims by the third party
- Stakeholders disagreements
- Contract termination.

From the above discussion, previous research hasmore emphasis on the reasons for the failure of projects in several sectors instead of project success. The available studies in other sectors have focused on time and cost overrun. These studies have supposed that if a project achievement time goes beyond its due date or budget then the project is a failure. They have focused only on the successful project management perspective. In this research, project success took holistic project management, business, and social perspective. The research arose from the desire for a thorough knowledge of project success, especially the CSFs power transmission sector of power transmission projects in Indian setup and how EPC ventures can use them to enhance project success.

1.5 "PURPOSE AND SIGNIFICANCE OF THE RESEARCH"

The concept of project success factors, more commonly recognized asCSFs is defined as a progression of work that is followed to achieve objectives (Reh, 2006). Rockart (1979), states critical success factors as: "significant parts in which satisfactory results would confirm the successful modest performance for the organization". He also defined CSFs as "key areas where things must go appropriate for the business to embellishment".Rowlinson

(1999), states that the CSFs are basicvariablesthat inherently exist in a project, which must be controlled to get work in an efficient and effective manner. These variables are required on a daily basis and operate throughout the project life cycle. The PT project stakeholders should be aware of project success variables because of capital investment. Project managers of PT sector have to understand the CSFswith their impact on the project results. Success factors variables of the project are the ones which are considered to ensure successful completion of the project. The survey of the literature indicates a clear gap in CSFs of power transmission project in Indian setup and institutes a need to take a study on PT project success. For this study, the CSFs framework is developed based on the synthesis of literature findings, presented in Figure 1.6.

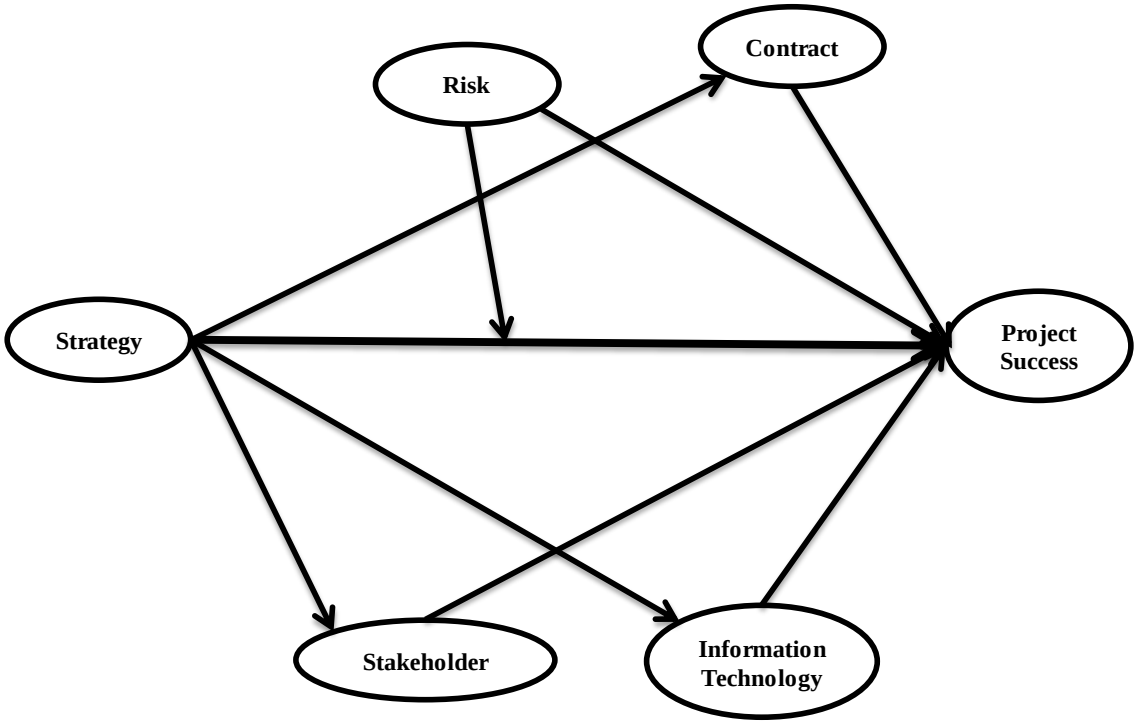

Figure-1.6: CSFs Framework for Power Transmission Projects

Each CSF is comprised of a set of elements. The following five critical success factors are defined, specifically, for power transmission projectssuccessfor use in the study in hand.

1) **Strategy**- This CSF links the strategy with the project success as the absence of strategy or absence of vision to actualize through the project is the major challenge looked by numerous organizations. This includes these elements: Leadership strategy; Bidding strategy; Effective cash Flow management strategy; Clear Objectives and understanding; Cohesive procurement strategy; Strategy of effective communication; Market intelligence strategy; Strategic execution plan aligns with project scope; Managing Risk Strategy; Communication strategy.

2) **Risk**-This CSF explains as an incident that may or may not occur and can lead to higher costs, delay of the project, non-fulfilment to quality necessities/standards, failing to satisfy information need/ norms and failure to fulfil definite organizational Risk Management. This includes these elements: Fund flow of client; Control of scope creeping; Team conflict resolution; Timely subcontractor payment; Opposition from social Bodies; Suspension of work; Accidents and safety; Avoid to Changes in design; Test list with less frequency; Stable Government; Shortage of construction material at the project site; Geographical location of Project.

3) **Contract-** This CSF explains that projects need to highlight in a domain that cooperates with joint endeavours, coalitions, global sourcing, subcontractors and multifaceted supplier relations and considered as one of the most vital factors in setting up a proposal and assessing the expense and benefit of a project. This includes these elements: Price variation clause; Payment terms; Realistic schedule; Type of Contract; Claims for time extension; Clear and unambiguity scope; Justified penalty clause; Dispute and Arbitration; Timely document and drawing approval; Force Majeure clause.

4) **Stakeholder-** This CSF connects the project stakeholders and the anticipated project success. This includes these elements: Managing stakeholders with economic, legal, environmental and ethical responsibilities; Trust of Stakeholder; Effectively resolving conflicts between stakeholders; Communicating with stakeholder; Early Identify, prioritize and engage key stakeholders; Top management support.

5) **Information Technology**- This CSF details the improvement in coordination and communique among various project teams, members, and participants who is essential for project success. This includes these elements: E-tendering; Planning & monitoring; Energy Management and Control system; Network Management system; Decision Support System.

1.6 "RESEARCHOBJECTIVES"

The research will meet the following objectives:

- Find the CSFs of PT projects in India.
- Find the impact of CSFs on power transmission PT project success in India.
- Develop a CSFs framework for a power transmission project in India.

1.7 "RESEARCH QUESTIONS AND HYPOTHESES"

The basic research question is: What are the factors across PT projects considered important for the success of a power transmission project in dynamic environments? This question devolves into the following sub-questions which are investigated, applying the CSFs given above:

RQ1: What are the "critical success factors" in the attainment of power transmission project success in a dynamic environment in India?
RQ2: What is the impact of all identified critical success factors to make a power transmission project a success in India?
RQ3: What is the interrelationship between CSFs to broaden the CSFs framework for power transmission projects success in India?

The following hypotheses are proposed to address the given research questions.

H1: In power transmission projects, strategy, risk, contract, stakeholder and information technology are critical factors which have a significant direct influence on project success.

H1a: Strategy has a significant positive relation to Project Success.
H1b: Contract has a significant positive relation to Project Success.
H1c: Stakeholder has a significant positive relation to Project Success.
H1d: Information technology has a significant positive relation to Project Success.
H1e: Risk has a significant positive relation to project success.

The CSFs (Risk, Contract, Stakeholder and Information Technology) also have a significant indirect impact on the relationship between Strategy and Project Success, in accordance with the diffusion innovation theory (Rogers 1976), as hypothesized below.

H2: In power transmission projects, risk, contract, stakeholders and information technology are critical factors which have a significant indirect influence on the association of strategy and project success.

H2a: Risk has a moderating effect on the relationship between strategy and project success.
H2b: Contract has a mediating effect between strategy and project success.
H2c: Stakeholder has a mediating effect between strategy and project success.
H2d: Information technology has a mediating effect between strategy andproject success.

1.8 "SCOPE OF THE STUDY"

The proposed framework has been developed by keeping the scope of the study as the power sector (public and private) companies across India, which execute the PT projects. The power transmission sector has been chosen because it is a progressively vital part of the electricity supply system. It is the key area of attention for keeping pace with global development. The power sector cannot fulfil its potential role because of the higher failure rate in PT projects due to various bottleneck factors. This study takes a better holistic

method to project success pertinent to project management, business, and social implications.

1.9 "RECEIVERS OF THE STUDY"

The PT sector would benefit from this research framework. This research framework would demonstrate the straight-forward approach to PT project manager, project coordinator, project controller, and vice president to quantify the real scenario in power transmission project in India and generate efficient results while executing PT projects and redefining the practices to execute successful PT projects within the scope of time, cost and budget.

1.10 "RESEARCH METHODOLOGY"

To meet the main objectives, the study has been carried out in Power Transmission (Public & Private) companies across India, targeting the head offices. The Quantitative research approach has been used for collecting primary data. The research tool has been designed after a review of past studies pertaining to the research topic and discussions held with the actual practitioners in the target industry. The questionnaire has been finalized after testing for reliability and content validity and finally framed. The data is collecting by administering the questionnaire to 207 respondents from 14 power transmission organizations. The study first has been used to identify the CSFs and second to develop a CSFs framework, relationship of CSFs, and impact of CSFs on project success. The gathered data has been compiled and then analyzed using Factor Analysis, KMO & Bartlett's test, Pearson's correlation, Relative Importance Index, Regression Analysis with the help of statistical software SPSS version 25.0. The details have been given in Chapter 3.

1.11 “ORGANIZATION OF THE DISSERTATION”

This dissertation emphasizes on the identification of CSFs of PT projects, the relationship and impact of CSFs on PT projects, through quantitative analysis, which are put together as a CSFs framework that can be used as a standard framework for power sector organizations.

Chapter 1 introduces the topic of project success of power transmission projects providing the background and purpose of the study followed by the details of the problem, research objectives and research questions, conceptual framework, hypotheses framing, scope and limitation of the research.

Chapter 2 explains the detailed review of relevant and available literature on topics of project success, CSFs for projects in different sectors and discusses the research objective-1. The literature review directs towards the CSFs explained in the past and analyzes the viewpoint of various researchers about the importance of CSFs in PT projects. The gaps in the literature help to ascertain the need to design a CSFs framework specifically for PT projects by taking various hypotheses.

Chapter 3 details out the research methodology, appliedto achieve the aim and objectives, to collect data from the target audience, and strategy for the compilation of the collected data and data analysis. It gives a detailed outline of the target organizations and details the profile of each participating organization with a focus on the number of employees, total turnover, products, and services offered by them with their major clients.

Chapter 4 presents the details of results of the data analysisand derived CSFs framework which shows the impact of CSFs and relation between CSFs, mediating and moderating impact of CSFs on the relationship between strategy and project success.

Chapter 5 concludes the whole research work and give recommendations to guide to some important future research on the related topic.

Appendix-A: Includes A Survey Questionnaire.

Appendix-B:Includes Detailed Statistical Analysis Results.

Appendix-C:Includes the Publications.

1.12 “THE CHAPTER SUMMARY”

The chapter predicts the possible research on PT project performance. The primary advantage of using empirical-based research approaches for power transmission project execution lies in using proven techniques to improve work efficiencies. Finally, it is worth observing that an understanding of a research’s ethnographic and explanatory bases provides contractual clarity on research. With the current study a lot of issues related to success and failure of PT projects have been raised, resolved and more are highlighted to align CSFs strategically with business goals to maximize the success of PT projects. The chapter describes the whole process of solving PT project issues.

CHAPTER 2

LITERATURE REVIEW

2.1 “INTRODUCTION”

This literature review looks to find research and narrative materials relating to project success factors explicitly power transmission projects to examine the advancing ideas and speculations. The literature on various topics such as project management, CSFs, projectsexecuted in the power sector, success as well asthefailure of projects, infrastructure projects is explored here. The specific theories on strategy, risk, contract, information technology, and stakeholder are studied with the help of books, journal articles, magazine articles, and internet articles pertaining to industries such as power generation and transmission, construction, oil & gas, and other infrastructure projects, to support the study. Various factors impacting project success or failure are reviewed to know their criticality. This chapter is an appraisal of all the past endeavors of researchers who have concentrated on CSFs and PS, particularly with respect to the power sector projects.

Generally, a literature review recognizes, assesses, and amalgamates the important literature within a field of research. It lights up how information on critical success factors within a specific sector project has advanced. Construction projects are particularly indispensable to almost all industries, including the power sector projects. PT project is unique with a well-defined timeline, set-up through many activities’ vis-a-vis designing, procurement, construction, commissioning, etc. in different phases of projects.

PT project is considered as the engine of the monetary boom in any nation and an indispensable part of the power project. Due to its significance, every nation is determined to maximize the potential of power projects (Gharaibeh, 2013). As a result, timely completion of power transmission projects, as a necessary part of electrical structures, ought to play a critical function in the advancement of the social set up. The inherent

complexity, dynamism, and uncertainty are the main characteristics of PT projects and its management remains a huge mission for any organization as well as project managers and project teams. Investment under energy infrastructure is an unstable venture (Sovacool et al. 2014). There are endless operational procedures that require the collaboration of different shareholders in ensuring its success.

An extensive understanding of project success is, therefore, necessary for project managers, top management, and other stakeholders. Though each project has different intents and purposes concerning stakeholders, the recognition of certain success factors is defined as the necessity to begin with the project.

2.2 “PROJECT SUCCESS”

Project success is defined as an organization of standards or norms through which a project encounters its objectives within its budget. There are two potential perspectives of project success: large scale and smaller scale perspectives. The large-scale perspective cares for the inquiry “does the exceptional idea tick?”. Clients and stakeholders are normally the ones taking care of the project's success from a large-scale perspective. A smaller-scale perspective normally concerns the construction stakeholders. Smaller scale perspective concerns the construction stakeholder including the developer and contractor (Lim and Mahamed, 1999). As indicated by Jugdev and Muller (2005), the meaning of the project success has evolved over a span of five decades, i.e. from the 1960s to the 21st century as described in the following section.

2.2.1 Project success between 1960-1970

Throughout the 1960s and 1970s, project success has been characterized differently. As indicated by Turner and Muller (2005), “the focal point of project success is on usage, estimating time, cost and useful upgrades”.

In agreement withJugdev and Muller (2015), since project success is very simple and easy to use, in previous examinations it is measured as far as scope, cost, and time with hypothetical ideas of literature along with the absence of empirical research. Atkinson (1999), Cookes-Davies (2002), and Hartman (2000) stated that this practice upheld the utilization of time, cost, and scope i.e. the **iron triangle** as the criteria of characterizing project success.

According to Shenhar et al. (1997), during the 1970s demand to incorporate stakeholder satisfaction is picking up force, as a variable in estimating project success. This implies characterizing forthright measures during the beginning of a project is required, yet it accepts the project managers to realize how to characterize the necessities of the stakeholder. Furthermore, research throughout this period underlined the utilization of effective measures and a specialized framework rather than the conduct or relational frameworks (Munns and Bjeirmi 1996).

2.2.2 Project Success Between 1980-1990

Expansion of time, budget, and scope of stakeholders’ satisfaction estimation, business advantage, and product success advantage have been indicated in the 1980s and 1990s. Kerzner (1987), expressed that CSFs are the components required to make a situation where projects are overseen reliably with greatness.

2.2.3 Project Success on 1990-2000

The critical success factors framework and its consequent reliance on both stakeholders. De Wit (1998), shows that project success includes more extensive goals from the perspective of stakeholders for the duration of the life of the project. A study directed in the information technology industry in 1998 by Wateridge noticed the significance of considering stakeholders in project success.

2.2.4 Project Success in 21st Century

The spotlight has been on the stakeholders. Till now, the time, scope, and cost also called triple constraints for failing to consider other factors, such as stakeholder impact, since stakeholders are different and goals and expectations are different for each stakeholder in a company. It is supported by project success criteria to be founded on its "expected result and effect" to the association's business case. The changing business environment warrants project success to incorporate advantages to the association and arrangements for the future (advancements) to remain competitive. In recent times, project success is defined as the conceptual phases of the project life cycle in order to complete the product cycle of the project. This is considered as the **strategic project management period**.

2.3 “PROJECT SUCCESS FACTORS”

Characterized the idea of project success is subtle and a troublesome undertaking. Liu et al. (1998), explained project success as a subject that is often talked about but seldom explored. The idea of project success is equivocally characterized. There are various definitions of project success in literature. Lewis (2001), states that a successful project is the one that conveys the expected results and meets stakeholder requirements. The regular component in the majority of definitions is the triple constraint: cost, time, and performance (specification/quality). Through the years, project success has thus been defined as the

culmination of actions intended to handle the constraints- time, cost, quality. Today, authors have added different components to the definitions. Kenner (2001), has referenced project success incorporated additional project success factors such as:

- Project acceptance through clients, consumers, or users.
- Assigned resource usage in an impactful and efficient manner.
- Healthy customer relations.
- Mutual agreement over the scope.
- Undistributed workflow of an organization.
- Respected corporate culture.

The meaning of project success is uncertain and elusive. Liu et al. (1998) comment the subject of project success is frequently inspected, anyway barely ever settled upon. The importance of project success is shifting from individual to individual, deciding if the project is a success or not. Freeman et al. (1992), has demonstrated a case of various assessments of individuals, for example, an architect may recognize success from an aesthetic view, an engineer from specialized capability, an accountant for the dollars spent within budget, a human resource manager from the perspective of worker fulfillment and CEOs from revenue generated. An organization and its project managers are continually attempting to deal with a project's success in operational ways.

The variables of the iron triangle (Scope, Cost, and Time) are considered customary to project success (Atkinson, 1999). These measurements are hidden in the project and do not refer to an inclination to a specific individual. Atkinson (1999), reasons that any of these measurements in any event, when taken together are fragmented and misdirecting. A project’s worth suffers a setback if it achieves its time, budget, and scope specifications but fails to meet the client’s requirements.

De Wit (1988), has expressed the success of project management to be estimated on the conventional proportions of execution cost, quality, and time. Munns and Bjeirmi (1996), explains the variation in project success and project managementachievement as long-term destinations and momentary goals. Project success is characterized to have two fundamental segments for example issues managing the project itself and issues managing the customer (Pinto and Slevin, 1998). Project success is also segmented into two classes: large and small project success (Lim and Muhammad, 1999).

Shenhar et al. (2001), linked four measurements of success with a period of anticipated impacts as, 1) momentary aim of project effectiveness (meeting cost time objectives), 2) aims to meet client's requirements (meeting specialized particulars), deliberate execution taking care of client's concern that incited the project right using coordinating immaterial and substantial results (Nuggets, 2006), 3) aims for business goals accomplishment (business satisfaction) and 4) total long-term aims to get prepared for the future such as developing advanced equipment, products, strategies, and markets.

Cookes-Davies (2002), has referenced project success dependency on project targets, and project management achievement is projected against time, cost, and quality. Rolstadas (2008), elucidates that project management has three distinct classes of targets to meet, as given below:

- The iron triangle of scope, time, and cost (considered as project objectives); and
- Owner's expectations (considered as business objectives); and
- Local community's expectations (considered as environmental and social objectives).

It is intricate to decide on project success or failure.Bellassi et al. (1996), credits this to an absence of lucidity on the most proficient method to quantify project success because project stakeholders see project success and failure factors shift in the various number of past researches. Turner (2004), has recommended that project managers should maintain

the emphasis on a more extensive arrangement of targets and not simply the accomplishment of time, cost, and working objectives.

Despite the deficit consensus to define project success, this research considers project success in a more extensive sense, taking the long-term outlook into consideration. This is because this research aims at the identification of success factors of power transmission projects in India, where the project management strategy is often varied. Jugdev et al. (2005), states that actualizing project management on projects to do advance viability and adequacy. However, the consideration in the literature has been on the project management's incentive to upgrade proficiency which reinforces the operational idea.

Steinfort and Walker (2007), have stated that project management strategies being proficiently performed which caused strategic outcomes that incorporate a clear mission/vision and concurred dreams with agreed success criteria and clean aptitude of wanted and anticipated qualities utilizing the project culture,key stakeholder, project plan and programfor example, the arrangement of enough savings and possibilities, the attainability of that arrangement being settled through every key stakeholder, satisfactory resources being submitted for the venture dependent on detail, truly said project management potential, revel in and a gathering of laborers/director's assistance including project manager, challenge goals methodologies to incite concur with practices, reasonable correspondence, project capabilities, adequate and satisfactory and chose association outline, reliability, ground-breaking communication, commitment, assistance, team strategy, mentoring, and outside impacts which incorporate political or social dynamics of the organization .

Bannerman (2008), moves toward project success which grants stakeholders to be resolved key achievements at unique occasions after project closeout and from a stakeholder point of view. The key achievement is the project itself (the strategies utilized and their viability in delivery the project in the transcendent structure limitations), the variables or significant

deliverable created by the project(it's fit to details and reason notwithstanding acknowledgment and use), and the hierarchical advantages came back from the speculation (the accomplishment of business targets and the period of strategic worth). These successes comprise five levels (process, project management, product, business, and strategic) at which projects related in general execution can be formally or casually surveyed.

1) **Process success**- each project region has standard and top of the line rehearses that are essential to completing a project. Even commonplace procedures, for example, project management and risk management have a fieldhand zone interesting wonderful practice.

2) **Project management success** - that is the traditional measure of adventure accomplishment, decided on closeout towards key task format parameters comprehensive of the project schedule, cost, and some performance desires alongside finishing every purposeful stage and occasion.

3) **Product success**- this degree thinks about the success of the significant deliverable from the project. What that is willing extend with the endeavor field and the exact project such as a data framework, submarine, building, road, or some state of service deliverable. It incorporates measures alluding to the deliverable itself, which incorporates its match to determinations, necessities, and quality desires, and customer/buyer charm (together with variable allure, use, and adequacy).

4) **Business success**- success at this degree is represented on account of the gathering of invaluable net points of interest to the endeavor from the project. It could also incorporate an assessment of the scaled commitment to the project's result. Thus, measures will typically incorporate how much the project met the objectives and focus on that spurred the speculation endorsement (which can be ordinarily definite in the business strategy) and whether the normal benefit has been resolved. They may likewise comprise of regard for the adequacy and commitment of organization administration to the project.

5) **Strategic success**- at this stage, hierarchical helpfulness is estimated with the guidance of external stakeholders broadly of financial specialists, contenders, controllers, or industry experts in inclination to organization internal stakeholders. Success at this level gets from total enhancements in industry position, organizations' development and advancement, forceful advantage, and/or potentially another strategic benefit.

Shenrar and Dvir (2010), stated that the success of a project can be defined by five metrics as 1) the very first dimension among five metrics is project efficiency, which speaks to brief metric which is concerned regarding the project accomplishment, 2) customer sway speaks to the principal stakeholders and ought to plainly show how the project improved the customer's matter of business, 3) sway in the team surveys the team's satisfaction and the circuitous speculation that the organization made in the team members, including capabilities and the improvement of the expert and managerial aptitudes, 4) business and direct success are identified with the project's business achievement along with its commitment to the organization's conclusive outcomes and 5) prepare themselves for a better future and time shows how thoroughly the project helped the organization set up its foundation for the future and how the project made new chances.

After the literature review, the Table-2.1 shows the project success factors as studied by various authors.

Table - 2.1: Project Success Factorsstudied in Literature

Source	Time	Cost	Safety	Business Success	Quality	Customer Acceptance	Good Customer Relation	Team Satisfaction	Organizational Structure	Client's Satisfaction
Atkinson, 1999	√	√			√					
Al-Momani (2000)					√					
Adwan and Soufi (2016)				√						
Belassi and Tukel (1996)										√
Bannerman P L (2008),				√						
Bakar et al. (2009)	√									
Cheung et al., 2004)		√		√	√	√				
Dissanayakaand Kumaraswamy (1999)	√	√								
Doloi et al., (2012)			√		√					
Gardezia et al., (2013)	√									
Gunduz et al, (2013)			√							
Gul et al., (2014)	√		√							
Gebrehiwet and Luo (2017)	√		√							
Hovichit (2007)	√	√			√					
Hwang et al. (2013)					√					
Hung and, Wang (2016)			√							
Jawad A. Alsuliman (2019)	√									
Kenner (2001)						√	√			
Marzaouk and Rasas (2014)	√		√							
Niazai and Gidado (2012)	√									
Nundwea&Mulengab (2017)	√		√							

Okuwoga (1998)	√	√								
Osorio et al (2014)									√	
Patil et al (2013)			√							
Pall et al. (2016)										
Reichelt and Lyneis (1999)	√	√			√					
Redda and Turner (2018)				√						
Shenrar and Dvir (2010)								√		
Shenhar et al., (2001)				√						
Saraf (2015)	√				√					√
Tang (2015)	√									
Ugwu and Haupt (2007)		√			√					

2.4 “CRITICAL SUCCESS FACTORS (CSFs)”

As stated by Belassi and Tukel (1996), there are various aspects of the project that could decide the failure or success project but are not regulated by the management. Such aspects are implied to be CSFs. The investigation of CSFs has added to an increasingly important knowledge of project success across the industry (Koutsikouri, et al. 2008).

The scope and range of project management have been upgraded along with the information expected to oversee projects all the more adequately (Morris et al. 2006, APM BOK 2006). According to Koutsikouri et al. (2008), the information and relevant data stream from the research are basic to help managers or leaders to guide their organization towards long-term presence and development.

A success factor, in a business setting, can be defined as the information, expertise, attribute, rationale, esteem, approach, or various individual trademarks that are basic to define the activity or job which separates strong execution from unmatched execution

(Pepds, 2004). Pheng et al. (2006), examined that the distinct proof of project success factors can be utilized to investigate the purposes behind project success and/or failure.

Rokart and the Sloan School of management propose the idea of “Critical Success Factors” (CSFs), along with the expression utilized previously with regards to the data frameworks and project management.Rokart(1982), further expresses that CSFs are those highlights which have been distinguished as important to be accomplished so as to make clear outcomes, if the CSFs are absent, one can anticipate challenges in the project and discover that CSFs work to its hypothetical precursor, "success factors," proposed by D. Ronald Daniel in 1961. He has studied and examined the trouble of lacking admin data to set targets, decide strategies, decide and evaluate results in opposition to objectives.

Daniel, in their work, has defined success factors at the business level, and they are basic across the organizations within the industry. He focused on single pitch industry-level success factors such as success factors that apply to any organization in a specific industry. CSFs could shift from project to project and from manager to supervisor, driving the proposals of administrative level CSFs, and organizationally unique CSFs (Anthony 1972).

Rowlinson (1999), characterizes CSFs as specific fundamental concerns that are inherent to the project, which are to be protective for a stakeholder attempting to follow proficiently and effectively. They require a typical mind and work everywhere throughout the project. Kerzner (1987), takes a gander at CSFs as the components required to make a domain where projects are overseen reliably with magnitude. Cookes-Davies (2002), takes a proactive meaning of CSFs calling them "those contributions to the administrative framework that lead legitimately to the success of the project." Given an exceptional idea of every individual project, it’s normal that concentrating on CSFs will profit the PS.

The success factors are typically communicated as either extremely broad variables or somewhat definite factors influencing a specific project (Baker et al. 1983, Cleland and King 1983, Pinto and Slevin 1987, Finch 2003). Different types of CSFs are perceived by

different levels of executives. Rockart (1982), discovered five types of CSFs that diversified into the project success:

1) Structure and formation of the certain industry (CSFs of the industry)
2) Industry situation, competitive and effective strategies, and topographic or geographic locations (Strategical CSFs)
3) Challenges to anorganization (temporal CSFs)
4) Large-scale environment (environmental CSFs)
5) Administrative outlook (management CSFs)

2.5 "SUCCESS CRITERIA AND CRITICAL SUCCESS FACTORS"

A distinction has to be made between two similar or related ideas: CSFs and PS criteria. Proper success criteria must be perceived and afterward, CSFs ought to be incorporated to enhance project success, in the starting (Muller and Turner, 2007). Project success is a questionable subject regularly talked about but scarcely figured out. The point of view of project success has changed over the period. Project success is constrained to the execution organization which thus chooses success over the life cycle of the project. Project success can be perceived differently by different stakeholders; there is a requirement for well-defined criteria to control their inclinations and perspectives (Dvir et al. 1998).

Westerveld (2003), underlines the significance of stakeholder's satisfaction as the principal criteria for success, reciprocal to time, quality, and cost, and includes that diverse time slacks ought to be considered. Project success is evaluated by estimating distinctive execution factors, for example, cost, customer satisfaction, quality, and business satisfaction (Cheung et al., 2004).

Building up a lot of criteria suitable for a project is impractical (Mir and Pinnington, 2014). Though some criteria pertinent to evaluating the success rate of themajorityofprojects, they ought to be regulated to the size, unpredictability, term, type, and stakeholders'

prerequisites with expanded degree of multifaceted nature. While moving ahead features are projects' success is regular and dictated by the dynamic condition where projects are executed. Even though the rundown of success criteria is still ongoing continually with quantifiable or non-quantifiable variables in the project management literature, as a result, the circumstances change over the project manager’s dilemma to vaguely characterizing success criteria to manage projects under different situation. One of the success conditions referred to by Davis (2014), in light of a thorough literature study, is that “before the beginning of the project, stakeholders ought to be conceded to success criteria, and constantly present at the structured audit focuses all through the project”.

2.6 “SIGNIFICANCE OF CRITICAL SUCCESS FACTORS”

CSFs can diminish organizational uncertainty. Developing a lot of CSFs can decrease the reliance on the foreseen destinations of the organization. CSFs mirror the contained, aggregate motor of key directors and subsequently, are a progressively reliable and autonomous articulation of the organization's fundamental execution regions. CSFs are steadier than objectives as a controlling power for the organization. An organization can be fixed with acceptable objectives that will move the organization toward its strategic goal. Nonetheless, if the objectives are not sure on the off chance that it isn't appropriately depicted or created of the project. Proficient manager’s accomplishment to push the organization toward its strategic goals, of the nature of the objectives that have been set which reflects CSFs for the project success. To accomplish the mission, destinations, or objectives for business or project, the organization must conform to the CSFs of project success. The organization directs and measures the success of a project by recognizing CSFs. Additionally, CSFs assist individuals with different goals and perspectives in a singular work process and towards a similar and large objective. CSFs are continuously modified to suit the current work of the organization. Suitable utilization of CSFs is probably going to be progressively powerful and to consider present practical conditions on account of the numerous wellsprings of CSFs. CSFs give a key risk-management

perspective for the organization to thoroughly consider. The risk perception of official level directors is set up into CSFs, so their “get consideration” is uncovered to the organization in general, and CSFs appear significant for path rectification.Oncethese factors are clarified, project managers either comprehend that the knowledge of CSFs may not coordinate the truth of their necessity to the organization or they CSFs can be utilized to rework on the successful exercise. An interesting quality of the CSFs strategy is that it considers the changing condition with which organizations and managers must arrange. Additionally, CSFs are especially suitable for top management and the development of the organization; the strategy creates mindfulness among top management about a significant measure to the element of the organization's prosperity. Support and affirmation of top administration, connecting quality activities to clients and providers are built up to be the most significant CSFs to the project organizations. Distinguishing CSFs is given the association/organization an upper hand and is the result of accomplishment in accomplishing the commitment of a project management organization.

2.7 “INDUSTRY WISE CRITICAL FACTORS”

To represent a project as a success or a failure is an extremely difficult activity. One of the significant issues is that stakeholder engagement with the project enables success in an alternate method. Project management science has not yet arrived at an agreement for the meaning of the project success. The success factors are normally communicated as either broad variables or quite certain factors influencing just a specific project (Cleland and King 1983, Baker et al. 1983, Pinto and Slevin 1987, Finch 2003).

Dissanayaka and Kumaraswamy (1999), utilize exceptional description to assess time and worth execution along with project success, acquisition device, challenge group by and large execution, customer portrayal's attributes, contractor Characteristics, design attributes, outside condition. The development and application of KPIs can help to recognize the acquisition method (Karim &Marosszeky, 1999).

Samson and Lema (2002), a comment that attributes of rising execution dimension signs need assessment of every organization and environmental factors, for example, nature of work, overall resistance, best honors, hierarchical job, outside needs, and power of it. The indicators should be equipped with forgotten minds of reasons of issues, manage all feasible in general execution drivers, and see capacity open doors for advancement.

Cookes-Davies (2002), contends that to distinguish CSFs one must respond to three inquiries. What factors lead the way for the project towards success? What aspects lead to an effective project? What's more, what factors lead to reliably successful activities? He thinks of a rundown of 12 factors. Later in a paper he introduces at PMI congress procedures (2004), he gathers them into three levels as: 1) the project manager and the time, cost, quality, specialized, execution, degree and wellbeing criteria, and conceivable CSFs are clear and feasible objectives, very much chose proficient and powerful project group, satisfactory resourcing, clearness about specialized execution, compelling arranging, and a risk, 2) Understanding of the customer benefits (stakeholders' satisfaction) and the presumable CSFs are clear and attainable objectives, stakeholders' responsibility and mentality, compelling advantages of management and acknowledgment forms and suitable project strategy, and 3) the top administration, investors and portfolio administrators search for project success of all activities taken, the general degree of project management and adequacy in actualizing business strategy and henceforth conceivable CSFs are persistent improvement of business, project and productive and powerful portfolio and asset the management process.

Bullen and Rockart (1981), recognize CSFs from other authoritative administration expressions, such as "strategy," "objective," "goals," "measures," and "issues" and distinguish five significant wellsprings of CSFs (industry position, a competitive strategy of the industry, environmental components, worldly factors, and administrative position) and grouping of the arrangement for CSFs (inner versus outside and examining as opposed

to building/adjusting), other than a reviewing of CSFs including industry, corporate, and sub-association.

2.7.1 Critical Factors in Power Sector

Maqbool et al. (2018), identify 57 CSFs tocategorize into six groups for renewable energy projects in Pakistan. The six groups namely: 1) communication factor, 2) Project success factor, 3) team factor, 4) environmental factor, 5) organizational factor, and 6) technical factor. The dependent variable, project success, independent variable, communication factors, and four mediating variables including 1) team, 2) technical,3) organizational, and 4) environmental factors. In this research, a remarkable and significant alliance is examined and verified with the help of correlation and SEM, among the CSFs of the project and renewable power project success.

Samsudin and Hasaman (2017), identify 40 factors into five groups for productive maintenance in power generation management in Malaysia. The five groups are 1) top management, 2) continuous improvement, 3) resource management, 4) training, and awareness, and 5) work culture and general question. This study deliberates the theory development on the CSFs on realizing entire productive conservation in the power industry to increase the business performance.

Hermawati and Rosaira (2017), identify six factors specifically project making plans and development, network participation, vital communication and consumers, including technology preservation scheme availability, presence of workshop and technician, project management and local administration and various other shareholder or stakeholders come and support, and networks expansion development in a renewable energy project in rural Indonesia. Qualitative data is used in the form of intensive interviews performed on-site along with the project owners, managers (a project owner is a crucial person in every local authority), and neighborhood community, inclusive of local managers or leaders and

consumers of renewable power energy. Secondary data is also used in the form of different project reports. The outcomes show that the implementation and achievement of renewable energy projects lay nolonger correct technological performance and long-period maintenance but instead became dependent upon these six factors.

Betty and Joseph (2017), identify 56 delay factors into 10 groups in an electrical construction project in Hong Kong. The ten groups are namely; client, design team, main contractor, electrical contractor, labor, apparatus, system performance, statutory submission and inspections, external, and contractual relationship. The ranking factor, frequency index, severity or gravity index, and resultant important importance index statistical test are used. The result shows that inadequate labor, delayed clients' decision-making of clients, and deficient electrical contractors are among major factors.

Pall et al. (2016), identify 82 delay factors into nine groups for power transmission projects namely: administrative, employer associated, contractor associated, consultant associated, drawing associated, amaterial associated, apparatusassociated, worker associated, and external ormiscellaneous issues. The research is done through 67 published literature which is related to non-power linear construction projects like as building construction, groundwater construction, oil and gas line construction, petrochemical construction and development, groundwater construction, railway construction, highway orroad construction and bridge construction, power generation and distribution projects. The delay aspects or factors are then placed in terms of the frequency of events and instances in the literature. The present review has provided understandings into the possible risks along with uncertainties come across in the execution of PT projects and their completion on time.

Salehet al. (2015), identify the five clusters incorporating 23 CSFs are identifying as follows, strategicmanagement, stakeholders' involvement, 3) comprehensive power admin team, 4) risks management in energy management in Malaysia, 5) awareness. In this study,

the10-point action plan of the Talloires Declaration is chosen as KPIs towards the sustainable universities. It can be considered that there is an effective and positive relationship between CSFs and KPIs for energy management towards these sustainable universities.

Yau and Yang (2012), analyze the empirical research and investigation attentive to the cause for delay in power distribution projects through a case study, professional interviews, surveys through questionnaires, and statistical analysis of data. This explains and shows that 27 factors are critically affecting the cause of scheduled delay designs for power distribution projects in Taiwan. This project consists of substation construction and distribution lines which are similar to PT projects stations or substations and construction of TL/TLs over a smaller scale and level.

Ali et al. (2008), discuss the policies and strategies required to develop and maintain a renewable energy market and let the technologies be practicable. The widespread utility of this era may be greater via employing several strategies particularly 1) development of renewable power technology information resources and services, attention and capacity building programs, 2) betterment of renewable technology or processes market transformation, demo projects, and infrastructure development, 3) financial policy and framework improvement supportive towards renewable technology and market sustainability, and 4) status quo of competitive nearby solar generation manufacturing firms or industries, the imposition of worldwide standards and norms for solar power technology components along with enhancement R&D programs. To achieve the renewable energy target and bring the technology into a competitive market, policies need to be in place by implementing appropriate strategies. Table-2.2 shows the critical successfactorsofthePowersectorproject.

Table-2.2: Critical Factors of Power Sector Projects

S. No.	Author	Location	Research Variable/CSFs	Research Tool	Type of Study-Statistical Analysis
1	Bhattacharyya and Dey (2007)	India	1) political, 2) financial, 3) economic, 4) legal and regulatory framework, 5) management failure	Data is collected from secondary sources like the REC website and published project-related documents.	The probability of risk and the severity of impacts have been categorized under three qualitative scales: high, medium, and low.
2	Choudhury (2014)	India	1) conception and feasibility studies, 2) project planning,3) bidding and contracting 4) project implementations	The project management and management information systems data collected from report Published by NTPC and literature review and questionnaire survey.	Total Points = (No. of Respondents) x (point as per scale)
3	Chiu and, Lai (2017)	Hong Kong	1) customer, 2) design team, 3) main servicer, 4) electrical contractor, 5) workforce, 6) apparatus, 7) system performance, 8) statutory submission and inspections, 9) external,10) contractual relationships	Data is collected through a survey questionnaire	Ranking factor
4	Divi and, Sundara (2017)	India	1) investment criteria at present situation; 2) sales; 3) owner; 4) contractor; 5) labour; 6) materials, equipment; 7) site, third party; 8) consultant	Questionnaire survey is adopted to gather information	Ranking factor: Relative Importance Index

5	Dong et al (2019),	China	1)society and environment, 2) economy, 3) resources technology, 4) enterprise management, and 5) market	Delphi Method	Fuzzy DEMATEL and Analytic Network Process
6	Hermawati and Rosaira (2017)	Indonesia	1) planning, 2) community 3) communication and beneficiaries, 4) technology 5) project management 6) stakeholders support and network development.	Sources of study information collected from focus group discussions.	Descriptive qualitative
7	Mokan, et al. (2019)	Not Specified	1) economic, 2) environment, 3) social, 4) technology, 5) government, 6) organization and management	Literature Review	Qualitative
8	Mohammed, and Alshaoush, (2018)	Arabia	1) investment 2) economic viability ,3) procurement, 4) contractual arrangement, 5) administration and management, 6) risks, 7) technical	Interview and literature review	Ranking factor through mean of factor.
9	Maqbool, et al. (2018)	Pakistan	1) communication, 2) team, 3) technical, 4) organizational, 5) environmental	Data collected via survey questionnaire	Structure equation model
10	Nundwea, and Mulengab (2017)	Zambia	1) late advance payments, 2) financial mismanagement by the contractor, and 3) irregular payments to sub-contractors	Data collected through interview	Ranking factor: Relative Importance Index
11	Osorio (2014),	Brazil	effectiveness and efficiency	Questionnaire survey	Count of citation of factors and reliability test
12	Pall et al. (2016)	Not Specified	1)administrative2) employer 3) servicer 4) advisor, 5) sketch, 6) material, 7) apparatus, 8) worker, 9) miscellaneous	Literature Review	Qualitative

13	Pall et al. (2019)	Bangladesh	1)sector-specific ,2) general, 3) administrative,4) employer/owner ,5) contractor, 6) consultant, 7) materials, 8) equipment, 9) labour/worker, 10) external/unavoidable	Survey questionnaire	Ranking factor: Relative Importance Index
14	Saleh, et al. (2015)	Malaysia	1) strategic management 2) energy admin team, 3) stakeholder 4) cognizance 5) risk administration.	Literature review	Qualitative
15	Yau and Yang (2012)	Taiwan	1) contract, 2) client, 3) turnkey contractor, 4) government, 5) others.	Survey questionnaire	Ranking Factor
16	Zhao et al. (2010)	China	1) viability, 2) set-up, 3) company, 4) servicer 5) suppliers	Survey questionnaire	Ranking Factor
17	Zhao and Chen (2018)	China	(1) resource grant (2) generation method (3) renewable energy demand, (4) renewable energy accommodation (5) investment (6) admin policies, (7) economical benefits (8) environment effect (9) social	Survey questionnaire	Ranking factor: Relative Importance Index

2.7.2 Critical Factors in Construction Sector

Alsuliman (2019), identify 50 factors into four categories in Saudi construction projects. The categories are; (1) factors prior to tenders, (2) at the time of tenders, (3) after tender, and (4) general. A questionnaire is administering and data is collected from 211 respondents. The Ranking factor is applied to find out the critical factor for construction projects in Saudi Arabia. The main 20 delay causes are identified. A Case study is conducted to show the time delay rate as compared to its standard schedule by using the developed formula. The key groups that affected the delay are examined and evaluated by

the survey consist of the following, including the first rank of the group of awarding tenders, affecting the delaying factor in Governmental projects in Saudi Arabia. It includes concern financials and rewarding the lowermost aspirant and contractor selection having additional delaying or faltering projects.

Shing et al. (2018), identify 26 factors into seven categories for Indian construction projects. The 7 categories are 1) site, 2) equipment, 3) management, 4) construction method error, 5) material, 6) skilled/unskilled labor, and 7) unforeseen factors. For data collection, the questionnaire is developed and statistical analysis (RII and correlation factor) is done for getting the result. The result shows top ten factors are 1) poor site management & suspension 2) bill payment delay to a contractor, 3) delay in project site handover, 4) insufficient labor productivity, 5) inadequate coordination among parties, 6) repeating or correcting work because of errors in previous ones, 7) inadequate and inappropriate contractors' experience 8) shop drawing approval delay, 9) sudden changes of subcontractor and 10) delay in final rates of extra items.

Gebrehiwet and Luo (2017), cite 52 causes with four categories including pre-construction, construction, and post-construction stages and general delays causing construction project delay. In this research using a questionnaire survey for data collection from 77 experienced participants for Ethiopia construction projects. RII and correlation coefficient are used for analysis. Result of this studies displays: the pinnacle most causes of put off in the Ethiopian construction project; corruption, inflation or expenses will increase in materials, unavailability of site utilities, materials' loss, late layout and layout files, gradual shipping of materials, overdue in approving and receiving of entire task landscape, bad web page management, and overall performance, past due launch finances/price range and ineffective task making plans and scheduling. This observation shows the awarding tendering.

Marzaouk and Rasas (2014), identify 43 delay factors in Egypt construction projects. Further, factors are classified into seven groups namely; proprietor, advisor, contractor, 4) material, labor &apparatus, project, and miscellaneous. Frequency, severity, and significance indices are used for analysis with retention of the highest values to define ten causes of delay are identified for production project in Egypt.

Polat et al. (2014), identify 38 factors in micro-scaled construction projects and categorized into 7 groups related to the contract, time, budget, quality, human resources, communication, and risk. This research ranking factor identified the level of factors.

Gardezi et al. (2013), identify 27 key factors into seven groups in the construction industry in Pakistan. The seven groups of related factors are namely; 1) contractor 2) client, 3) material, 4) consultant, 5) labor & equipment, 6) contract and 7) external factors. Analysis of relative important index (RII) method determined the important construction project delays.

Gunduz et al. (2013), identify 83 factors into nine (9) major groups in Turkey construction projects. Major nine groups are delay factors related to the consultants, contractors, outline, apparatus, externality, labor, owner, material, and project. This study uses an interview questionnaire to assess the perceptions of those in the Turkish industry. The questionnaire is filled with 64 highly experienced construction project managers, site managers, procurement managers, and technical managers. The demonstration of those projects of delay factors used the Ishikawa (Fishbone) diagram to display variables, interrelations among different organizations of factors, and their outcomes. The delay factors are then quantified and ranked as per their level of importance.

Niazai and Gidado (2012), identify 83 delay factors in nine groups for construction projects in Afghanistan. The nine groups of related factors include 1) contractor, 2) design-, 3) advisor, 4) labor, 5) materials, 6) apparatus, 7) client, 8) otherfactors, and 9) project factors. The factors are finalized on a review of literature and questionnaire is

developed.Questionnaires are sent to 60 construction professionals to get their feedback on a Likert scale of 1-5. The importance indexed is used to rank the factors. It is found the most significant factors include security, corruption, and under-qualified contractor staff, inadequate site management, and ineffective planning.

Doloi et al. (2012), identifiy 45 delay attributes into seven categories under-construction projects in India. Following are those in seven categories 1) inadequacy of commitment towards work, 2) inappropriate location management, 3) incorrect strategic plan, 4) deficient scope of the project, 5) poor site coordination by the workforce, 6) substandard contract, and 7) absence of communication or very less communication. In this research questionnaire survey is used for data collection from the Indian construction sector. The regression analysis is done to test hypotheses. The result of these studies shows gradual choice from proprietor, negative labor efficiency, architects' unwillingness to exchange and remodel because errors in creation are the reasons for delays of the task notably.

Tabish and Jha (2011), analyze 36 success attributes in public construction projects in India and these attributes make into four factors including 1) awareness &compliance, 2) planning & clarity, 3) powerful association of project members or participants, and 4) external control and monitoring.

Jha and Iyer (2006), identify 41 success factors into six groups and 26 failure factors into seven groups for Indian construction projects. The fulfillment groups namely: 1) project manager competency, 2) proprietors and pinnacle administration, 3) tracking, remarks, 4) supportive running condition, 5) commitment of all project participants and 6) owner's competency. Failure groups include 1) participants' conflict with each other, 2) lack of understanding in the manager of the project, 3) hostile socioeconomic environment, 4) incompetency of the owner, 5) weakness of project participants, 6) adjustable climate condition at site, and 7) mission particular elements. In this research attributes collect from literature and questionnaires are sent to construction professionals for the data collection

on a 5-point Likert scale. The conclusion derives seven factors that impact the schedule outcome. It is found that participant's commitment, competency of the owner, and conflict among project participants to the process have the capability to increase performance level.

Ugwu et al. (2003a), identifies top nine CSFs for construction projects, namely; development cost, strategic level assistance, availability of suitable technology, ease of use, improvement team know-how and knowledge of production enterprise processes, understanding of user requirements, communication, standardization problems and change control at organizational degree i.e. huge businesses. Table-2.3 shows the critical factors of construction projects.

Table-2.3: Critical Factors of Construction Projects

S. No.	Author	Location	Research Variable/CSFs	Research Tool	Type of Study-Statistical Analysis
1	Odeh and Battaineh (2002)	Iran	1) customer,2) servicer,3) advisor,4) material ,5) workforce & apparatus ,6) contract,7) predetermined agreement relationships,8) miscellaneous	Survey questionnaire	Ranking factor: Relative Importance Index
2	Albert et al. (2004)	Not Specified	1) human, 2) project,3) project strategy, 4) project management effort, and 5) outside situation.	Literature review	Qualitative
3	Assaf and Hejji (2006)	Saudi Arbia	1) workforce ,2) service provider,3) project,4) customer,5) advisor,6) plan,7) engineering group,8) materials,9) others	Literature review and questionnaire	Ranking factor-Severity Index
4	Atul and Martin (2008)	India	1) government policies such as excessive bureaucracy,2) inferior execution of projects, 3) low quality and below standards, 4) personal stake,5) corruption & lack of transparency	Questionnaire Survey	Qualitative

5	Alsuliman (2019)	Saudi	1) before the award of tenders, 2) during the award of tenders, 3) after the awards of tender and 4) general.	Questionnaire survey	Ranking factor
6	Buertey, et al. (2014)	Ghana	1)customer, 2) servicer,3) advisor, 4) material, 5) apparatus, 6) workforce, 7) finance and 8) miscellaneous	Questionnaire survey	Ranking Factor: frequency index and severity index
7	Bekr, (2015)	Iraq	1)customer, 2) servicer, 3) advisor and 4) miscellaneous	Questionnaire survey	Ranking Factor: Important Index, frequency index and severity index
8	Doloi, et al., (2012)	India	(1) deficit promise, (2) incompetent location management, (3) bad location organization, (4) inappropriate plan, (5) deficit project scope, (6) absence of communiqué, and (7) insufficient contract.	Questionnaire survey	Ranking factor: Relative Importance Index Regression Analysis
9	Doloi, (2013)	Australian	1) agreement, 2) project management team, 3) quality, 4) plan and 5) servicer	Questionnaire survey	Descriptive Analysis, Regression Analysis
10	Dinesh (2016)	India	1) customer ,2) servicer,3) advisor, 4) engineer, 5) workforce, 6) material,7) apparatus, 8) outside	Questionnaire Survey	Ranking factor: Relative Importance Index
11	Enshassi (2009)	Gaza	1)budget,2) timeline ,3) quality, 4) productivity, 5) customer contentment,6) public satisfaction, 7) people ,8) health, 9) innovation, 10) environmental	Questionnaire survey	Ranking factor: Relative Importance Index

12	Eyiah-Botwe, et al. (2016)	Ghana	1) pre-conditions (external factors), 2) pre-stakeholder recognition, 3) stakeholder recognition, 4) stakeholder evaluation (classification and prioritization), 5) stakeholder assignation 6) application, 7) monitor and evaluation, 8) constant support	Literature Review and Questionnaire survey	Ranking factor: Relative Importance Index
13	Gunduz et al. (2013)	Turkey	1) advisor, 2) servicer, 3) engineer, 4) apparatus, 5) externality, 6) workforce, 7) material, 8) customer, and 9) project.	literature review and interview with experts	Ranking factor: Relative Importance Index
14	Gardezia, et al. (2014)	Pakistan	1) customer, 2) servicer, 3) advisor, 4) material, 5) workforce & apparatus, 6) contract and 7) others	Questionnaire survey	Ranking factor: Relative Importance Index
15	Gebrehiwet and HanbinLuo (2017)	Ethiopian	1)accountability,2) resource,3) finance,4) contract condition	Questionnaire survey	Ranking factor: Relative Importance Index
16	Hwang and Lim (2013)	Singapore	1) project features, 2) contractual measures, 3) project stakeholders, and 4) communicating processes.	Questionnaire survey	Chi Square test
18	Jha and Iyer (2006)	India	1) capability of pm, 2) assist of upper management, 3) monitor and response by project stakeholder, 4) communication between project stakeholder, 5) ability of customer, 6) disagreement among project stakeholders, 7) inadequate climate, 8) incompetent pm 9) inadequate concepts, 10) project specific factors, 11) high tender competition	literature review and questionnaire	Logistic Regression Analysis

19	Jha, and Iyer (2006)	India	1) capability of pm, 2) strategic level help, 3) monitor, response and direction, 4) advantageous work atmospheres, 5) obligation of stakeholders, and 6) capability of customer. failure:1) conflict among project stakeholder, 2) inexperience of project manager 3) aggressive socioeconomic environment, 4) ineffectiveness of customer, 5) inconclusiveness project stakeholder, 6) adverse climatic condition at site, and 7) project definite factor.	Outcome of a construction project, and questionnaire survey	Multinomial Logistic Regression
20	Jolowo et al. (2014)	Malaysia	1)project management tools & techniques,2) stakeholder (customer), 3) stakeholder (project team manager),4) project factors,5) project procurement,6) others	Structured questionnaire survey	Ranking factor: Relative Importance Index
21	Jayasudha and Vidivelli (2016)	India	1)methodical ,2) period ,3) erection, 4) design,5) legal, 6) market,7) management,8) financial, 9) policy and political, 10) environmental, 11) community risk, 12) safety, and 13) practical risk.	Survey	Ranking Factor through descriptive analysis
22	Kanchana and, Janani (2018)	India	1) schedule / budget, 2) stakeholder knowledge, 3) financial, 4) bidding situations, 5) project features, 6) assessing process	Review of literature and Questionnaire survey	Qualitative
23	Marzouk and, El-Rasas (2014)	Egyptian	1) customer, 2) advisor, 3) servicer, 4) material, 5) workforce & apparatus, 6) project, 7) miscellaneous	Questionnaire survey	Ranking Factor: Important Index, frequency index and severity index

24	Ugwu, and Kumaraswamy (2006)	China	1)upper management assist /promise/accountability & direction,2) capability of project team,3) teamwork within interdepartmental, 4) clear goals and objectives, 5) undeveloped interdepartmental communication	Questionnaire survey	Ranking Factor
25	Niazai and Gidado (2012)	Afghanistan	1) service provider, 2) engineer, 3) materials, 4) workforce, 5) advisor, 6) apparatus, 7) customer, 8) others, 9) project.	questionnaire	Relative Importance Index
26	Norizam and Malek (2017)	Malaysia	1)mixing, 2) scope, 3) timeline, 4) budget management, 5) quality, 6) people, 7) risk	Structure questionnaire	Ranking Factor: Descriptive analysis
27	Olajide, et al. (2013)	Nigeria	1)material, 2) workforce ,3) apparatus, 4) finance, 5) servicer ,6) customer, 7) advisor	Questionnaire survey in Lagos State, a total of 10 construction firms and 10 consulting firms are selected.	Ranking Factor
28	Onyango et al. (2017)	Kenya	1) government policies,2) funding process, 3) participatory planning process	descriptive survey research design	Regression Analysis
29	Shen et al., (2001)	China	1)financial, 2) legal, 3) management, 4) market,5) policy and political ,6) technical	Survey conducted	Ranking factor: Index Score
30	Samad and Sepasgozar et al. (2006)	Iran	(1) servicer association, (2) shortage of workforce, (3) others, (4) lack of material, (5) reason of engineering, (6) customer, (7) knowledge constraint, (8) advisor and (9) project	Interview and official report.	Ranking Factor, frequency index and severity index

31	Venkatesh and Venkatesan (2017)	Malaysia	1) customer 2) advisor 3) architect, 4) servicer,5) miscellaneous	Review of research articles	Qualitative
32	Wiguna and Scott (2006)	Indonesian	1)outside and site condition, 2) economic and financial, 3) technical and contractual ,4) decision-making	Intensive literature review and questionnaire	Structure Equation Model

2.7.3 Critical Factors in Oil and Gas Sector

Redda and Turner (2018), citing that 11 success criteria and 57 success factors in three success criteria groups and six groups of success factors in the oil& gas industry. Success criteria are namely 1) project management success, 2) business success and 3) future potential/growth. Success factors are 1) project management leadership & team competence, 2) front end load, 3) project external context and compliance, 4) impacts of the project on the external environment, 5) project risk & quality management, and 6) project connectivity with local resource capacity.

Tsiga et al. (2017), found 58 factors into 11 groups in the petroleum industry in the United Kingdom. The 11 groups include 1) Challenge, 2) Client knowledge 3) support of Top Management, 4) organizational, 5) project features, 6) competent Project managers, 7) organization, 8) contract, 9) team capability, 10) riskcontrol, and 11) requirements handling. The questionnaire is developed and ask respondents to rank the 11 CSFs based on a 10-point Likert scale. Most of the respondents are geographically located in the UK, US, Nigeria, the Netherlands, and Russia. The statistical test is done like ranking factor, reliability, and regression analysis. The factors have been ranked based totally on their RII. The take a look at highlights, the significance of risk management and necessities control in petroleum tasks, with each ranked as extra crucial than some already installed classes, which include outside ventures (which turned into ranking least critical).

Hajiagha et al. (2016), identify twenty critical factors in five final factors after factor analysis. The five final factors are namely; 1) cooperation 2) achieving desired goals, 3) milestone for the future, 4) clarity on methodologiesandguidelines, and 5) contractors' capacity to manage the project.

Damiebi and Nazatul (2011), in Nigeria, identify thirteen factors, inoil and gas projects besides project schedule delivery and strategy for project budget and portfolio management affecting success. The research is done through a questionnaire survey. The result is found via a one-sample T-test that project schedule delivery, project budget, and portfolio management strategy all are significant.

Salama et al. (2008), identify five reasonsfor the delay in oil and gas projects in the UAE. The five delay factors are mainly: 1) initial purchasing long period items, 2) equipment and material delivery, 3) bad project management through the contractor and scarcity of professional and experienced engineers, 4) lack of experience, and 5) knowledge of contractor technical. For the data, acollection questionnaire survey is used and for ranking the factors relative importance index is used.

Table-2.4 shows the critical factors of Oil and Gas project.

Table-2.4: Critical Factors in Oil and Gas Projects

S. No.	Author	Location	Research Variable/CSFs	Research Tool	Type of Study-Statistical Analysis
1	Dey, at al., (1994)	India	1) Technological, 2) Budgetary, 3) Economic and Political ,4) Acts-of-God, 5) Legal-need	Fuzzy-set analysis	The Analytic Hierarchy Process, a multi-attribute decision-making technique,
2	Fiberesima and Rani (2011)	Nigeria	1) Completion in Time,2) Cost and 3) Portfolio Management Strategy	Cross-sectional, and non-experimental	One sample T-test
3	Fallahnejad (2013)	Iran	1) Advisor, 2) Srvice Provider ,3) Material, 4) External,5) Correspondence,6) Interface, 7) Agreement, 8) Work Force and Apparatus	Scrutinizing projects' documents, Initial interviews, Questionnaire survey	Relative Frequency Index, Correlation coefficient
4	Pham and Hadikusumo, (2014)	Vietnam	1) Investment, 2) Scope and Agreement, 3) Engineering, 4) Purchase, 5) Construction, and 6) Creation	Case study on selected EPC projects	Frequency Index
5	Ruqaishi and Bashir (2015)	Gulf country	1)Owner, 2) Service Provider, 3) Advisor,4) Material, 5) Work Force and Apparatus, 6) Contract, 7) Predetermined Agreement and 8) Others	Questionnaire survey from case study	Kruskal-Wallis tests
6	Redda, and Turner, (2018)	Not Specified	1) Leadership & Team Capability, 2) Front End Load,3) Outside Situation and Conformity, 4) Effects on Outside Situation, 5) Risk & Quality and 6) Connection with Local Source.	Questionnaire survey	Reliability and Loading Factor

7	Salama et al. (2008)	UAE	1)Delaying in Procurement of Long-Lead Components, 2) Delay in Material and Equipment Received at Site ,3) Lack of Skill and Knowledge of Contractor, 4) Substandard Project Management by Servicer ,5) Dearth of Skilled and Competent Engineers	Structured interviews	Relative Importance Index
8	Tsiga et al. (2017)	United Kingdom	1)Outside Provocation, 2) Skill and Competence of Customer ,3) Assist of Upper Management, 4) Official Reasons ,5) Project Features, 6) Capability of Project Manager, 7) Project Organization, 8) Detail of Predetermined Agreement, 9) Ability of Project Team, 10) Project Risk, 11) Requirements	Questionnaire	Relative importance index, Regression test

2.7.4 Critical Factors in Other Infrastructure Sectors

Nallathiga et al. (2017), identify the important factor in the road infrastructure projects in India. They mention significant factors impact project performance at all major road infrastructure project life cycles which are: 1) planning stage, 2) procurement stage, 3) development stage, and 4) construction, operation, and maintenance stage along with twenty-four subfactors. This research is done by a survey of government firms, consultants, road contractors, finance institutions, and users to obtain their score on a six-point Likert scale. The research brings that each stage in the road infrastructure project has exclusive necessity which has to be satisfied to make the project a successful one.

Yang et al. (2017), identify nineteen factors in five groups for the PPP BOT project in China. The five groups are; 1) feasibility of the project, 2) sound environment, 3) reliable contractors, 4) strong project company, and 5) good suppliers.

Nallathiga et al. (2015), observe the important factors hampering the progress of infrastructure projects in India. They identify the key aspects affecting major factors

affecting project delays at all major project stages – planning, design, and execution and monitoring – by surveying professionals in the infrastructure sector to find their scores on the Likert scale and rank those factors depending on mean scores. The study brings out the major factors causing delays in infrastructure projects in India based on the RII scores of various stakeholders i.e., stakeholder convergence. Stakeholders based evaluation of critical factors become applied for the first time in India that renders the assessment innovative.

Deeppa and Krishnamurthy (2014), states the fundamental factors of project delays consequential in time as well as cost overruns in infrastructure projects in India. They administer a survey for ranking of factors. They use the conventional analysis ranking based on the RII scores to identify significant factors. Afterward, group these factors under major factors by using principal component analysis of contractor factors, professional management- factors, material factors, labor and equipment, government- factors, external factors, project factors, owner factors, contractual duties, layout, and documentation.

Doloi (2013), makes a comprehensive assessment of success or failure of road projects by considering various factors and classifies the under 1) contract, 2) project management team, 3) quality, 4) planning, 5) contractor. It also categorizes the existing literature on project success/failure into those to 1) project planning &monitoring, 2) efficient design, 3) location, 4) communication, 5) competence of contractors, 6) project clearances, 7) persistence and 8) market.

Patil et al. (2013), identify 64 delay factors into seven groups in transportation infrastructure projects in India. The seven groups are 1) equipment, 2) client, 3) contractor, 4) equipment, 5) consultant or design 6) manpower, and 7) material and external factors.

Nallathiga et al. (2012), find the main factors of real estate construction projects in India. A survey is taken on to obtain their responses on a Likert scale. Correlation coefficients are used between the responses of the above three groups instead of ranking factors to

recognize determinants of the major factors. They categorize the major determinant factors of project success namely: client objectives, competency, team leadership, and managerial activities. In addition, they become aware of sub-factors inside every of the most important variables.

Singh (2010), states that delays ware one of the major reasons for infrastructure or infrastructure project cost invades or overruns. These costs invade are experienced in larger projects compared to the smaller projects. Similarly, when this is compared with the other firms or sectors, such as road, urban development, and civil aviation sectors or shipping or port, have faced many delays. Some analyses have shown some of these delays and invasions, overruns are inevitable because of inadequate techniques and incompleteness. However, these delays are much regular and long to get into consideration by insufficient techniques, incomplete contracts, and instabilities.

Zhang (2005), attempt to conclude the CSFs of PPP in the development of infrastructure. The diagnosed five keys CSFs are; 1) optimistic investment set-up, 2) economic practicality, 3) trustworthy concessionaire group with technical strength, 4) financial platform, and 5) risk distribution. Each factor has various sub-factors and also recognize and a survey is conducted on all factors and sub-factors including both industrial and academic respondent groups.

Table-2.5 shows the critical factors of other Infrastructure projects.

Table-2.5: Critical Factors in other Infrastructure Project

S. No.	Author	Location	Research Variable/CSFs	Research Tool	Type of Study-Statistical Analysis
1	Patil (2013)	India	1)Customer ,2) Servicer, 3) Adviser and Engineer, 4) Workforce, 5) Apparatus,6) Material and 7) Outside Issue	Questionnaire Survey	Relative importance index
2	Amoatey and Ankrah (2017)	Ghana	1)Owner, 2) Servicer,3) Contributor	Empirical and survey approach for data gathering	Relative importance index
3	Nallathiga, et al. (2017)	India	1) Plan, 2) Purchase, 3) Development and 4) Erection, Operation and Maintenance	Questionnaire survey	Descriptive analysis and Relative Importance Index
4	Alaloul et al., (2016)	Malaysia	1) Plan and Time, 2) Resource and Contact Administration ,3) Archives and Documents, 4) Contract Execution, 5) Quality and Value Engineering,	Delphi technique	Relative importance index
5	Pawar et al., (2016)	India	1)Material,2) Workforce, 3) Apparatus, 4) Engineering, 5) Advisor, 6) Servicer,7) Customer, 8) Project, 9) Miscellaneous	Literature review and questionnaire survey	Relative importance index
6	Singh at al. (2018)	India	1) Site, 2) Apparatus, 3) Administration, 4) Execution, Procured & Errors, 5) Material, 6) Skilled/Unskilled Worker, 7) Unpredicted	Questionnaire survey technique	Relative Importance Index Technique and Factor Loading.
7	Gupta et al., (2013)	India	1)Predominant Situation, 2) Monetary Practicality, 3) Concessionaire Association, 4) Economic Package, 5) Risk Distribution, 6) Practical Solution	Depth discussions and exhaustive literature review, comprehensive questionnaire	Relative importance Index

8	Mackhaphonh N, and Jia G (2017)	Developing Countries	1)Corruption,2) Project Resources,3) Financial,4) Social and culture ,5) Outside Situation,6) Service Provider ,7) Technology and Practical,8) Project management Expertise	Literature Review	Qualitative
9	Pawar C S et al. (2015)	India	1) Practical, 2) Financial ,3) Legal, 4) Erection ,5) Political, 6) Engineering ,7) Environmental ,8) Predetermined Agreement	Comprehensive literature review, questionnaire surveys	Qualitative
10	Song et al., (2013)	China	1) Government Decisionmaker, 2) Government Credit, 3) Legal and Policy, 4) Procedural, 5) Contract Variation, 6) Environment, 7) Community Obstruction, 8) MSW Supply, 9) Payment, and 10) Revenue Risk	Review of documents, Interviewees from contracting and non-contracting parties, semi-structured questionnaire	Frequency index
11	Wai et al., (2013)	Malaysia	1) Before Execution, 2) During Execution, 3) After Execution,4) Organizational ,5) the Information, and 6) Change	Standardized open-ended interviews.	Reliability and Factor loading
12	Yang et al., (2017),	China	1) Viability of Project, 2) Supportive Atmosphere, 3) Strong Project Company, 4) Genuine Servicer and 5) Good Suppliers.	'Business case' methodological review framework and questionnaire	Relative importance index, Reliability

2.8 "Analysis"

With respect to PT projects' CSFs, are identified as the need to finish the project within a stipulated time, calculated cost, and highest quality to accomplish the business objective and in a protected way with shared objectives for all contractually involved stakeholders including the owner, contractorand different stakeholders. In light of the above

examinations and a substantial investigation of the success, delay cost overrun and failure of projects uncovered from the literature looked into, this research proposes five main CSFs group are given underneath:

1) Strategy
2) Risk
3) Contract
4) Stakeholder and
5) Information Technology

2.8.1 Strategy as CSF

The fields of strategy cover an extensive time table from historic Greece to the 21st century. Groups, researchers, and practitioners, from each sector of the expert world, have emphasized on strategy as a key subject matter in some unspecified time in the future (Chinowsky 1999a). The strategic control includes principles from an aggregate of quantitative as well as qualitative fields. At the quantitative side, control and business sciences have validated the domains of logistics, finance, and operations. In addition to this, quantitative rigour encompasses the human dimension of sociology, psychology, and human useful resource control. In mixture, these quantitative and qualitative variables address diverse corporation wishes along with professional, technical, and strategic demands.

Partnering can be defined as a cooperative strategy that aims to link organizational boundaries and develop an environment inside which team members can openly interact and perform (Crowley & Karim, 1995). According to Hope & Fraser, (2001), 60 percent don’t associate strategy and budget; and eighty-five percent teams spend approximately one hour a month discussing approach strategy. Awwal (2014), states, many such projects are likely to be successful, though others have not been able to do so. The key factor behind this failure may reside underneath the asymmetric alignment of business strategy and

project management. The maximum of the case initiatives is terminated due to misalignment of business strategy and project management.

Reducing uncertainty and miscommunication requires a strong foundation of concepts. In the subject of strategic management, those foundational standards include strategy, strategic control, strategic making plans, and strategic plans.

Strategic management develops strategic concepts. However, simply as strategic ideas do not usually develop naturally. It does not assure that organization individuals will pay attention to developing strategic ideas. To encourage this cognizance, several academic and commercial enterprise writers have anticipated various strategic making plans models (Thompson & Brooks 1997; Lemmon & Early 1996; Davis 1987; Mintzberg 1994; McCabe & Narayanan 1991). Those strategic planning models offer particular commands for drawing close, executing, and assessing the improvement of strategic concepts.

Even though the strategic direction is the main landmarkfor strategic planning, but it isn't always the final conclusion required for implementation. As a substitute, a strategic plan is needed to define the dreams, goals, mileposts, and evaluation standards that ought to be accompanied to obtain the evolved approach. The time required to cognizance on broadening patron bases, or examining new revenue streams, is regularly overridden using demands by initiatives for attention to finances, time table, or personnel matters. The companies remain focused on employee-level concerns, which is a strategic plan. There are measurable outcomes in a strategic plan that each department and company managers can evaluate for development and the very last achievement.

Strategically managed initiatives aim to improve commercial enterprise overall performance which produces benefit the company’s preference to sustained (Shenhar et al. 2000). Competitive gain provides the organization with the capacity to gain profit above the enterprise common and contribute to shareholder satisfaction (Vainio, 2012; Barney and Hesterly, 2008; Carpenter and Sanders, 2007; Johnson et al. 2005).

Osorio et al. (2014), stated that the project are ways to implement strategies and a project objective must be directly connected to the organization's strategic objective. Wan Abdullah et al. (2006), most projects are part of their organization's strategic management and must be evaluated based on their contributions to the business results. Jamieson and Morris (2004), propose the components of strategic planning as inner evaluation, organizational structure, and of management structures as assignment management tactics and sports. Artto and Dietrich (2004), advise that an important managerial project concerned in the alignment of project control with enterprise strategy is inspiring people to take part in the use of rising techniques to through light on new ideas and reintroduce present techniques. The specific business strategy opted by employer drives their project portfolio management method. The predominant reason purpose is to makeaselection of projects on priority (Cooper et al. 1998b), stability initiatives (Archer &Ghasemzadeh 1999, Cooper et al. 1998b), alignment of projects and business strategy (Cooper et al. 1998b), manipulate tough-cut aid potential (Harris and McKay 1996; Wheelwright and Clark, 1992), and adjust agreement limits for a project and functional control (Harris and McKay, 1996).

Table 2.6 reveals strategy as a CSF and its variables identified after a review of the literature.

Table 2.6: Critical Success Factors and Variables- Strategy

Source	Tendering Process	Aggressive Bidding	Project Goal	Construction Method	Feasibility Study	Alignment in The Preforming Organization	Project Objectives	Organizational Commitment	Projects Aligned to The Strategy	Contract Strategy	Cost Leadership,
Assaf and Al-Hejji (2006)		√									
Aleksandra, (2012)										√	
Aigbavboa and Thwala, (2014)			√								
Andreas and Alfen, (2015)					√						
Bakar et al. (2009)							√				
Hussein (2013),							√	√	√		
Chan, and Kumaraswamy (1997);	√		√		√						
Cheng et al. (2000)			√					√			
Cooke-Davies, (2002),										√	
Chan et al (2004)	√				√						
Cabanis-Brewin, & Pennypacker, (2006)									√		
Dong et al., (2019)		√									
Eyiah-Botwe, et al., (2016)					√			√			
Gebrehiwet. and Luo, (2017),				√	√						
Niazai, & Gidado (2012)	√										
Jha, and Iyer (2006),		√									
Jawad (2019),	√						√				

Kothari, C. (2003),										√	
Munns &Bjeirmi (1996)			√								
Naoum et al., (2004)							√				
Nundwea&Mulengab (2017),		√									
Pinto &Slevin (1987)							√				
Pall, et al. (2016)		√									
Sabin (2006)											√
Saleh et al., (2015)			√								
Shing et al., (2018)		√		√							
Yang (2009)							√				
Zhao et al. (2010)									√	√	
Tsiga et al. (2017)	√										

2.8.2 Risk as CSF

The probability of inequality in the occurrence of an event, which may happen either positive or negative outcomes, is called risk (Smith,1999). Looking at the significance of risk management in the construction projects,Uher and Toakley (1999), find that the construction industry is sluggish to recognize the capability of blessings of risk management. Moreover, he reveals the main reason preventing the use of risk management in the construction industry becomes ‘cultural problems’ together with poor knowledge, negative view, and distrust of risk analysis.

The prediction of projects with the uncertain economic environment will never be perfect (Nevitt and Fabozzi, 2000). The effects of these risks are inadequate productivity, deficit performance, and increased project cost (Mills, 2001).

Jayasudha and Vidivelli (2016), identify typical ninety (90) risk factors mainly in thirteen categories in the Indian construction project. Thirteen categories of risk are 1) technical, 2) time, 3) construction, 4) design, 5) legal, 6) market, 7) management, 8) financial, 9) policy and political, 10) environmental, 11) social, 12) safety, and 13) physical.

Wiguna and Scott, (2006), identify four groups of 16 risk factors as 1) external and site condition, 2) economic-financial, 3) techno-contractual and 4) managerial. The review indicates that the lower the project risk in a project, lower the negative impact on monthly progress is, and consequently the better the schedule performance will be.

There is more concrete concerning political risk in construction projects initiatives of worldwide scope, focusing on variables inclusive of charges team of workers, materials, and overhead expenses- and income – related to taxes, overseas foreign money, and change rates (Ashley and Bonner, 1987; Baloia and Priceb, 2003). The external risks have a high weight but not directly associatedwith the construction process. The risks are categorized as political, socio-economic, natural, and others (El-Sayegh, 2008).

Sudirman et al. (2018), cites that there are two groups of risk factors that impact the realization of the fast track program (FTP), namely: internal and external. Internal factors associated with the internal organization and under certain conditions can be controlled, on the other hand, external factors come from outside the organization that tends not to be controlled by the organization.

While the risk factors that arise in power plant projects using EPC contracts on FTP program are: unrealistic project schedules with consideration to the capability or plant sites, inconsistencies between components of contract documents, overdue design processes, the difficulty of contractors in a meeting of standard contracts, obsolete technical specifications, unavailability of approach to project sites in a well-timed manner; land disputes all through implementation degree on the project site, completion of permits and licenses, a gap between manufacturing delivery schedule and installation work at site;

awful soil/ geological conditions, past due payment, and regulatory changes. In the EPC contract, the owner takes benefit from the less risk to be borne, whereas most of the risks are on the contractor side. Because of the risks of EPC contracts, several things need to be part of the attention of the parties in drafting and negotiating for lump-sum turnkey or EPC contracts, so that, proper risk balance in the contract would be created for the parties. Issues that need attention such as determination of the scope of work, the appointment of engineer/ consultant as owner's representative, variations, the extension of time, contractor's responsibility for design prepared by the owner, risks for the owner, compliance to regulation, copyright, and license.

Sadeghi et al. (2016), identify twenty-six (26) recurring risks and categorize in eight groups namely 1) economic, 2) political-legal, 3) natural physical and 4) the third party which is external and 5) scope and contract, 6) design, 7) owner and 8) construction which is internal. These risks are categorized into two groups: External and internal. External risks are usually the results of the conditions that are out of control of the project participants. These situations are not limited to EPC projects. Internal risks are the results of choosing of EPC as the project delivery system. In other words, the EPC delivery system brings about several risks within itself.

Through the analysis of information and consultation of experts' opinions, Mai et al. (2016), summarize the characteristics of the hidden risks leading to delays in the construction progress of the hydropower projects. Based on these characteristics, the main reasons leading to the construction progress delays can be divided into groups asRisk due to contracts, Risk of politics and legality, Technology risk, Risk from the social milieu, Economy risk, Risk from management, Risks of EPC general contractors in Hydropower Construction Projects in Vietnam.

Songet al. (2013), in total, identify tenkey risks in ignition projects in China. These risks are 1) decision-making, 2) government acclaim, 3) policy-legal, (4) technical, 5) contractual, 6) Natural 7) public opposition, 8) MSW supply, 9) payment, and 10) revenue.

Miller and Lessard (2001) dissect risk into classes as 1) market-associated: call for, financial and supply chain; 2) execution; 3) institutional Olsen and Osmundsen, (2005) illustrate the way to take the risk management of supply chain projects in construction. Ling and Hoi (2006), take the risks taken by the Singapore corporations whilst task construction work in India as an instance. The main risks encompass political and social, the high price of financing, changing currency trading charges, and massive cultural differences among foreigners and Indians.

The strategy of effective risk management can be defined as a significant element of succeeding management (Banaitiene and Banaitis 2012). It is important to examine and recognize the risk factors acting at the same time as they may lead it to the failure of any construction project (Raz et al.2002). He also indicates that too many project risks may cause construction project delays, high expenditure, inadequate project results or even failure.

Dey et al. (1994), identify the risk factors in India pipeline project namely; technical, financial, economic and political; natural; legalrequirement. The risk factors are identified at the work-package level, and their effects are assessed using the Analytic Hierarchy Process, because of the subjective nature of risk factors.

Table-2.7 shows risk as CSF and its various variables as identified in the literature.

Table 2.7: Critical Success Factors and Variables- Risk

Source	Fund Availability	Political/ bureaucratic influences	Financial Capacity	Price escalation	weather condition	Inflation Currency	Order change	Rework	Insufficient tools	unqualified worker	Poor site management	Suspension of work	Government Policies	Law and Regulation	Shortage of resource	Insufficient survey	Appropriate risk allocation
Al-Momani (2000);					√				√								
Assaf and Al-Hejji (2006)					√					√		√				√	
Bhattacharyya & Dey (2007),	√					√				√					√		
Betty and Joseph (2017),	√						√	√							√		
Chan, and Kumaraswamy (1997)					√		√			√				√			
Chan et al. (2004)					√	√	√			√				√			
Doloi, et al., (2012)		√	√	√	√		√	√	√	√							
Gardezia et al., (2013)	√	√	√	√	√	√											
Gunduz et al, (2013)								√		√							
Polat et al., (2014)			√		√	√	√										
Gebrehiwet and Luo, (2017)	√	√			√		√	√		√							
Hwang et al. (2013)									√								
Hung and, Wang (2016)				√		√		√									

Jha, and Iyer (2006),		√														
Alsuliman (2019),			√			√										
Long et al. (2004)					√											
Marzaouk and Rasas (2014)			√		√	√	√			√		√				
Niazai, and Gidado (2012)		√	√				√	√		√	√	√				
Nundwea&Mulengab (2017)			√		√	√	√			√						
Nallathiga (2017)						√										
Ogunlana et al. (1996)					√											
Patil et al. (2013)							√					√			√		
Pall, et al. (2016)				√			√									
Semple et al. (1994)					√											
Shenhar et al., (2001)							√	√						√	√		
Sweis et al. (2008)					√											
Salama et al (2008)				√			√								√		
Saraf (2015)								√			√				√		
Saleh et al., (2015)										√							
Sadeghi et al., (2016)		√		√		√											
Shing et al., (2018)				√	√			√								√	
Tang (2015)		√											√	√	√		
Yang (2009)																	√
Zhao et al (2010)										√							

2.8.3 Contract as CSF

Contract management comprises creating and controlling the existing pattern of an agreement from statement to its end through the deliberate and methodical coordination of assets and procedures helpful for risk control and finance streamlining (Leveau 2013). Taking into account the contract specialists, contract the administrators are characterized as a movement of drafting and accomplishing concurrence on contract terms and conditions, with the point of guaranteeing the gatherings will actualize the terms and states of the agreement during the execution phase of the contract. Simultaneously, contract management exercises spread the planning time frame as well as remember the executive's exercise for changes in the extent of duties of the gatherings at the hour of agreement usage for which would be concurred and reported in the contract alteration. In rundown, contract management is a deliberate procedure in setting up an agreement until the settlement of the contracting issue of a project (Sudirman et al. 2018).

Cleland and Bidanda (2009), citing that during a very associated and serious worldwide, most projects need to highlight in a domain that cooperates with joint endeavours, coalitions, global sourcing, subcontractors and multifaceted supplier relations. Associations with outside organizations are controlled through agreements. Notably, organizations offer services or variables dependent on the impacts of direct contract dealings with the customer. One of the most vital factors in setting up a proposal and assessing the expense and benefit of a project is the sort of contract foreseen.

Smith (1995), states that the key decisions for contract strategy are considered as 1) the project properties, 2) organizational structure 3) contract type, 4) tenders' manner (Perry, 1985). The absolute most significant subjects to be considered for placing in a contracting strategy, in particular: 1) objectives, 2) organization system 3) risk distribution, 4) payment, 5) contract and 6) tendering method.

According to Costa (2009), the foundation of the contract as 1) bidding period the offering span is from the planning of offering records to offer to start. It give an acknowledgement among the proprietor and service providers, 2) Contract negotiations This period can be separated into two territories: 1) the underlying tender evaluation 2) approach to discuss destiny and sign-off. In conclusion, the two perspectives sign the contractors. The implementation segment of the contract is from signing the contract to the contract end. The contractors can acquire economic benefits consistent with the contract.

The association between contract management and project management is much closer, and this can be reflected in the PMBOK guide (PMI, 2008), NCMAA (National Contract Management Association's Annotated Guide) to CMBOK, (NCMA, 2006).

Contract management has strategic level importance for organizations as well as projects. The organization can increase control, effectiveness, and reduce costs for competitive advantages, through contract management. Itis applicable to all types of companies irrespective of size or function of the business. There are less revenue and high assets & service cost for the companies that fail to give attention to the contract process. Inadequate management of contracts approaches large danger-taking and masses of extra charges (Jaakkola 2004).

Effective contract management has emerged as a vital function to enhance profitability, assist compliance, and manage risk. It becomes necessary that the contracting activities are managed by a supply chain team as ineffective management leads to customer in-satisfaction and unwanted cost overruns (Kanchana et al.2018).

Construction companies should give higher priority to contract management to overcome risky and dangerous operating environments (Enshassi et al. 2008). A well defined and mature process of contract management can support in additional savings (Mossalam and Arafa, 2016).

Prager (1994) and Basheka (2013), assert that effective and aligned management besides contract monitoring help to enhance the value of goods as well as services with a reduction in procurement cost, consequently reaching three vast desires: 1) quality products and services, 2) prompt goods and services delivery, and 3) cost-effectiveness.

Davison and Sebastian (2009) and Oluka and Basheka (2013), explain the possibility of trouble in contract and contract that is most like to encounter the maximum problems. As an instance, in construction projects contracts, delays, change order, and the price havestatistically comparable risk of going on and is substantially much more likely to arise than that of the last issues, and that creation contracts are much more likely to face troubles than different varieties of contracts.

After literature review Table-2.8 shows the variables of contract factor.

Table-2.8: Critical Success Factors and Variables- Contract

Source	Payment		Drawing approvals	Legal disputes	Unclear Scope	Technical Specification	Penalties	Inspection and Testing	Delivery of Sites	clear statement	alternative dispute	Force Majeure	Type of Contract	Material Delivery	contract documents	ROW's (Right of Way)
Aboushiwa& Bower (2000)													√			
Assaf and Al-Hejji (2006)			√	√				√					√			
Adwan and Soufi (2016)															√	
Bhattacharyya & Dey (2007)				√												

Chan, and Kumaraswamy (1997)				√												
Cheng et al. (2000)													√			
Chan et al. (2004)				√						√						
Doloi, et al., (2012)	√		√			√		√						√		
Gardezia et al., (2013)	√		√	√												
Gunduz et al, (2013)			√			√										
Polat et al., (2014)	√				√	√	√									
Gebrehiwet and Luo, (2017)			√						√	√	√	√				
Hung and, Wang (2016)					√			√					√			
Jha, and Iyer (2006),					√											
Song et al., (2013)				√												
Jayasudha&Vidivelli (2016)															√	
Alsuliman (2019),				√					√							
Marzaouk and Rasas (2014)			√			√	√									
Naoum et al., (2004)					√											
Niazai, and Gidado (2012)	√					√	√						√	√		
Nundwea&Mulengab (2017),			√			√										
Nie-Jia Yau and Jyh-Bin Yang's (2012),						√			√							
Pillai and Kannan (2001)							√									
Patil et al (2013),					√			√	√							

Pall, et al. (2016)									√				√			
Osorio et al (2014)										√						
Shenhar et al., (2001)	√		√			√										
Sepasgozar et al (2006)																√
Salama et al (2008)							√	√								
Shing et al., (2018)						√								√		
Tang (2015)	√															
Yang (2009)										√						
Tsiga et al., (2017)					√								√			

2.8.4 Stakeholder as CSF

The way toward engaging stakeholders incorporates distinguishingly and classifying them; acquiring detailed information regarding them; perceiving their aims and objectives in a project; characterizing their strengths and shortcomings; recognizing their strategies; estimating their conduct just as creating and affecting a system for overseeing them (Cleland, 2002). Stakeholder engagement, retainment and management have been so much underlined in construction projects (Abdullah et al. 2010; El-Dirabyet al. 2006; Landin and Olander, 2005; Newcombe, 2003, Thomas et al. 2000).

Stakeholder management is significant in project management with a project can be viewed as an impermanent association of stakeholders to make something together. Stakeholders are people, group or organization with a personal stake in the project, and who can influence its result (Littau et al. 2010) and Stakeholder Management is characterized as a procedure wherein the project team deals with the requirements of stakeholders, recognizing them, gathering their desires, closing concurrences with them, and guaranteeing that their objective is met (Rajablu et al. 2015). Stakeholder management has animated consideration in professionals and scholastics as a significant way to accomplish

project targets. The connection between the project supervisor and project stakeholders came to have a more prominent accentuation to the degree that the more instrumental methodology of stakeholder management does not bring about an improvement in the impression of project success (Achterkamp and Vos, 2008; Bourne, 2015; Heravi et al. 2015; Mok et al. 2014; Olander and Landin, 2005; Rajablu et al. 2015).

Mitchell et al. (1997), propose to order stakeholders dependent on the need of their contending claims through the Salience model. stakeholders can be distinguished from three traits: 1) the intensity of stakeholders to impact the project, 2) the authenticity of the stakeholders' relationship with the project, and 3) the earnestness of stakeholder's requests in the project. Accordingly, the saliency of stakeholders is identified with the view of the administration with regards to the nearness or the blend of these three properties.

Landin (2000), thinks that "the long-term execution of any construction project and its ability to satisfy stakeholders" rely on the choices and the consideration of choices taken by method for leaders in encouraging stakeholder correspondence. Aaltonen et al (2008) express that the major challenge in a project for stakeholder management is the managing of the connections among the project team members and project stakeholders. These referred to as CSFs of stakeholder management, yet further confirmation is required by taking quantitative and subjective investigations.

Karlsen (2008),affirm that five (5) factors essential forthearrangement of connections among project team and stakeholders. Karlsen et al. (2008), recognize fourteen factors, generally significant for building the trust of project team members on the stakeholders and vice-versa. Since the managing stakeholder connections are intrinsic to significance to stakeholder management, the examination appears to be essential.

Karlsen (2008), from an experimental examination planned for investigating CSFs for building trust in project stakeholder connections, recognized solid conduct; great correspondence; earnestness; ability; uprightness; duty and kindness in a specific order.

Following stakeholder management literature analysis, Yang (2009), recognize; managing stakeholders with social duties (monetary, lawful, ecological and moral); Formulating an away from of project missions; Identifying stakeholder appropriately; an Understanding territory of stakeholder' inclinations; Exploring stakeholder' needs and limitations to projects; Assessing stakeholder' conduct; Predicting the impact of stakeholder precisely; Assessing qualities of stakeholder; Examining clashes as well as alliances amongst stakeholder; Negotiating clashes between stakeholders successfully; retaining and advancing great connections; Formulating fitting procedures to oversee stakeholders; Predicting stakeholders' responses for executing the techniques; Analyzing the difference in stakeholders' impact and connections during the project procedure; Communicating with and drawing in stakeholder appropriately and much of the time as fifteen CSFs.

Yang et al. (2009), examine and define fifteen (15) aspects and eventually grouped these into three main success factors. These factors are 1) managing and handling stakeholders with economic, environmental, legal, and ethical responsibilities, 2) identifying and analyzing stakeholders' requirements, and 3) line of connection or communication along with the players of projects, engaging professionals such as stakeholders, completely and more often.

Eyiah-Botwe et al., (2016), identify 35 stakeholder critical success factors into seven groups in the Ghana construction project. The seven groups mainly, 1) Initial conditions, 2) Initial stakeholder credentials, 3) identification of stakeholder, 4) Stakeholder assessment (classification and prioritization), 5) Stakeholder commitment 6) assessment 7) support.

Nwachukwu et al. (2017), recognize thirty-two (32) success factors for stakeholder management composed under PESTLE (political, economic, social, technologies, legal and environmental factors), however, the ones that do not fit into any of the orders are assigned to others. Omar EI-Naway (2015), found thirty (30) factors of stakeholder control for

accomplishing research, the factors are protected into six organizations namely; 1) Precondition, 2) assessment, 3) identification, 4) Decision making, 5) a General factor group, and 6) Continuous support.

After literature review, Table-2.9 shows the variables of stakeholder factor.

Table 2.9: Critical Success Factors and Variables- Stakeholder

Source	Understanding Stakeholder	Conflict	Communication & Coordination	Local Public	Top Management Support	Managing stakeholders with social responsibilities	stakeholder reactions strategies	Community Engagement	stakeholders' needs
Aboushiwa& Bower (2000)				√					
Al-Momani (2000)				√					
Adenikinju, (2005).								√	
Adwan and Soufi (2016)			√						
Bhattacharyya & Dey (2007)		√							
Bakar et al. (2009)					√				
Chan, and Kumaraswamy (1997)	√			√		√			
Cheng et al. (2000)		√	√		√				
Chan et al. (2004)				√					
Doloi, et al., (2012)		√							
Eyiah-Botwe, et al., (2016)	√	√					√		
Gardezia et al. (2013)		√							
Gunduz et al. (2013)		√	√						
Gebrehiwet and Luo, (2017)	√	√				√			

Hermawati and Rosaira (2017)				√					
Iyer et al. (2005)								√	
Jha, and Iyer (2006)		√	√		√				
Jing et al. (2009)									√
Alsuliman (2019)		√							
Long et al. (2004);				√					
Marzaouk and Rasas (2014)			√						
Maqbool et al. (2018)								√	
Niazai, and Gidado (2012)		√							
Nallathiga (2017)				√					
Nundwea&Mulengab (2017)	√		√						
Ogunlana et al. (1996)				√					
Patil et al. (2013)					√	√			
Semple et al. (1994)				√					
Shenhar et al., (2001)			√						
Samson and Lema (2002								√	
Sweis et al. (2008)				√					
Saleh et al., (2015)	√								
Samsudin, and Hasaman, (2017),					√				
Yang (2009)	√					√			
Tsiga et al., (2017)	√	√				√			

2.8.5 Information Technology as CSF

The earliest work which brings out the function of Information Technology on the competitiveness of business organizations and way specific factors of a value chain can be

organized otherwise through the use of Information Technology is through Michael Porter (Porter 1985).

Inside the wake of the Indian Electricity Act 2003, the complexity and demanding situations of the energy region have accelerated various areas. The act entreats the philosophy of competition, liberalization, and commercial targets vis-a-vis the social worries even greater. In the current enterprise surroundings, utilities ought to redevelop and automate their enterprise strategies for sustainable increase and survival along with the following targets:

- Potential constructing and operational performance
- Business manner performance
- ATC loss reduction
- Metering, billing, and collection efficiency
- Overall strength accounting
- Better customer family members and consumer pleasure.

The adoption of today's and first-class-of-breed generation is essential to fulfilling the above goals. Hence, the information technology is recognized as the primary thrust area to spearhead our country’s agenda of energy reforms, despite the difficulties confronted due to the gradual absorption of recent technology.

Afterwards, the proper information and details became tougher and cannot be defined as simple gear which includes Critical Path Method (CPM) charts, bar charts, Earned Value (EV) curves, and many others. Therefore, the development agencies are asked to use the current task control gear based completely on the information technology used for effective tracking. Aitkens (2000), also mention that the quantitative and authentic records have to be automated to prompt training, assimilation and collation. Despite the fact, construction is a technology and it doesn't use IT. According to Jean-Marc et al. (2006), the construction

sectors use large-scaled information for decision-making processes, however, they do not use furthermore information available anywhere such as the internet and extra software packages. Aitken (2000), states that there is a massive sort of SPM product, for use appropriately in keeping track of systems. Other than problematic SS curves along with network charts, to monitor exercise nowadays has come to be superior to the superior usage of state-of-the-art IT (Information Technology) tools. It enhances the coordination and communique among various project teams, members, and participants. This also increases the rate of communication as well as reduces the required documentation mistakes. Lee et al. (2007), examine that the process of the budget in Korean companies can be identified in following factors related to the delay services and waste on the prioritized processes 1) budget estimation variation between the office and field, 2) inappropriate calculations, 3) constraint and insufficient budget. (Lee et al, 2007)

This is authentic to various mediums and massive construction organizations and may be success over by developing standardized IT gear throughout numerous departments. Additionally, the idea of utilizing the WWW in construction turned out to be originally hypothesized by Walker and Betts in the year 1997 (Nitithamyong and Skibniewski, 2006). Presently the possibility of the net and its related innovations are being studied for ground-breaking usage of construction projects. Regularly, enormous creation projects are put in faraway regions, wherein discussion techniques are compelled. In such a situation the part of the WWW made successfully reduces wastefulness in a report and builds the adequacy in forcing the creation plans and control. In such a circumstance the WWW made viably lessens the wastefulness in correspondence and builds the adequacy in actualizing the proper planning and control. In such a circumstance the WWW created adequately diminishes the wastefulness in correspondence and expands the viability in executing the strategic planning, monitoring, and overall control. Nitithamyong and Skibniewski (2006), call attention to how the enormous utilization of IT innovation has been used by big organizations for an incredible following of construction projects. Likewise, Peansupap and Walker (2005), quote "ICT is recognized as a viable facilitator for improving data

reconciliation." They notice that WPMS vows to upgrade the construction project documentation. Engineering News reports also called ENR reports verified whether there is a remarkable augmentation in the use of WPMS. The major objective for such Information technology platform usage in order to enhance the effectiveness and certainty of project outcomes in the planning and controlling process. But, various industry exercises in terms of utilization of IT-based equipment in project control majors can enhance the effectiveness of the venture implementation. Nitithamyong and Skibniewski (2006), state that separated from PMASP there must be equivalent significance to different factors, for example, procedure, staff, and team management. Additionally, the adequacy of PM-ASP's isn't yet as high as at first expected, mostly due to vulnerability about measures that are ought to be utilized to assess framework execution.

Caralli (2004), examines and discusses the idea of operational-unit Critical Success Factors, which focuses on the contributions which an entity tends to guide the overall desires and undertaking of an enterprise, and stands in support of operational units in the IT strategy context. Ugwu et al. (2003), identify four critical success factors for Information Technology for the sustainability of construction sector projects. The variables are; 1) data modelling, statistics and user requirement extraction (i.e. Developing sustainability ontology), 2) persistent information and statistics storage using database management gadget, 3) analytical equipment for computational evaluation and evaluation of the sustainability of design proposals, 4) gadget integrations (i.e. Information-responsibilities-and manner-stage integration) to decorate collaborated operating and sustainability information management in organizational contexts.

Adwan and Soufi (2016), identify, 22 sets of construction tasks through information technology inclusive of, 1) business procedure and strategy, 2) collaboration, communication, and information sharing, 3) cost, 4) financial, 5) budget,6) estimation and accounting, 7) data and information modelling, 8) selection making, 9) layout drawing, 10) integration and optimization, 11) document management, 12) E-commerce, 13)

educational and training, 14) environmental, 15) HR Management, 16) knowledge management, 17) marketing and presentation, 18) production, 19) performance and quality assurance, 20) project planning and management, 21) safety, 22) health and maintenance, and another subset of 6 proposals including, 1) delineation of digital images, 2) digital town, 3)Standardization, 4) assignment management, 5)time-saving and research development.

Kagioglou et al. (2000), proposed an IT-enabled document system called the “legacy archive” so one can report and assess project information at a section of the project or the reason that understanding is diagnosed as the key useful resource. Information technology has made its way into the scene of sustainability, in the form of assessment tools.

Skyrius (2001), underlines the decision producer's mentalities towards various affecting the high-caliber of business venture decisions; these variables incorporate measurement sources, expository devices, and the situation of statistics technology. Handzic (2001), additionally can pay attention to the impact of records availability on human being’s capability to manoeuver and use information in quick and long-time period making plans and in decision-making responsibilities. He discovers that the higher the provision of records, the better the effect on both performance and accuracy of business selections.

Meredith and Mantel (2006), locate that using ITeffectssolving all problems, at some point of venture existence cycle stages, by way of providing essential computer software, undertaking management software program together with, which may additionally support in lowering the time and fee which are required to apply specific clarifications for task making plans. Consequently, outlets furnish greater aid for the major stages of the project existence cycle consisting of venture risk management and create knowledge to strengthen the workforce (Ahlemann 2007).

Akram Jalal Karim (2011), cite interdependence among IT and project management has reached its maximum degree for decades. It givesavariety of project management packages

and the adoption of numerous management answers such as “Executive Support System (ESS), Decision Support System (DSS), Knowledge Management System (KMS), Management Information System (MIS), Supply Chain Management (SCM), Business Intelligent Systems(BIS), virtual reality (VR), and risk management (RM)”.

After literature review, Table-2.10 shows the variables of Information Technology

Table 2.10: Critical Success Factors and Variables- Information Technology

Source	Decision	Design	Planning	Material Procurement	E-Tendering	MIS	Integration and Optimization	Budget Tracking	Network
Argyris, (1971)						√			
Aigbavboa and Thwala, (2014)				√					
Adwan and Soufi (2016)					√	√	√		
Bali and Apte (2014),				√					
Chan, Kumaraswamy (1997);		√		√					
Chan et al. (2004)		√		√					
Eyiah-Botwe, et al. (2016)				√					
Gardezia et al., (2013)	√	√	√						
Gunduz et al, (2013)		√							
Gul polat et al., (2014)	√	√		√					
Gebrehiwet and Luo (2017)	√			√					
Hermawati and Rosaira (2017)	√								√
Jha, and Iyer (2006)	√								
Song et al., (2013)	√								
Kagioglou et al. (2000)	√								

Lee et al. (2007)								√	
Marzaouk and Rasas (2014)	√								
Niazai, and Gidado (2012)	√			√					
Nundwea&Mulengab (2017),	√								
Nie-Jia Yau and Jyh-Bin Yang's (2012),							√		
Pall et al., 2016,						√			
Shing et al., (2018)				√					
Tang (2015)				√					

2.9 "RESEARCH GAP"

The section provides a detailed summary of findings on the significance and need for the research on 'CSFs' of PT projects undertaken by EPC contracting companies. The characteristics and challenges vary from project to project. Studies in the past either in India or anywhere across the world have explained the failure factors instead of success factors for power transmission projects that also very few studies. The Table-2.11shows identified research Gaps in CSFs and success of PT Project Success.

Even though there are common characteristics for projects in construction, across the world, the projects are affected and represented by nation explicit conditions, which should be figured out and investigated (Olawale and Sun, 2010). Although there have been numerous investigations to evaluate the reasons for delays in projects, there has been exceptionally constrained research work completed on the success factors topic in India in the set-up. After reviewing the existing literature, it is discovered that there is no particular research directedtowords the Critical Success Factors of PT projects with the strategy as an independent factor for the project success. Past studies concentrated on CSFs like; "team factors, contractor factor, consultant factor, material factor, labor factor, communication

factor, the organizational factor". The analysis of literature identified the major gap as given below:

- In the past literature the success of PT projects has not been studied with respect to strategy, risk, contract, stakeholder and information technology as the CSFs
- There is no study in PT project taking strategy as an independent factor.
- There is no study on PT projects in public and private organization in India.
- No research is taken to show the interrelationship of project success factors and moderator and/or mediator impact of CSFs on the association between strategy and project success.
- There is no holistic framework for PT projects which can be considered as standard like other project management practices.

Summarized the factors are; strategy, risk, contract, stakeholder and information technology, which are not discussed earlier, mentioned in Table-2.11.

Table-2.11: Identified Research Gaps in Critical Success Factors and PT Project Success

S. No.	Author	Location	Research Variable/CSFs	Interference/ Impact	Gaps/Remarks
1	Bhattacharyya and Dey (2007)	India	1) political, 2) financial, 3) economic, 4) legal and regulatory framework, 5) management failure	Managing Risk in rural electrification in India	No interrelation is shown between factors/variables
2	Choudhury (2014)	India	1) conception and feasibility studies, 2) project planning,3) bidding and contracting 4) project implementation	Information System in Thermal Power Station in India	Case Study
3	Chiu and, Lai (2017)	Hong Kong	1) customer, 2) design team, 3) main servicer, 4) electrical contractor, 5) workforce, 6) apparatus, 7) system performance, 8) statutory submission and inspections, 9) external,10) contractual relationships	Delay impact in electrical construction project in Hong Kong	No interrelation is shown between factors/variables. Study not in India

4	Divi and, Sundara (2017)	India	1) investment criteria at present situation; 2) sales; 3) owner; 4) contractor; 5) labour; 6) materials, equipment; 7) site, third party; 8) consultant	Delay impact in construction project in India	No interrelation is shown between factors/variables.
5	Dong et al (2019),	China	1)society and environment, 2) economy, 3) resources technology, 4) enterprise management, and 5) market	Sustainable development in power generation project in China	No Mediator and Moderator impact analysis with independent factor strategy. Study not in India
6	Hermawati and Rosaira (2017)	Indonesia	1) planning, 2) community 3) communication and beneficiaries, 4) technology 5) project management 6) stakeholders support and network development.	Success factors of renewable energy project in rural areas in Indonesia	No Empirical analysis Study not in India
7	Mokan, et al. (2019)	Not Specified	1) economic, 2) environment, 3) social, 4) technology, 5) government, 6) organization and management	Critical success factors implication in renewable energy projects	No Empirical Analysis
8	Mohammed, and Alshaoush, (2018)	Arabia	1) investment 2) economic viability ,3) procurement, 4) contractual arrangement, 5) administration and management, 6) risks, 7) technical	Critical success factors implication in PPP electric project in Saudi Arabia	No interrelation is shown between factors/variables. Study not in India
9	Maqboo, et al. (2018)	Pakistan	1) communication, 2) team, 3) technical, 4) organizational, 5) environmental	Critical Success factor impact and relation in renewable energy project in Pakistan	No Moderator impact analysis with independent factor strategy. Study not in India
10	Nundwea, and Mulengab (2017)	Zambia	1) late advance payments, 2) financial mismanagement by the contractor, and 3) irregular payments to sub-contractors	Delay impact in power transmission project in Zambia	No interrelation is shown between factors/variables. Study not in India

11	Osorio (2014),	Brazil	usefulness and efficiency	CSFs influence in project management in Energy company in Brazil	No Mediator and Moderator impact analysis with independent factor strategyStudy not in India
12	Pall et al. (2016)	Not Specified	1)administrative2) employer 3) servicer 4) advisor, 5) sketch, 6) material, 7) apparatus, 8) worker, 9) miscellaneous	Delay factors in power transmission project	No Empirical analysis
13	Pall et al. (2019)	Bangladesh	1)sector-specific ,2) general, 3) administrative,4) employer/owner ,5) contractor, 6) consultant, 7) materials, 8) equipment, 9) labour/worker, 10) external/unavoidable	Delay factors influence in power transmission project	No Mediator and Moderator impact analysis with independent factor strategy
14	Saleh, et al. (2015)	Malaysia	1) strategic management 2) energy admin team, 3) stakeholder 4) cognizance 5) risk administration.	Critical Success factors in energy management sustainability in Malaysian universities	No Empirical Analysis
15	Yau and Yang (2012)	Taiwan	1) contract, 2) client, 3) turnkey contractor, 4) government, 5) others.	Delay factors influence delay schedule in power distribution project in Taiwan	No interrelation is shown between factors/variables. Study not in India
16	Zhao et al. (2010)	China	1) viability, 2) set-up, 3) company, 4) servicer 5) suppliers	Critical success factors influence in BOT power project in China	No interrelation is shown between factors/variables. Study not in India
17	Zhao and Chen (2018)	China	(1) resource grant (2) generation method (3) renewable energy demand, (4) renewable energy accommodation (5) investment (6) admin policies, (7) economical benefits (8) environment effect (9) social	Critical Success factors impact in renewable energy project in China	No interrelation is shown between factors/variables. Study not in India

18	Odeh and Battaineh (2002)	Iran	1) customer,2) servicer,3) advisor,4) material ,5) workforce & apparatus ,6) contract,7) predetermined agreement relationships,8) miscellaneous	Traditional contract is cause for delay in construction project in Iran	No interrelation is shown between factors/variables. Study not in India
19	Albert et al. (2004)	Not Specified	1) human, 2) project,3) project strategy, 4) project management effort, and 5) outside situation.	Success factors influencing in construction project	No Empirical analysis
20	Assaf and Hejji (2006)	Saudi Arbia	1) workforce ,2) service provider,3) project,4) customer,5) advisor,6) plan,7) engineering group,8) materials,9) others	Factor influence -delay in construction project in Saudi Arabia	No interrelation is shown between factors/variables. Study not in India
21	Atul and Martin (2008)	India	1) government policies such as excessive bureaucracy,2) inferior execution of projects, 3) low quality and below standards, 4) personal stake,5) corruption & lack of transparency	Factors influence-construction project management in India	No interrelation is shown between factors/variables.
22	Alsuliman (2019)	Saudi	1) before the award of tenders, 2) during the award of tenders, 3) after the awards of tender and 4) general.	Factors that cause delay in construction project in Saudi Arabia	No interrelation is shown between factors/variables.Study not in India
23	Buertey, et al. (2014)	Ghana	1)customer, 2) servicer,3) advisor, 4) material, 5) apparatus, 6) workforce, 7) finance and 8) miscellaneous	Factors for delay in construction project in Ghana	No interrelation is shown between factors/variables. Study not in India
24	Bekr, (2015)	Iraq	1)customer, 2) servicer, 3) advisor and 4) miscellaneous	Factors for delay in construction project in Iraq	No interrelation is shown between factors/variables. Study not in India

25	Doloi, et al., (2012)	India	(1) deficit promise, (2) incompetent location management, (3) bad location organization, (4) inappropriate plan, (5) deficit project scope, (6) absence of communiqué, and (7) insufficient contract.	Factors impact in Indian construction project	No Mediator and Moderator impact analysis with independent factor strategy
26	Doloi, (2013)	Australian	1) agreement, 2) project management team, 3) quality, 4) plan and 5) servicer	Key stakeholders' role in construction project in Australia	No Mediator and Moderator impact analysis with independent factor strategy Study not in India
27	Dinesh (2016)	India	1) customer ,2) servicer,3) advisor, 4) engineer, 5) workforce, 6) material,7) apparatus, 8) outside	Delay Factor influence in construction project in India	No interrelation is shown between factors/variables.
28	Enshassi (2009)	Gaza	1)budgett,2) timeline ,3) quality, 4) productivity, 5) customer contentment,6) public contentment, 7) people ,8) health, 9) innovation, 10) environmental	Factors influence construction project management in Gaza	No interrelation is shown between factors/variables. Study not in India
29	Eyiah-Botwe, et al. (2016)	Ghana	1) pre-conditions (external factors), 2) pre-stakeholder recognition, 3) stakeholder recognition, 4) stakeholder evaluation (classification and prioritization), 5) stakeholder assignation 6) application, 7) monitor and evaluation, 8) constant support	Stakeholder success factor influence Stakeholder management in Ghana	No interrelation is shown between factors/variables. Study not in India
30	Gunduz et al. (2013)	Turkey	1) advisor, 2) servicer, 3) engineer, 4) apparatus, 5) externality, 6) workforce, 7) material, 8) customer, and 9) project.	Delay Factor influence in construction project in Turkey	No interrelation is shown between factors/variables. Study not in India

31	Gardezia, et al. (2014)	Pakistan	1) customer, 2) servicer, 3) advisor, 4) material, 5) workforce & apparatus, 6) contract and 7) others	Time extension factors influence in construction project in Pakistan	No interrelation is shown between factors/variables. Study not in India
32	Gebrehiwet and HanbinLuo (2017)	Ethiopian	1)accountability,2) resource,3) finance,4) contract condition	Delay Factor influence in construction project in Ethiopian	Mediator and Moderator impact analysis with independent factor strategy Study not in India
33	Hwang and Lim (2013)	Singapore	1) project features, 2) contractual measures, 3) project stakeholders, and 4) communicating processes.	Key factor influences in construction project in Singapore	Case study Study in India
34	Jha and Iyer (2006)	India	1) capability of pm, 2) assist of upper management, 3)monitor and response by project stakeholder, 4)communication between project stakeholder, 5) ability of customer, 6)disagreement among project stakeholders, 7)inadequate climate, 8) unawareness and absence of knowledge of pm, 9) deficit concepts 10) project specific factors, 11)tender competition	Delay Factor influence in construction project in Ethiopian	No interrelation is shown between factors/variables.Study not in India

35	Jha, and Iyer (2006)	India	1) capability of pm, 2) startegic level help 3) monitor, response and direction, 4) advantageous working atmosphere, 5) obligation of all project stakeholders, and 6) capability of customer. failure:1) conflict among project stakeholder, 2) inexperience of project manager 3) aggressive socioeconomic environment, 4) ineffectiveness of customer, 5) inconclusiveness project stakeholder, 6) adverse climatic condition at site, and 7) project definite factor.	Factors influencing quality performance in construction project in India	Mediator and Moderator impact analysis with independent factor strategy
36	Jolowo et al. (2014)	Malaysia	1)project management tools & techniques,2) stakeholder (customer), 3) stakeholder (project team manager),4) project factors,5) project procurement,6) others	Factors influencing schedule performance in construction project in India	Mediator and Moderator impact analysis with independent factor strategy
37	Jayasudha and Vidivelli (2016)	India	1)methodical ,2) period ,3) erection, 4) design,5) legal, 6) market,7) management,8) financial, 9) policy and political, 10) environmental, 11) community risk, 12) safety, and 13) practical risk.	Factors influencing in construction project in Malaysia	No interrelation is shown between factors/variables. Study not in India
38	Kanchana and, Janani (2018)	India	1) schedule / budget, 2) stakeholder knowledge, 3) financial, 4) bidding situations, 5) project features, 6) assessing process	Risk factor influence in construction project in India	No interrelation is shown between factors/variables.
39	Marzouk and, El-Rasas (2014)	Egyptian	1) customer, 2) advisor, 3) servicer, 4) material, 5) workforce & apparatus, 6) project, 7) miscellaneous	Factor impact on construction project in India	No interrelation is shown between factors/variables.

40	Ugwu, and Kumaraswamy (2006)	China	1) upper management assist /promise/accountability & direction,2) capability of project team,3) teamwork within interdepartmental, 4) clear goals and objectives, 5) undeveloped interdepartmental communication	Causes of delay in construction project in Egypt	No interrelation is shown between factors/variables. Study not in India
41	Niazai and Gidado (2012)	Afghanistan	1) service provider, 2) engineer, 3) materials, 4) workforce, 5) advisor, 6) apparatus, 7) customer, 8) others, 9) project.	Information Technology factors influence in construction project in China	No interrelation is shown between factors/variables. Study not in India
42	Norizam and Malek (2017)	Malaysia	1)mixing, 2) scope, 3) time, 4) cost management, 5) quality, 6) people, 7) risk	Causes of delay in construction project in Afghanistan	No interrelation is shown between factors/variables.Study not in India
43	Olajide, et al. (2013)	Nigeria	1)material, 2) workforce ,3) apparatus, 4) finance, 5) servicer ,6) customer, 7) advisor	Critical success factors influence in construction project in Malaysia	No interrelation is shown between factors/variables. Study not in India
44	Onyango et al. (2017)	Kenya	1) government policies,2) funding process, 3) participatory planning process	Delay factor influence in construction project in Nigeria	No interrelation is shown between factors/variables. Study not in India
45	Shen et al., (2001)	China	1)financial, 2) legal, 3) management, 4) market,5) policy and political ,6) technical	Critical success factor impact and relation in construction project in Kenya	Mediator and Moderator impact analysis with independent factor strategy Study not in India

46	Samad and Sepasgozar et al. (2006)	Iran	(1) servicer association, (2) shortage of workforce, (3) others, (4) lack of material, (5) reason of engineering, (6) customer, (7) knowledge constraint, (8) advisor and (9) project	Risk factor influence in construction project in China	No interrelation is shown between factors/variables. Study not in India
47	Venkatesh and Venkatesan (2017)	Malaysia	1) customer 2) advisor 3) architect, 4) servicer,5) miscellaneous	Delay factors influence in construction project in Iran	No interrelation is shown between factors/variables. Study not in India
48	Wiguna and Scott (2006)	Indonesian	1)outside and site condition, 2) economic and financial, 3) technical and contractual ,4) decision-making	Delay factors influence in construction project in Malaysia	No Empirical Analysis Study not in India
49	Dey, at al., (1994)	India	1) technological, 2) budgetary, 3) economic and political ,4) acts-of-god, 5) legal-need	Risk factors influence in building project in Indonesia	No Mediator and Moderator impact analysis with independent factor strategy
50	Fiberesima and Rani (2011)	Nigeria	1) completion in time,2) cost and 3) portfolio management strategy	Risk factor influence in Petroleum project in India	No Mediator and Moderator impact analysis with independent factor strategy
51	Fallahnejad (2013)	Iran	1) advisor, 2) service provider ,3) material, 4) external,5) correspondence,6) interface, 7) agreement, 8) work force and apparatus	Success factors impact in Nigerian Oil and Gas project	No Mediator and Moderator impact analysis with independent factor strategy Study not in India

52	Pham and Hadikusumo, (2014)	Vietnam	1) investment, 2) scope and agreement, 3) engineering, 4) purchase, 5) construction, and 6) creation	Reason of delay in pipeline project in Iran	No interrelation is shown between factors/variables. Study not in India
53	Ruqaishi and Bashir (2015)	Gulf country	1)owner, 2) service providers, 3) advisor,4) material, 5) work force and apparatus, 6) contract, 7) predetermined agreement and 8) others	Delay factor influence schedule performance in petrochemical project in Vietnam	No interrelation is shown between factors/variables. Study not in India
54	Redda, and Turner, (2018)	Not Specified	1) leadership & team capability, 2) front end load,3) outside situation and conformity, 4) effects on outside situation, 5) risk & quality and 6) connection with local source.	Reason of delay in Oil and Gas project in Gulf	No interrelation is shown between factors/variables.Study not in India
55	Salama et al. (2008)	UAE	1)delaying in procurement of long-lead components, 2) delay in material and equipment received at site ,3) lack of skill and knowledge of contractor, 4) substandard project management by servicer ,5) dearth of skilled and competent engineers	Success factors influence in Oil and Gas projects	No interrelation is shown between factors/variables. Study not in India
56	Tsiga et al., (2017)	United Kingdom	1)outside provocation, 2) skill and competence of customer ,3) assist of upper management, 4) official reasons ,5) project features, 6) capability of project manager, 7) project organization, 8) detail of predetermined agreement, 9) ability of project team, 10) project risk, 11) requirements	Reason of delay in Oil and Gas project in UAE	No interrelation is shown between factors/variables. Study not in India

57	Patil (2013)	India	1)customer ,2) servicer, 3) adviser and engineer, 4) workforce, 5) apparatus,6) material and 7) outside issue	Success factors influence in petroleum projects in United Kingdom	No Mediator and Moderator impact analysis with independent factor strategy Study not in India
58	Amoatey and Ankrah (2017)	Ghana	1)owner, 2) servicer,3) contributor	Reason of delay in transportation project in India	No interrelation is shown between factors/variables.
59	Nallathiga, et al. (2017)	India	1) plan, 2) purchase, 3) development and 4) erection, operation and maintenance	Critical factors influence in road project in Ghana	No interrelation is shown between factors/variables. Study not in India
60	Alaloul et al., (2016)	Malaysia	1) plan and time, 2) resource and contact administration ,3) archives and documents, 4) contract execution, 5) quality and value engineering,	Critical factors influence success/failure in road project in India	No Mediator and Moderator impact analysis with independent factor strategy
61	Pawar et al., (2016)	India	1)material,2) workforce, 3) apparatus, 4) engineering, 5) advisor, 6) servicer,7) customer, 8) project, 9) miscellaneous	Factor influence in building project in Malaysia	No interrelation is shown between factors/variables. Study not in India
62	Singh at al. (2018)	India	1) site, 2) apparatus, 3) administration, 4) execution procured & errors; 5) material, 6) skilled/unskilled worker, 7) unpredicted	Delay factor influence in residential project in India	No interrelation is shown between factors/variables.
63	Gupta et al., (2013)	India	1)predominant situation, 2) monetary practicality, 3) concessionaire association, 4) economic package, 5) risk distribution, 6) practical solution	Delay factor influence in residential project in India	No interrelation is shown between factors/variables.

64	Mackhaphon h N, and Jia G (2017)	Developing Countries	1)corruption,2) project resources,3) financial,4) social and culture ,5) outside situation,6) service provider ,7) technology and practical,8) project management expertise	Critical success factors influence in BOT project in India	No interrelation is shown between factors/variab les.
65	Pawar C S et al. (2015)	India	1) practical, 2) financial ,3) legal, 4) erection ,5) political, 6) engineering ,7) environmental ,8) predetermined agreement	Factors influence in Megaprojects in developing countries	No Empirical analysis
66	Song et al., (2013)	China	1) government decisionmaker, 2) government credit, 3) legal and policy, 4) procedural, 5) contract variation, 6) environment, 7) community obstruction, 8) msw supply, 9) payment, and 10) revenue risk	Risk factor influence in Infrastructure project in India	No interrelation is shown between factors/variab les.
67	Wai et al., (2013)	Malaysia	1) before execution, 2) during execution, 3) after execution,4) organizational ,5) the information, and 6) change	Risk factors influence in waste energy project in China	No interrelation is shown between factors/variab les. Study not in India
68	Yang et al., (2017),	China	1) viability of project, 2) supportive atmosphere, 3) strong project company, 4) genuine servicer and 5) good suppliers.	Success factors influence in social infrastructure projects in Malaysia	No interrelation is shown between factors/variab les. Study not in India

Table-2.12: CSFs of PT Projects after Gap Analysis

S. No.	Factor	Variables/Subfactors
1	Strategy	Leadership strategy
2		Bidding strategy
3		Effective cash Flow management strategy
4		Clear Objectives and understanding
5		Cohesive procurement strategy
6		Strategy of effective communication
7		Market intelligence strategy
8		Strategic execution plan aligns with project scope
9		Managing Risk Strategy

10		Communication strategy
11	Risk	Fund flow of client
12		Control of scope creeping
13		Team conflict resolution
14		Timely subcontractor payment
15		Opposition from social Bodies
16		Suspension of work
17		Accidents and safety
18		Avoid to Changes in design
19		Test list with less frequency
20		Stable Government
21		Shortage of construction material at project site
22		Geographical location of Project
23	Contract	Price variation clause
24		Payment terms
25		Realistic schedule
26		Type of Contract
27		Claims for time extension
28		Clear and unambiguity scope
29		Justified penalty clause
30		Dispute and Arbitration
31		Timely document and drawing approval
32		Force Majure clause
33	Stakeholder	Managing stakeholders
34		Trust of Stakeholder
35		Effectively resolving conflicts between stakeholders
36		Communicating with stakeholder
37		Early Identify, prioritize and engage key stakeholders
38		Top management support
39	Information Technology	E-tendering
40		Planning & monitoring
41		Energy Management and Control system
42		Network Management system
43		Decision support System

2.10 “THE CHAPTER SUMMARY”

The literature review quickly clarifies different ideas of ‘CSFs’ and the decision of industry, e.g., power sector project, construction project, oil-gas projects and other infrastructure projects yet, it is seen that the vast majority of the investigations are led to decide to delay factors in the Project. Hardly any significant investigations are led to critical

success factors identified with the PT project in India with the more extensive meaning of project success. The research is done explicitly to area India and PT projects to distinguish the CSFs that are quite certain variables just in a specific circumstance specifically kind of organization for example 'EPC contracting organizations. Likewise, when this research is started, the need and opportunity to lead a doctoral research concentrate right now rather than self-evidently. The need is felt for leading increasingly point by point investigation to examine the critical success factors identified with PT projects management in EPC ventures working in India and to form bits of knowledge into what comprises the accomplishment of a project. The present research centres on distinguishing the CSFs that are explicit to Indian PT project organizations working in India.

The investigation of the selected topic from existing literature on territories identifies with the research topic, it very well may be intelligently determined that the absence of strategy or absence of vision to actualize through the project is the major challenge looked by numerous organizations. Project success is characterized in various terms by various organizations, the vast majority of them identifying with the triple constraints. The clear linkage to the strategic objectives of the organization is not very evident in the literature. This prompts the end that, in numerous organizations, the strategy linked with project management isn't considered among the assorted management level. This hampers project success which hinders esteem creation for the organization in the medium to the long term.

Thus, the author intends to source this data by looking for information from experts. Since the experts of PT projects are the best reasons to offer responses, the researcher expects tosend a survey to chosen professionals in power sector project organizations. The results hence obtained can be further analyzed according to the research methodology described in chapter-3. For answering some questions, a questionnaire is developed (Appendix-A). The data collected are analyzed with the help of a qualitative method, and the following chapters thus discussed the complete details about the research methodology employed.

The review incorporated the study of different knowledge fields and maturity models and various processes. Figure 2.1. Show the information flow of the literature review, along with the arguments developed at each stage, and fixes the need for the succeeding information phase.

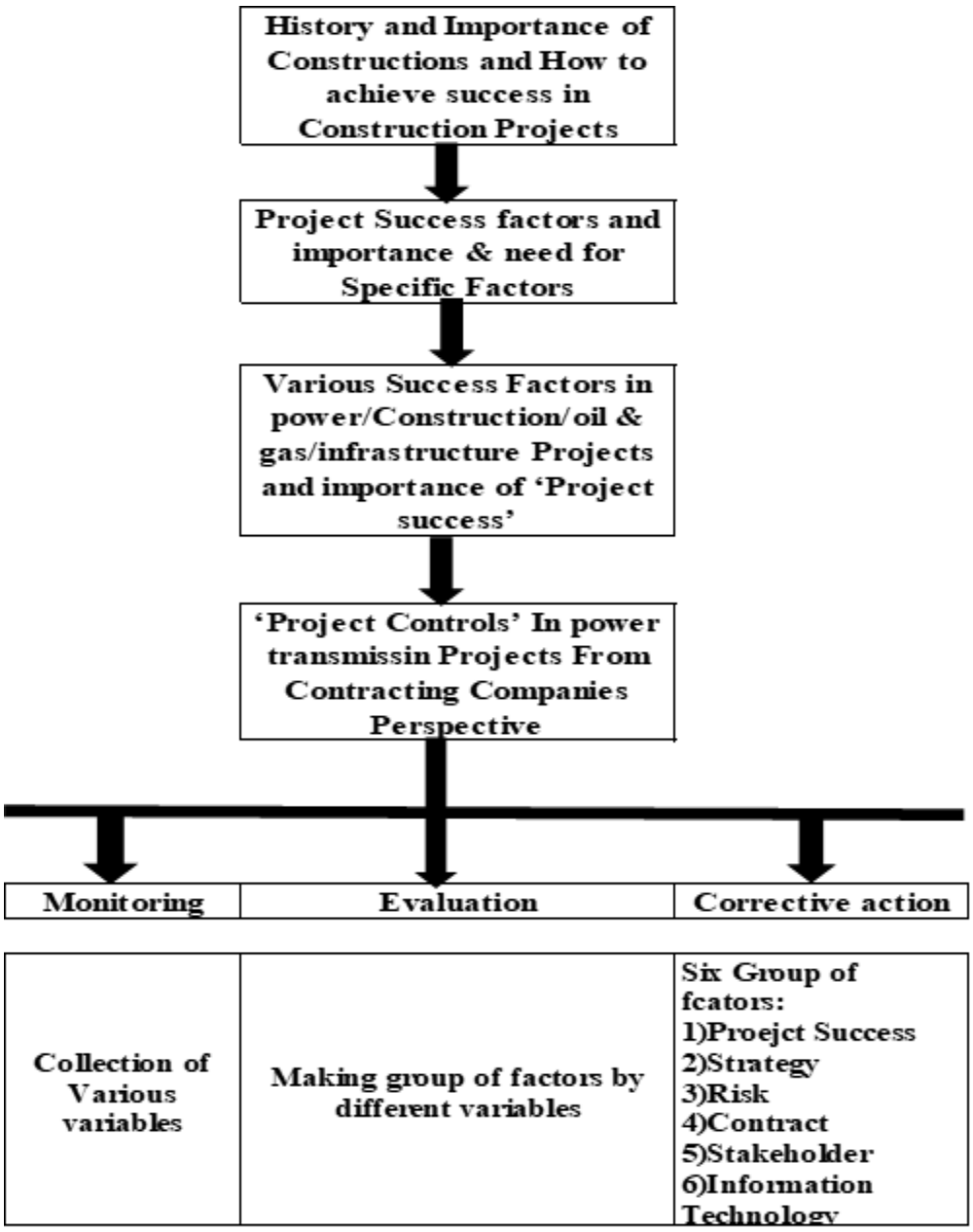

Figure-2.1: Literature Review Flow.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 “INTRODUCTION”

The research methodology is explained as step by step process, which is important for any type of objective and essential research. The creditability of findings of the research is also revealed bythequality of the research methodology being adopted and ethics being followed in the research. This chapter presents a detailed and efficient research methodology that would enable the readers to understand the entire process of research undertaken. The chapter begins with an introduction of the research design, followed by an explanation of the research design and strategy, questionnaire development and administration, overview of participating companies. The independent and dependent variables involved in the study are identified. Various statistical analysis methods, used for testing of hypotheses, are outlined in Chapter 1 are discussed.

3.2 “RESEARCH PHILOSOPHY”

Research philosophy deliversadirection to the researcher in order to take up the research, contributing a framework of required theories, methods of describing data (Collis and Hussey, 2003). Hence, the choosing philosophy is crucial for research design, collection of data and analysis. Nature of this study is precisely the positivist research philosophy because this research focuses on the power sector where factors of PT project are being analyzed by collecting and measuring the responses on a different scale.

In order to meet the objective of the research, which is, identification of CSFs of PT projects to further design a strategic framework of CSFs, the focus of the study is to ensure that the identified factors during the review of literature, which are important in the said objective, they are aligned with the actual practices follow the power sector and. Therefore, to design the framework, the related literature is reviewed, and factors that are important

for the project in hand are identified. Then the pre-test is performed using a questionnaire along with interview methodology. The response and observation of industry professionals are taken as input from the real world. The changes are incorporated to design the final model. For testing of the research hypotheses and the proposed framework, primary data is collected with the help of a survey method using the questionnaire. The collected data is analyzed using Factor Analysis, Multiple Regression analysis, and Pearson's correlation.

This philosophy contains quantifiable remarks for statistical enquiry carried out by the researcher asanobjective analyst.

3.3 "RESEARCH DESIGN"

The research question is industry-specific and deals with an area in the subject of project management (project success factors) which might vary from project to project. Keeping this in mind and being consistent with selected philosophy, an inductive research approach is considered. The research methodology chosen for the above study is entirely based on research questions. For this research, the researcher intends to observe specific power transmission projects studying various project success factors in order to build strategic frameworks. Hence as Hyde (2000), suggests inductive methodology is used for this research to develop a CSFs framework with the help of data collection from specific populations. This would mean that while making selections of organizations for data collection, the researcher looks at various aspects such as the categorization of organization, ranking, reputation, revenue, domain, along with the data quality which will be essential.

The above research is an attempt to understand the criteria of an organization to employ project success factors, and how other actions such as monitoring, correcting, and evaluating are implemented by many other projects leads or managers.The researcher

intends to collect quantitative data from various organizations fortheunderstanding of various practices of project management.

Initially, the study revolves around identifying the CSFs of PT project success in India. The identification is based on the literature review done, and the dynamics of CSFs are captured in this phase. So, this followed by an analysis of the review statistics to generate a valid CSFs assessment and design of the framework after hypothesis testing. The chapter explains the research methodology in details.

3.4 "STUDY DESCRIPTION"

The current research needs to identify, evaluate as well as to elucidate the CSFs of PT projects in India. Three main outcomes of the research include:

- Identification of CSFs as most relevant predictors of PT project success
- Impact of predictors and their association on project success of PT projects
- Critical success factor framework of PT projects

With the help of preliminary research, the main aim of the present research is designed; i.e. project success has been selected among the considerable researchs of power transmission. This shows that the relationship is established between CSFs and project success. However, there are very few or many be none researches done on "Power transmission projects in India", and hence the present study will be unique and acceptable. In order to execute the acknowledged needs, three research consequences are essential and vital:

1)The research confirmed CSFs of the project (that would deliberate project success and its drivers/predictors) the result of which through tested hypothesis could be changed into actionable work.

2)The next step is deemed necessary to identify the critical factors with their impact on project success.

3)The third step is to develop and validate CSFs framework of PS which provides an explanation to the cause as well as the effect of project success in power transmission project Engineering, procurement and construction (EPC)ventures. The project success critical factors and their comparative significance are to be acknowledged, besides the impact of CSFs on the project. In order to seek an answer to the dearth of the conjectural justification of project success and explain the CSFs construct, such a framework is premeditated.

3.4.1 The Research Framework

The research framework is shown in Figure 3.1. One dependent variable (DV) 'Project Success'is on the right side of the figure whereas 5 independent variables (IDVs) i.e. 'Strategy', 'Risk', 'Contract', 'Stakeholder'and 'Information Technology' factors. Sub-hypotheses are identified to test each IV-DV arrangement.

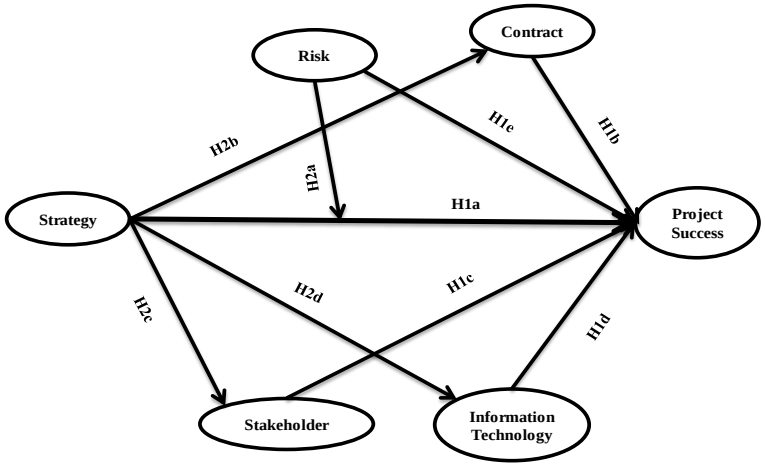

Figure 3.1: CSFs Research Framework

The CSFs framework establishes projects as those activities which are essential to achieve specific goals. The framework consists of six CSFs, easily remembered by the mnemonic "SCRIPS", where:

- '**S**' stands for strategy
- '**C**' stands for contract
- '**R**' stands for risk
- '**I**' stands for Information Technology
- '**P**' stands for project success
- '**S'** stands for stakeholder

3.4.2 The Variables

Dependent Variable

The intent of current research is giving a CSFs framework which depicts the PT project success. In this research, Project Success factor is considered the dependent variable. The overall Project Success is target DV in the study which is impacted by critical factors through their direct and indirect interactions with Project Success as depicted in Figure 3.1.

Independent Variables

The independent variables (IDVs) examined in CSFs framework are identified in Figure 3.1 and have direct, moderating and mediating impact on Project Success (DV). Each IDV is a group of dimension variables as given in Chapter 2- Table 2.12, which are identified as literature gap analysis. In this research Strategy, Risk, Contract, Stakeholder and Information Technology are considered as independent variables.

3.5 “RESEARCH SAMPLE”

3.5.1 Sampling Strategy

Random sampling is very common and the most widely adopted sampling technique. According to Teddlie and Yu (2007), a simple random sample technique is utilized to provide every unit of the populationwith an equal chance to get selected in the sample. The definite level is defined as based on the functional areas in the organization. In any data set, randomness signifies and ensures unbiasedness at the time of questionnaire administration, that is to say, sample formulation, sample identification along with respondent identification. In this research for all major power sector organizations chosen, the researcher is very careful not to dilute the meaning of randomness. Further, all levels i.e. top-level, middle level, and low level are categorizing as per years of experience of employees.

3.5.2 Unit of Analysis

The head offices of all Power sector companies operating in both public and private sectors in India, which are listed in Indian Electrical and Electronics Manufacturer Association (IEEMA) and “Ministry of Corporate Affairs” (https://ieema.org, 2018; http://www.mca.gov.in), are selected. Power sector companies are chosen irrespective of whether the private organization is an Indian Multinational Company (MNC) or foreign MNC and public organization at centre level or state level organization. Further, the PT project is taken by only those power sector companies which are into EPC ventures. Since state-level public power sector companies are not into EPC venture, thus only centre level power sector companies are considered along with the private power sector companies, in the present research.

The main group of people working on power transmission projects is the 'unit of analysis' for the present study. During the conceptualization of the research topic, it is deemed fit to have both public and private power sector companies. This research also took into the perspective that based on the origin of control, whether the private organization is an Indian MNC or foreign MNC and public sector at the centre and or state level.

3.5.3 Database of PT Organization

The researcher selected to survey all major power transmission companies listed in IEEMA and the Ministry of Corporate Affairs. However, all the organizations did not agree to participate in the study. The list of organizations which participated in the study is given below:

1) ABB Ltd.
2) BGR Energy
3) BHEL (Bharat Heavy Electrical Limited)
4) CG Power& Industrial Solutions Ltd
5) GE T & D Ltd
6) KEC International Limited
7) Kalpataru Power Transmission Limited (KPTL)
8) Larsen & Toubro Limited
9) Power Grid Corporation Limited (PGCIL)
10) National Thermal Power Corporation Limited (NTPC)
11) Sterling and Wilson
12) Sterlite Power
13) Siemens Ltd
14) Techno Electric & Engineering Company Limited

3.5.4 Overview of Participating Organization

It details the profile of each participating organization with a focus on the number of employees, total turnover, products and services offered by them with their major clients. Overall, 14 companies participated in this study. These companies operate in India in different states. In order to qualify as a suitable participant in this study, it is ensured that each of the chosen organization undertakes power transmission projects. Table-3.1 below presents an overview of the participating companies.

Table 3.1: Overview of The Participating Companies

Sl. No.	Name of Organization	Revenue	Year	Type of Organization	Location of Head Office in India	Type of work
1	ABB Ltd	228405.13 Crore	FY-2018	Foreign MNC Private	Bangalore	Execution substation (GIS/AIS), EBOP Project, and power product manufacturing
2	BGR Energy	3229.31 crore	FY-2019	Private	Chennai	Execution of Substation, Transmission line
3	Bharat Heavy Electrical Limited) BHEL	29348 crores	FY-2019	Public	Delhi	Power plant and Substations
4	CG Power& Industrial Solutions Ltd	5356 crores	FY-2019	Indian MNC Private	Mumbai	Substation project including GIS and AIS and power product manufacturing
5	GE T & D Ltd	4218.82 crore	FY-2019	Foreign MNC Private	Noida	Substation project including GIS and AIS and power product manufacturing

6	KEC International Limited	10117.80 crore	FY-2019	Indian MNC Private	Mumbai	Execution of Substation, Transmission line
7	Kalpataru Power Transmission Limited (KPTL)	7,115.12 crore	FY-2019	Indian MNC Private	Mumbai	Execution of Substation, Transmission line
8	Larsen & Toubro Limited (L & T)	141,007 crore	FY-2019	Indian MNC Private	Chennai	Execution of Substation, Transmission line
9	National Thermal Power Corporation Limited (NTPC)	90307.43 crore	FY-2019	Public	Delhi	Power Generation
10	Power Grid Corporation Limited (PGCIL)	32616.99 crore	FY-2019	Public	Gurgoan	Execution of Substation, Transmission line
11	Sterling and Wilson Limited	8240.40 crore	FY-2019	Private	Mumbai	Execution of Substation, Solar power
12	Sterlite Power Limited	3571 crores	FY-2019	Indian MNC Private	Delhi	Execution of Substation, Transmission line
13	Siemens Ltd	717,112.19 Crore	FY-2019	Foreign MNC Private	Gurgoan	Substation project including GIS and AIS and power product manufacturing
14	Techno Electric & Engineering Company Limited	988.64 crore	FY-2019	Private	Kolkata	Substation project including GIS and AIS

ABB Ltd.

ABB is a pioneer in innovation that is motivating an advanced change of ventures. With experiencemanifested by progression traversing more than 130 years, ABB has four clients concerted, versatilepowerful organizations: Electrification, Industrial Automation, Motion, and Robotics and Discrete Automation upheld by the ABB capacity digital stage. ABB's

business of grids will be acquired by Hitachi in 2020. ABB operates in over 100 countries with approximately 147,000 agents ("ABB FY 2018 Results"). ABB Ltd., revenue Rs. 228405.13 Crore (ABB FY 2018 Results).

BGR ENERGY

BGR Energy Systems Limited (formerly known as GEA Energy System Limited) is based in Chennai, working inside the utility business, providing administrations extending from item creation to extend execution. The association works in two portions capital merchandises and creation and engineering procurement construction (EPC) Contracts for power projects. Revenue Rs.3229.31 Crore in 2019 (www.bgrcorp.com/financials.php, Annual report) and various workers in 1829 ("Human Resources", 2011).

BHEL (Bharat Heavy Electrical Limited

BHEL is a people-driven PSU. Project Engineering Management (PEM) Division is BHEL's capacity plant System Integrator, a nodal organization giving all-out engineering solutions for customary warm and gas-based power projects and the regular island of the nuclear power plant, empowering BHEL to offer total Engineering, Procurement and Construction (EPC) administrations for power projects. The independent revenue Rs 29348 crore in FY19 (Annual Report Bharat Heavy Electricals Limited 2018-19) and a number of workers 39,821 (www.bhel.com/Annual Report 2018-2019).

CG Power& Industrial Solutions Ltd

Amongst the driving engineering companies, CG gives a start to finish results, supporting its clients utilize electrical power viably and increment on mechanical profitability with manageability. CG, since itset up in India from 1937; and, from that point forward the company remains a pioneer with its administration position in the administration and utilization of electrical energy. CG's special and differing portfolio includestransformers,

switchgear & circuit breakers, network and control gear, project engineering, HT & LT engines, drives, electricity automation products, and turnkey arrangements in every one of these territories; in this manner, upgrading numerous parts of mechanical and individual life. This portfolio is organized into 2 SBUs - Power Systems, Industrial Systems. The company posted net revenue of Rs. 5356 crores in 2018-19 and recorded its employee strength at 3,382(CG Power and Industrial Solutions Limited, 2019).

GE T & D Ltd

GE plays, nationwide, with solid capacities in engineering, manufacturing, project management, the supply of items, answers for power generation and PT foundation prerequisites. GE with 2 recorded organizations – GE Power India Limited and GE T&D India Limited. These are listed in the major stock exchange across India. Having expanded its business across different sectors and geologies, the company currently employs over 3200 workers in 6 assembling plants. GE T&D India is undoubtedly market creator inthenation and is well prepared to fulfil the needs for power apparatus and services even at 1200 KV-Ultra High Voltage. The company's turnover stood at Rs. 4218.82 crores in FY 2018-19 (Economic Times, 2019).

KEC International Ltd

KEC Int.Ltd. is country's second-biggest producer of electric PT towers and is amongst the biggest PT-EPC organizations on the earth. It is headquartered in Mumbaiand is a part of the ₹2550 crores RPG Group, involved in EPC works for PT distribution, rail, cables, solar, public, and smart infrastructure. It conducts activities in the districts of SAARC, EAP, Africa, the Middle East, and the USA. It posted a turnover of Rs. 10117.80 crores (Economic Times 2019), and recorded the number of employees at 5373 ("KEC International Ltd (42109771): Stock Quote and Company Profile-BusinessWeek").

Kalpataru Power Transmission Limited (KPTL)

KPTL has more than 30 years of experience in construction projects and networking of transmission lines including EHT and HT transmission cables and substation bays range to800/1200 kV. The company finishedabove 20,000 km long transmission cabling contracts, including difficult terrains such as mountains, deserts, waterway crossing, and so forth in different common climate states in more than 30 nations. It is prestigious for conveying to most extreme fulfilment and reliable exhibitions. Its revenue stood at Rs. 7,115.12 crores in 2018-19 (Money Control 2019).

Larsen & Toubro Limited

Larsen and Toubro Ltd., popularly called L&T Ltd. is an Indian worldwide aggregate organization with headquarter in Mumbai. It got established by two Danish designers with shelter in India. The organization has expanded in essential and substantial engineering, construction, realty, capital goods, IT, and finance domain. As of March 31, 2018, L&T Group involved 93 auxiliaries, 8 partners, 34 joint-adventure, and 33 joint task organizations. The organization's revenues stood at Rs. 141,007 crores in 2018-19 and employee strength of 44,761 ("Larsen and Toubro Annual Report Fiscal Year 2019 Results").

National Thermal Power Corporation Limited

NTPC is a public sector undertaking in India, involved in the generation of power and united exercises. It was included under Companies Act 1956 and is endorsed by the Government of India. It is headquartered in New Delhi. NTPC has a central line of functions is the power generation and sale to state-possessed distributioncompaniesand electricityboardof the states in India. The organization is also involved in consultancy and turnkey ventures that include engineering, project &construction management, and execution and power plant administration. Its revenues stood at Rs. 90307.43 crores during

the financial year 2018-19 (NTPC “Yearly Report 2019”) and recorded employee strength of 18359 (NTPC "Yearly Report 2019").

Power Grid Corporation Limited (PGCIL)

PGCIL is an Indian state-possessed Maharatna organization headquartered in Gurugram, India and engaged in the transmission of power. PGCIL transmits about half of the absolute power generated in India. Its previous auxiliary organization, POSOCOmanages national state transmission utilities. POWERTEL is telecom business of POWERGRID. PGCIL transmission’s revenues stood at Rs. 32616.99 crores in FY-2018-19 (PGCIL Annual Report, 2018-19) and the number of employees were estimated to be 8900 (2018).

Sterling and Wilson Limited

Sterling and Wilson is a partner organization of Shapoorji Pallonji and Co. Ltd. is one of India's driving turnkey MEP specialist organizations with a varied portfolio of products ranging from HV and LV Electrical Systems, HVAC, Plumbing, Fire Fighting, Fire Alarm Systems, Security Systems, IBMS, Structured Data Cabling, DG Set to Control Panels. Through their system of 12 branches and over 1500 engineering and support staff, Sterling and Wilson's revenue in the year FY 2019 was Rs. 8240.40 crore (Mercom India, 14 Feb 2020).

Sterlite Power Limited

Sterlite Power is a major developer of power transmission framework with projects of over ~12,500 circuit km and 22,719 MVA in India and Brazil. With an industry-driving arrangement of power conductors, EHV cables, and OPGW, Sterlite Power likewise offers solutions for updating, uprating, and reinforcing existing systems. The organization has set new benchmarks in the business by utilization of front-line advancements and inventive financing. It is also the patron of Indi Grid, India's first power sector Infrastructure

Investment Trust (InvIT), just as producers power conductors and cables. The revenue of Sterlite Power stood at Rs. 3571 crores in 2018-19 (Sterlite Power Annual Report, sterlite_power_ar_2018-19).

Siemens Ltd

Siemens is a Germany-based multinational organization with headquarter in Munich. In Europe, it is the biggest recentintegrating organization. The Siemens Energy Sector, established on January 1, 2008, is one of the four parts of Siemens. The organization produces and conveys power from diverse sources along within the extraction, change, carriage of oil and flammable gas besides renewable and other energy resources. Siemens works in the domains of business administration, financing, project engineering, and construction. The revenue of Siemens stood at Rs. 717,112.193 Crore in 2018-19 ("Earnings Release Q4 FY 2019") while the global employee strength stood at 385,000("Earnings Release Q4 FY 2019).

Techno Electric & Engineering Company Limited

Techno Electric and Engineering Company Limited, formerly known as Simran Wind Project Limited, is a supplier of Engineering, Procurement, And Construction (EPC) components to major enterprises in India. The company operates metallurgical and petrochemical divisions, among others. It provides solutions for captive power plants, the Balance of Plant (BOP) for thermal and hydropower projects, and utilities for power projects. It also engages in the construction of both air-insulated and gas-insulated substations. The company caters to a range of projects, from power generation plants to plant packages frameworks provided by others. It also serves extra high voltage substations and distribution systems. The organization's revenue in the year 2018-19 stood at Rs. 988.64 crores (2018-19 Annual Report).

3.6 “RESEARCH TOOL”

The research tool helps the researcher in data collection and also its evaluation. Tools may vary in complexity, interpretation, design, and administration. Each tool is suitable for the collection of creation type of information. In present the research, Structured Questionnaire is used the research tool for testing hypotheses.

3.6.1 Design of the Questionnaire

The structured questionnaire is used as a tool to survey the target respondents. Designing a questionnaire is done based on detailed knowledge not only of the survey topic and the target population but also of the technical potential of the chosen data collection method. This portion of research helped the respondents to understand the CSFs and subfactors/variables of each factor and adopt a CSFs framework for PT projects in India.

A logical method is utilized for an effective research design that encompasses innovative empirical findings besides the usual theoretical information from the literature review and input from industry experts/professionals and academicians. A questionnaire survey design is selected to collect quantitative data through a cross-sectional approach from a range of respondents, so as to achieve a broader understanding of extracted theoretical studies.

3.6.2 Structure of Questionnaire

The questionnaire testing is done on fundamental components of the data production process. The questionnaire is first pre-tested on 26 PT project professionals from the actual sample of respondents for checking its reliability and content validity. After the pre-tested the modified questionnaire is arranged in two sections as given below:

1) The first section in demographic information of the respondents like; name, organization name, experience, area of work(strategy/operation), type of project.
2) Second section based on critical success factors of PT projects i.e. strategy, contract, risk, stakeholder and IT, and their associated sub-factors/variables.

The researchers prepared a list of 52 attributes-basedonanalyses of previous literature, as well as the input of PT Project professionals during the pre-tested of the questionnaire. All this of 52 variables is put in different subheadings of section-2 of the questionnaire. Also, all 52 attributes cannot be called complete, attributed to the immense magnitude and dynamic setup of the power transmission construction industry. Subheadings are given below:

1) Project Success
2) Strategy
3) Risk
4) Contract
5) Stakeholder

The complete set questionnaire is given in **Appendix-A.**

3.6.3 Variables of Questionnaire

These variables are all 52 variables under 6 subheadings are explained below:

Subordinate variables under Project Success

- **Project Budget (V1)**: Project completion within budget indicates project success.

- **Estimated Time (V2):**Project completion within the estimated time period indicates project success.

- **Desired Quality (V3):** The project deliverathe desired quality directs project success.

- **Stakeholder Satisfaction (V4):** Project stakeholders are satisfied if the project deliversthemeet their requirements and expectations which in turning into project success.

- **Social Purpose (V5):** The project is called success which delivers makes social development.

- **Achieved Organization Goal (V6):** Achieving organization goal by project delivers directs project success.

- **Satisfaction of team Members (V7):** The evaluation of satisfaction of team members is just as important for the assessment of project success.

- **Safety (V8):** Effective safety measure prevents injuries and accidents which helps the project success**.**

- **Increase Market Share (V9):** The projected increase organization market share is called project success.

Subordinates Variables under Strategy

- **Leadership strategy (V10)**: Strategic Leadership is the capacity impacting others to deliberately settle down on choices that promotes the prospectsof project success.

- **Bidding strategy (V11)**: The strategy is applied to win the bid in a competitive environment.

- **Effective cash Flow management strategy (V12)**: The fundamental strategies that can be actualized to viably manage cash are delaying and extending Accounts Payables and accelerating an assortment of Accounts Receivables.

- **Clear Objectives and understanding (V13)**: This movement portray the project's outcome and the methods required to achieve that outcome. Strong described destinations and targets, or destinations with objectives, push a project inside spending plan, a region bargain, character understanding, choose accomplishments and cheery clients.

- **Cohesive procurement strategy (V14)**: A procurement strategy would specify the key methodology of cost-successfully procuring an organization's necessary supplies, taking into consideration a few components and factors, for example, the plan for procurement, the funding, spending plan, the anticipated risk, and opportunities, among others.

- **The strategy of effective communication (V15)**: In strategic communication, the identical thing applies but it is done between companies where it directly impacts the goals, they set up for themselves to achieve. Strategies for effective communication support the project to create strong relationships with the project stakeholders.

- **Market intelligence strategy (V16)**: Market intelligence is the information applicable to a company's market - movements, contestant, and customer (existing, lost, and targeted) monitoring, collected and evaluated specifically for correct and confident decision-making in determining strategy.

- **Strategic execution plan aligns with project scope (V17)**: The strategic plan is aligned with the execution of the project so that control the scope to avoid scope creep.

- **Managing Risk Strategy (V18)**: A risk management strategy gives an arranged and reasonable technique for recognizing, assessing, and overseeing risk.

- **Communication strategy(V19):** Project success depends on effective communication, and this is the importance of making communication strategy in any project.

Subordinates Variables under Risk

- **Fund flow of client (V20)**: Fund flow is usually measured on a monthly or quarterly basis, which smooth flow boosts the project towards achieving the goal.

- **Control of scope creeping (V21)**: Scope creep (occasionally recognized as "requirement creep" or even "feature creep") mentions how a project's necessities tend to gain over a project lifecycle. Scope creep is usually generated by key project stakeholders changing need, or sometimes from internal flounder and conflict. Overseeing scope creep at that point condenses to administering those adjustments in scope using a change control process.

- **Team conflict resolution (V22)**: as a team, discuss the impact the conflict on team dynamics. Abide bythecooperative process – Everyone involved cooperate to resolve the conflict fortheproject's success.

- **Timely subcontractor payment (V23)**: Subcontractor payment against their certified work within time as per the mentioned time in a contract that will support the project work with any hindrance.

- **Opposition from social Bodies (V24)**: The opposition in certain cases resulted in costly delays that affected the project performance and it also forced the abandonment of projects.

- **Suspension of work (V25)**: The capacity to suspend works in specific conditions is a significant element of numerous construction contracts. Be that as it may, these two cases, while accurately particular, exhibit the conceivably extraordinary results of getting a suspension wrong – regardless of whether by a contractor or a proprietor. Under precedent-based law frameworks, if an unfair suspension is found to add up to a disavowal of the contract, not exclusively will the honest party be qualified for a treat the contract has ended, however, it might likewise sue for harms – regularly for exceptionally huge entireties.

- **Accidents and safety (V26)**: Safety management means managing activities to prevent accidents by predicting risk factors in advance. It is involved in the whole process of the project.

- **Avoid to Changes in design (V27)**: Changing a design in the middle of a project can be costly. This prevalence of change doesn't fit with how engineers carry out design projects.

- **Test list with less frequency (V28)**: An unnecessary test of equipment and construction material at the project site increases the project cost, quality of work, and discourages the project team.

- **Stable Government (V29)**: Stable government reduce the risk in terms of changing of law and regulation.

- **Available of construction material at the project site(V30):** Available construction material like steel, cement, sand etc. helps the smooth project progress.

- **Geographical location of Project(V31):** Geographical location provides information about the weather and location of project place, as it helps to proactive planning for project progress.

Subordinates Variables under Contract:

- **Price variation clause (V32)**: The essential advantage is that a Price Variation Clause can adequately address the danger of theory in an increment of different parts of construction costs and take into consideration offering an evaluation at that point, which is liberated from such unsafe appraisals of value ascend during the cash of the contract.

- **Payment terms (V33)**: A common construction contract instalment methodology contains various fundamental advances: following the culmination of specific works or at the concurred interim, a contractor presents an announcement to the business demonstrating the sums to which he views himself as entitled; payment becomes due inside a concurred period. So brief period payment terms help the EPC contract to oversee cash flow, so project progress won't be hampered.

- **Realistic schedule (V34)**: Such a large number of projects are driven by a hopeful timetable. At that point, misguided endeavors to meet idealistic dates bring about superfluous issues that cause dates to slip, some of the time wildly, yet also bargain quality.

- **Type of Contract (V35)**: whether the power transmission project is for new construction or change existing structure, it is necessary to choose the right contract to meet needs.

- **Claims for a time extension (V36)**: Expansion of Time (EOT) is a postpone that couldn't be sensibly predicted at the hour of contract signing. The giving of an Extension of Time mitigates the contractor from liability of damages, for example, Liquidated Damages from the first date of agreement finishing for the time of the case.

- **Clear and unambiguous scope (V37)**: the project scope is concise. It helps to project team to get a good idea of what project con is compact. It assists with the anticipating group to get a smart thought of what project comprises of and what won't be a piece of the project.

- **Justified penalty clause (V38)**: Contract agreement concurrence with a justified penalty clause, go about as hindrances as well as help in guaranteeing business responsibility.

- **Dispute and Arbitration (V39)**: A mediation provision as an arbitration clause in a project contract can take numerous structures, from a straightforward explanation that the gatherings consent to allude any debate emerging between them to the assertion, to a point by point statement containing not just the understanding of the gatherings to referee questions, yet also sets out how the arbitrator is to be delegated and the systems to be utilized by the gatherings all the while.

- **Timely document and drawing approval (V40)**: Project documents and drawing approval as per the L2 network helps the project in time. Delay in approval affects the project timeline.

- **Force Majeure Clause (V41)**: Force majeure is a precedent-based law teaching or rule comprehensively appropriate in the business setting that pardons legally binding execution when a remarkable occasion or situation outside the ability to control of the gatherings intercedes to forestall execution.

Subordinates Variables under Stakeholder:

- **Managing stakeholders (V42):**CSR is a self-control mechanism by which an organization vigorously screenssociety, environment, trends across the globe, ethics, and legal compliance. CSR supports the organizational mission and encompasses its accountability and obligations to stakeholders and society. The CSR process looks after organizational activities that improve society all together: environment, groups, and people.

- **Trust of Stakeholder (V43):** the management of stakeholders of social inception contributes decidedly to confide seeing someone, be they natural, respectability, or capability.

- **Effectively resolving conflicts between stakeholders (V44):** Conflict in the workplace can have harmful effects on productivity, efficiency, motivation, and an individual and team's general prosperity. It can even distress the entire company. However, conflict is not always bad. Providing it is resolved effectively, it can lead to personal and professional growth and sometimes positive and negative consequences. By resolving and managing conflict effectively, the problems can be solved.

- **Communicating with stakeholders (V45):** regular communication with stakeholders has to be maintained to meet their expectations and address their concerns.

- **Early Identify, prioritize and engage key stakeholders (V46):** projects come up short since one of the most significant reasons is key stakeholders are not viewed as when it is important most, which drives them to misjudge the objectives of the project and its proposed sway. Stakeholders can give an abundance of data and understanding that can help push extends ahead if they are acquired and advised on the work the group is doing.

- **Top management support (V47):** Top management is the inside stakeholder and their help is a noteworthy factor to make the project fruitful. Top management may contain the leader of the organization, VPs, chiefs, division supervisors, the corporate working board of trustees, and others. These individuals propose the strategy and advancement of the association.

Subordinates Variables under Information technology:

- **E-tendering (V48)**: an internet-based system that comprises the full bidding process; starting from advertising until the receipt and submission of information about the tender is done online. This empowers companies to be more efficient, as paper-based businesses are reduced or rejected, which enables faster information exchange.

- **Planning & monitoring (V49)**: the process strategic information planning is to identify a portfolio of computer-based applications. It is a critical task for both information managers and project teams.

- **Energy Management and Control system (V50)**: EMCS innovation has progressed in the course of recent decades from pneumatic and mechanical gadgets to DDC or computer-based controllers.

- **Network Management system (V51)**: NMS programming is utilized to monitor network hardware to affirm all gear is working appropriately. Signals can be sent to network administrators if an issue is taken note.

- **Decision Support System (DSS) (V52)**: A decision support system (DSS) is a computer-based tool that gathers, systemizes, and analyses business data to enable quality business decision-making.

All the subordinates are mapped to proposed CSFs framework as depicted in Figure 3.2.

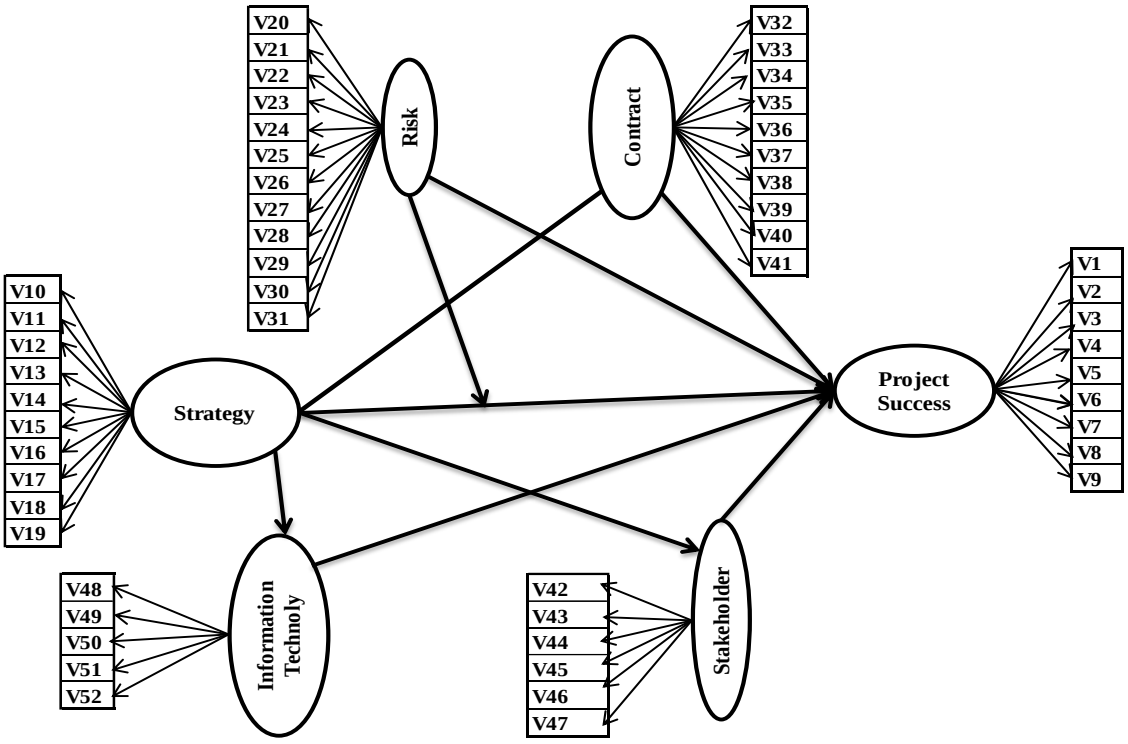

Figure 3.2: Mapping of elements of Questionnaire in proposed CSF Framework

3.7 "TESTING OF THE QUESTIONNAIRE"

The questionnaires are tested for their reliability, content validity, and scale sensitivity before they are finalized. The testing of the questionnaire is carried as follows.

3.7.1 Reliability

Cronbach's Alpha test is applied to check the reliability of the scale and the value of the coefficient is more than 0.7 in all the components of the questionnaire sets thus indicating the goodness of scale measurement. Details are given in Table-3.2.

Table 3.2: Reliability Cronbach's Alpha Test

Factor Groups	Variables scale summated	Cronbach's Alpha
Project Success	8	0.862
Strategy	9	0.868
Risk	9	0.808
Contract	9	0.836
Information Technology	5	0.844
Stakeholder	6	0.858
Total (Including six groups)	52	0.948

3.7.2 Content Validity

26 respondents (same group people from the different organization) from the actual sample test administered using the questionnaire. The detailed discussion is done with six (6) PT project experts i.e. strategic and operation levels each. The questionnaire is tested for the intensity of the study reflected by the variables taken in the questionnaire for the study in hand, the relevance of the topic keeping current business scenario in mind and response time of the respondents.

3.7.3 Observation and Feedback of The Respondents

It took almost 20 to 30 minutes for each respondent to furnish the details enquired in the questionnaires. On average, the questionnaire is found wide-ranging and the topic of the research is found suitable considering the importance of PT projects in the Indian environment. A few of the suggestions given are shown below:

- It is suggested to sub-categorize the questionnaire part-II for the ease of understanding.
- The questions allowed for flexibility in responding to concerns.

- To simplify, reword, remove and replace and supplement the variables.

Suggested changes are incorporated into the questionnaire.

3.7.4 Sensitivity of scale Measurement

In general, a 5-point Likert scale is used. Some questions are asked more than once with similar themes but with different ways to cross-check the subject. In some cases, questions are asked on yes and No scale depending upon the possibility of responses.

3.7.5 Questionnaire- Research Objective Mapping

To confirm the relevance and matching of the questionnaire with the topic of research in hand the questionnaire is mapped against each objective. The second section of the questionnaire is mapped to objective 2 and 3, i.e. to study the impact of CSFs on PT project and design a framework of while objective 1, i.e. identification of CSFs is mapped to literature review as well as a questionnaire. The questionnaire explains in Figure-3.3.

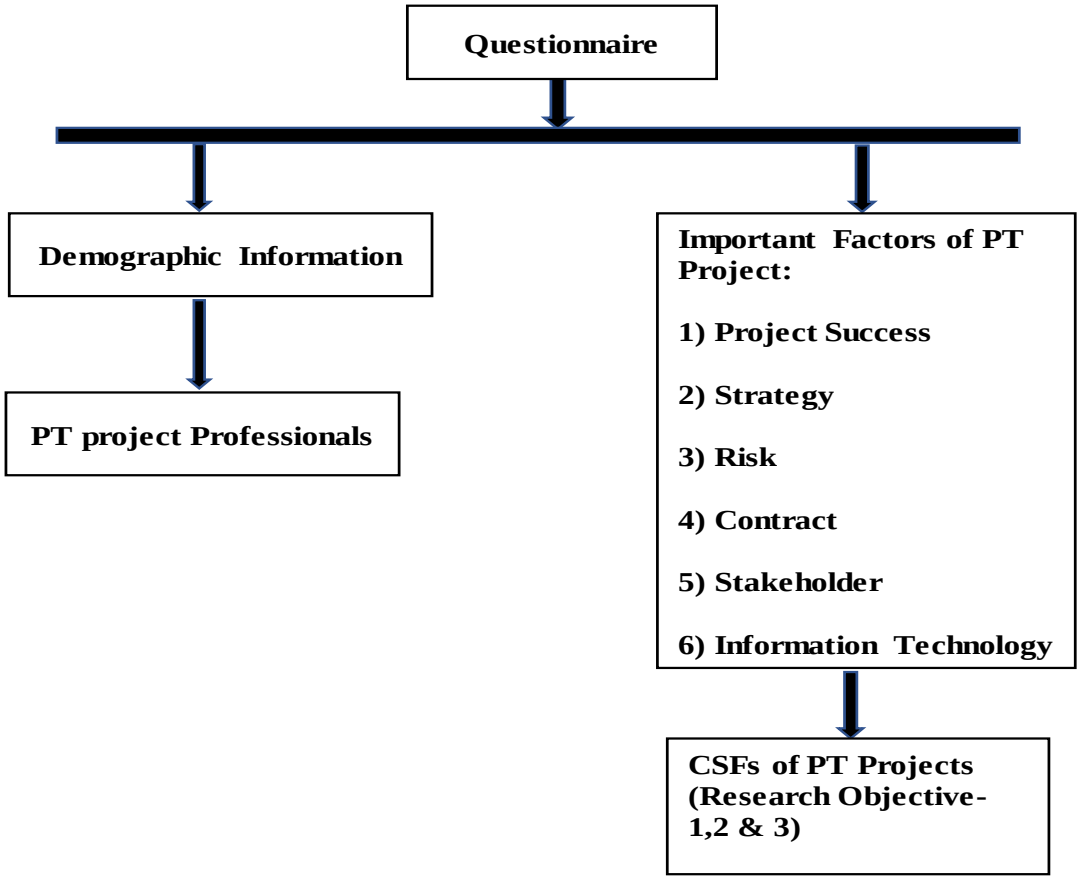

Figure-3.3: Mapping of Questionnaire- Research Objective

3.8 "RESEARCH PROCUDURE"

The research procedure which is followed in the study is outlined in Figure 3.4. The diagram walks the reader through the entire research methodology implementation procedure as followed by the researcher to define, design, test the CSFs framework as depicted in Figure 3.1. The research procedure followed is described in proceeding sections.

3.8.1 Literature Analysis

The research procedure started with a thorough literature review to identify the critical success factors of PT projects and their variables. A set of initial DV and IDVs for testing the hypotheses is identified as explained in Chapter 1.

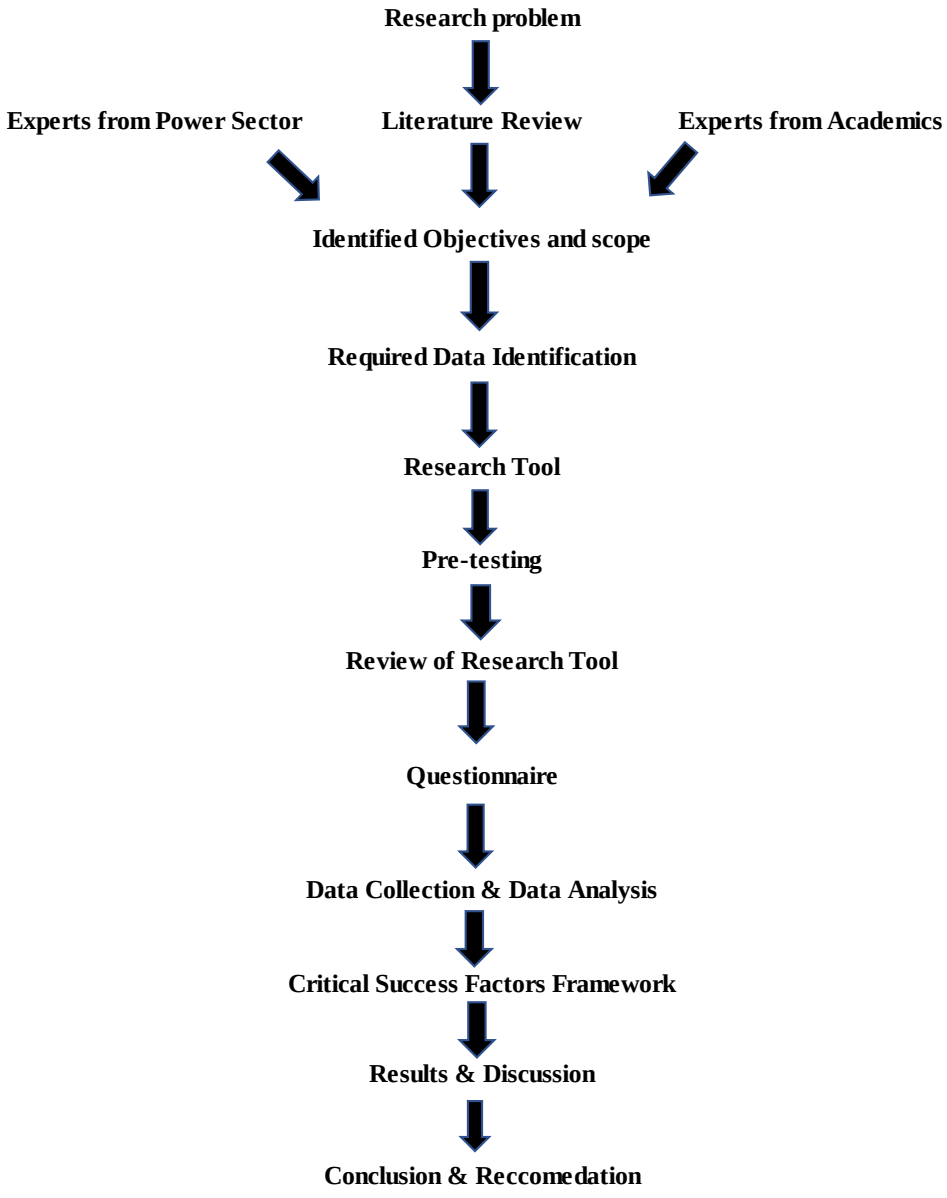

Figure 3.4: Research procedure

3.8.2 Data Collection

The questionnaires are administered to collect the primary data. Primary data from PT project professionals of the strategic (top-level) and operational (middle and lower level) level.

3.8.2.1 Sampling of Data Collection

The criteria followed for selecting the respondents and organization for data collection from the public and the private organization has given in the Table-3.3 and 3.4.

The target population is power transmission project professionals at Strategic (25%) and operation level (75%) in India. This includes public and private organizations both who executed power transmission projects (substation/ Line) since ten (10) years of consistency exist in industry revenue above Rs. 500 crores.

Table-3.3: Criteria of Selecting Respondents

S. No.	Respondents Level	Percent of Population
1	Strategic (Top Level)	25
2	Operational (Middle and Lower Level)	75

Table-3.4: Criteria of Selecting Organization

S. No.	Credential of Organization	Criteria
1	Consistency in industry	In the past 10 years
2	Revenue of organization	Greater than 500 crores

The above criteria are followed to draw a sample size. The sample is drawn to each participating organization has shown in Table-3.5 and 3.6. As per the criteria a total of 300 questionnaires is administered to a public and private organization operating in PT project.

Out of 300 questionnaires, 207 valid responses are received, giving a response rate of approximately 69%.

Table-3.5: Organizational Level-wise Sample Detail

Sl. No.	Name of Company	Strategic Level Respondents	Operation Level Respondents
1	ABB Ltd	9	19
2	BGR Energy		6
3	Bharat Heavy Electrical Limited) BHEL		5
4	CG Power& Industrial Solutions Ltd	11	21
5	GE T & D Ltd	12	20
6	KEC International Limited	9	10
7	Kalpataru Power Transmission Limited (KPTL)	5	8
8	Larsen & Toubro Limited (L & T)		7
9	National Thermal Power Corporation Limited (NTPC)	5	9
10	Power Grid Corporation Limited (PGCIL)	7	11
11	Sterling and Wilson Limited		9
12	Sterlite Power Limited		5
13	Siemens Ltd	3	8
14	Techno Electric & Engineering Company Limited		8
		61	146

Table 3.6: Details of Respondents

Characteristics	Category	No. of respondents	Percentage
Experience	1-5 years	10	5%
	6-10 years	21	10%
	11-15 years	30	14%
	16-20 Years	35	17%
	21-25 years	44	21%
	26-30 years	41	20%
	Above 30	26	13%
Function	Strategy	61	29%
	Operation	146	71%

3.8.2.2 Time Span of The Survey

Data collection was carried out for 8 months from August 2018 to March 2019.

3.8.3 Preliminary Data Screening

The data collected is pre-processed to identify and eliminate errors present in the dataset and configure the dataset for analysis. It is imperative to process the data for outliers and discrepancies arising from individual and variables cases. Data screening included missing data handling to estimate the missing values based on mean/mode of observed value in collected data or to omit all the missing data entries, data normality check with Skewness and Kurtosis and Data reduction with Factor Analysis and finding correlation coefficient.

3.8.4 Data Analysis

The data collected from the survey is coded and put in an excel sheet. Rigorous analysis of quantitative data is involved as given below:

- Pearson's correlation for the relationship between variables of the research framework.
- Relative Importance Index Test for ranking of factors
- Multicollinearity test to find any high inter-correlation among independent factors and Durbin-Watson test to find any autocorrelation in the sample
- Regression analysis (AndrewF. Hayes model-1 and 4) for the moderator and mediator impact

Table 3.7 and Table 3.8 summarize various statistical methods employed for testing of hypotheses as described in Chapter 1.

Table-3.7: Research Hypotheses Table with Analysis method

S. No.	Object	Purposes of Analysis	Analysis Method
1	Find the critical success factors of power transmission projects in India	What are the major attributes (variables) which account for each of the five success factors?	1) Factor analysis: a) Communalities for appropriate degree of interpretation among variables b) PCA for factor reduction c) Loading Factor for factors validity through cumulative variance 2) Pearson Correlation relationship between variables
2	Find the impact of CSFs on power transmission PS in India. (H1- H1a, H1b, H1c, H1d, H1e)	Whether the five factors have significant impact on the PS?	Regression analysis Dependent variable – PS and Independent variables- five CSFs
3	Develop CSFs framework with direct, mediating and moderating impact of CSFs on Project Success (H2- H2a, H2b, H2c, H2d)	Conceptual CSFs Framework need to be validated	Regression analysis: Moderator and Mediator effect through use of Andrew Hays Model-1 & 4

Table 3.8: CSFs Framework Validation

Measure	Symbol	Details
Coefficient of Determination	R^2	Proportion of the variance in DV as explained by regression equation
Standard error of the estimate	SE	SD of error term which is square root of MSE
Variation Inflation Factor	VIF	Indicates multicollinearity in multiple regression with VIF >10 specify multicollinearity and violation of regression assumptions

3.9 "THE CHAPTER SUMMARY"

This chapter explains the systematic process of collecting and analyzing the data. This includes preparation of the database for a survey, design of the survey tool including testing, mapping of research object with survey tool, method of collecting data, sampling criteria, sample for data collection and a brief analysis process. The detail data analysis is carried out in the next chapter.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 “INTRODUCTION”

The overall aim of the research is to provide CSFs framework that may be practised by PT project practitioners to augment the project success. The CSFs framework also describes the dynamics of project outcome and how the PT project executed EPC venture can ensure project success by identifying CSFs. This chapter reflects all the essential details of data analysis results by specifying and explaining the assembling and statistical investigation of critical information which is generated from the survey data. A set of statistical is conducted to explain the direct, mediating and moderating effect of CSFs on PS (Dependent Variable). The chapter presents all results of hypothesis testing to validate the framework. Statistical results in details are provided in Appendix B.

4.2 “CONCEPTUAL CSFs RECAP”

The CSFs framework is presented in Figure-4.1 below describes that an independent factor strategy has an impact on project success. All the factors and variables have been described after an in-depth study of literature onPS in the field of power transmission projects and survey data. The moderator factor ‘Risk’ affects the power of the relationship between Strategy and PS. Also, mediator factors ‘Contracts’, ‘Stakeholder’ and ‘Information Technology’ have a relationship with ‘Strategy’ and ‘Project Success’. Figure-4.1 shows the CSFs framework with all variables.

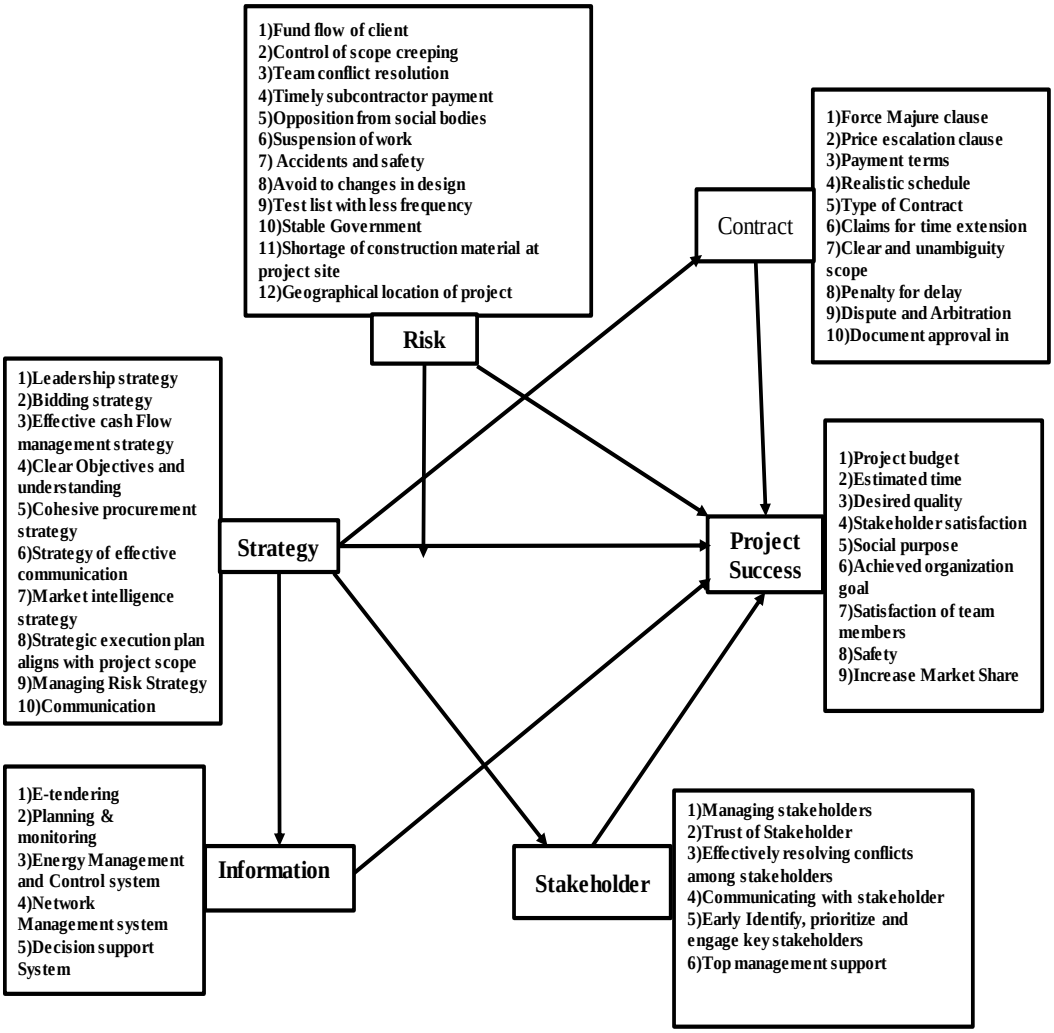

Figure-4.1: Scope of the Framework-Variables View

The framework has been tested for validity with the help of the data collected in the study from a sample of 207 from the PT project experts. The validation of the framework has been explained as follows:

1) The Validity of the framework tool

a) Measure of Goodness

i. Reliability of Scale
ii. Content Validity
iii. The Sensitivity of Scale Measurement

b) Factor Analysis

c) Correlation of Factors Validity of variables

2) Hypothesis Testing and Evaluation of Framework

i.Ranking of Factors
ii.Intercorrelation and Autocorrelation of Factors
iii.Multiple Regression Analysis

The framework is explained with the ranking of the factors, association between the factors and mediating and moderating impact on project success as per the hypotheses in the proceeding section of this chapter.

4.3 "MEASURE OF GOODNESS"

The measure of goodness of framework tool has been measured with the reliability of content validity and scale sensitivity.

Cronbach's Alpha test is used for checking scale reliability, as studies with coefficient value is more than 0.7. The value of the coefficient is more than 0.7 in all the components of the questionnaire. The minimum value of 0.7 (Whitely, 2002, Nunnally, 1979).

The variables are included in the tool as they are selected based on past literature. The literature details explain in Chapter-2. The respondents from the sample and academia they are a consultant to refine the tool to add some more variables if necessary. However, no significant change is done. This shows the variables simplicity of the tool.

A 5-point Likert scale is used for each element. Some questions are asked more than once with similar themes but with different ways to cross-check the subject. In some cases, questions are asked on yes and No scale depending upon the possibility of responses.

4.4 "FACTOR ANALYSIS"

4.4.1 Preliminary Data Screening

The first and foremost task after collecting all the primary data is to identify and eliminate errors present in the dataset and configuring the dataset for analysis. It is imperative to process the data for outliers and discrepancies arising from individual and variables cases. Total of 244 responses are received out of 300 administered questionnaire and 29 incomplete responses with missing values responses are removed. Further 8 responsesareeliminated because of the variability in responses is less than 0.3.

Moving further the data is checked for the normality. The determination of data normality is, however, a complex job with various degrees, and is not minimized by testing normality. The data is checked for Skewness and Kurtosis to test normality. The Skewness and Kurtosis test give the results for all 52 variables with Skewness value between -2 and +2 and, Kurtosis values between -2 to +2. Generally, inaperfectly normal distribution, the Skewness and Kurtosis ought to be zero. If the Skewness and Kurtosis values are between +2 /-2 then it is accepted as a normal distribution. Any deviation from ±2 indicates non-normality. The Kurtosis values larger than 2 signifythe similarity of responses, and a value of less than 2 denotes that respondents disagree considerably on many questions (Gaskin,

2013a). Hence, it is concluded that all variables are within normality measures. The details Skewness and Kurtosis test are presented **Table-4.1 in Appendix-B.**

4.4.2 Exploratory Factor Analysis

EFA is conducted for identifying the potential relationship between several variables. The EFA is applied to create a framework in a novel research area, like as variables, correlation and relative weightings of a selected variable (Kaiser,1974).

Certain preliminary tests have to be conducted to evaluatetherelevance of the respondent data for EFA. These tests comprise of the Kaiser – Meyer – Olkin (KMO) test (Kaiser et al., 1974) and Bartlett's test (Bartlett, 1954). The initial examination of the correlation matrix shows that many variables are correlated (above 0.3) and KMO value of 0.897 (P value less than 0.05). Here KMO value is greater than the value of 0.6, as suggested (Tabachnick&Fidell, 2001). Thisindicatesasignificant difference betweenthecorrelation matrix and identity matrix, in which correlationamongall variables is zero. KMO and Bartlett's are statistically significant to supportthefactorability of the correlation matrix. Table-4.2 shows KMO and Bartlett's test results.

Table-4.2: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.897
Bartlett's Test of Sphericity	Approx. Chi-Square	5570.853
	df	1326
	Sig.	0.000

Df- Degree of Freedom
Sig- Significance Level

4.4.2.1 Principle Component Analysis: Key Factor Identification

The probability that one variable is strongly correlated with one or more variable, then there is a chance of common variance i.e., communality. Hair et al. (2010) encourage the researchers to take a gander at each factor's communality, which speaks to the amount of difference represented by the factor goals for each factor. The communalities ought to be evaluated in order to inspect whether the variables meet the appropriate degree of interpretation. Hair et al. (2010) propose the end estimation of 0.5 for each factor after evaluating the communality. Considering the commonalities cut off value of 0.5, the "2" variables i.e. V21 and V22 value are under 0.5. The below Table-4.3 represents the Communality.

Table-4.3: Factor Analysis for CSFs for PT Projects as per respondents Input (N=207): Communalities of Variables

Variables	Factor	Initial	Extraction
V1	Project Success	1.000	0.699
V2		1.000	0.542
V3		1.000	0.710
V4		1.000	0.720
V5		1.000	0.724
V6		1.000	0.714
V7		1.000	0.649
V8		1.000	0.741
V9		1.000	0.592
V10	Strategy	1.000	0.680
V11		1.000	0.606
V12		1.000	0.652
V13		1.000	0.681
V14		1.000	0.674
V15		1.000	0.611
V16		1.000	0.624
V17		1.000	0.707
V18		1.000	0.735
V19		1.000	0.682

V20	Risk	1.000	0.585
V21		1.000	**0.471**
V22		1.000	**0.415**
V23		1.000	0.652
V24		1.000	0.676
V25		1.000	0.575
V26		1.000	0.574
V27		1.000	0.598
V28		1.000	0.602
V29		1.000	0.661
V30		1.000	0.776
V31		1.000	0.735
V32	Contract	1.000	0.541
V33		1.000	0.603
V34		1.000	0.633
V35		1.000	0.530
V36		1.000	0.631
V37		1.000	0.604
V38		1.000	0.590
V39		1.000	0.554
V40		1.000	0.719
V41		1.000	0.625
V42	Stakeholder	1.000	0.718
V43		1.000	0.583
V44		1.000	0.626
V45		1.000	0.654
V46		1.000	0.699
V47		1.000	0.659
V48	Information Technology	1.000	0.608
V49		1.000	0.736
V50		1.000	0.677
V51		1.000	0.715
V52		1.000	0.711

As selecting extraction method, PCA is considered to estimate the total variance and identifies factors that hold little percentage of unique variance and, in certain events, error variance. While common factor analysis considers exclusively the common or shared variance if unique variance and error variance don't appear to be of significance. In the

present study, the inquiry is the extraction of the factors and ensure the variables are independent of one another. Therefore, the researcher applies Principal Component Analysis (PCA) and Varimax type of rotation.

It is advocated by different academicians that in the event that rationale cannot be inferred from Kaiser Criterion, different criteria should be utilized for factors withanumber of variables (Costello and Osborne, 2005). In accordance with the Kaiser Criterion, twelve factors are extracted. From that point, the Scree Plot in Figure- 4.2 suggested that 6 factors extraction may customarily be the best option because Eigenvalue is more than '1' (Chatterjee et al. 1991).

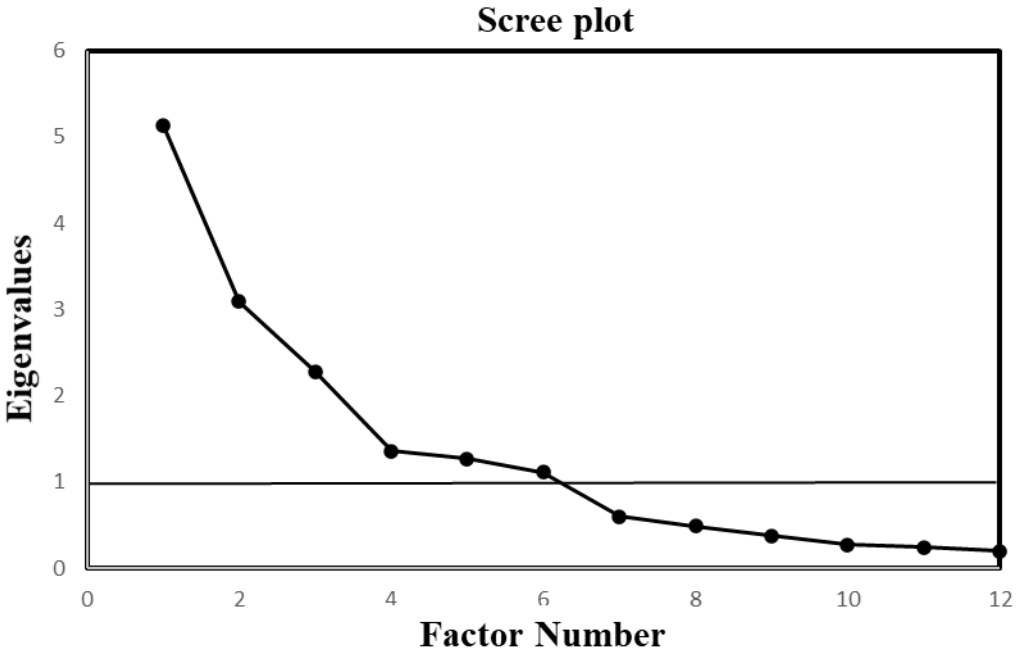

Figure-4.2: Scree Plot

Subsequently, the successive step is to run the EFA with the assistance of extraction procedure PCA and rotation methodology varimax, which based on a fixed number of 6

factors. In this research, six groups are considered for more information gained from the 52 factors. Thus, specified the number of factors mentioned "6" in the PCA -extraction method for extraction of factor groups. By the utilization of PCA on 52 variables 6 factors extracted but out of 52 variables, 6 variables do not have a face value. Table-4.4 shows details below.

Table-4.4: Factor Analysis for CSFs for PT Projects as per respondents Input (N=207): Rotated Component Matrix with 52 Variables

Variables	Factor	Factors					
		1	2	3	4	5	6
V1	Project Success		0.704				
V2			0.641				
V3			0.709				
V4			0.656				
V5			0.635				
V6			0.625				
V7			0.651				
V8			0.619				
V9							0.626
V10	Strategy			0.600			
V11				0.580			
V12				0.632			
V13				0.599			
V14				0.668			
V15				0.591			
V16				0.613			
V17				0.632			
V18				0.659			
V19							0.629

V20	Risk					0.583	
V21						0.515	
V22						0.476	
V23						0.566	
V24						0.604	
V25						0.612	
V26						0.584	
V27						0.547	
V28						0.552	
V29					0.551		
V30							0.482
V31				0.522			
V32	Contract				0.407		
V33							0.540
V34							0.515
V35							0.428
V36							0.461
V37							0.579
V38							0.456
V39							0.493
V40							0.421
V41							0.551
V42	Stakeholder				0.706		
V43					0.576		
V44					0.577		
V45					0.634		
V46					0.670		
V47					0.702		
V48	Information Technology	0.575					
V49		0.626					
V50		0.641					
V51		0.515					
V52		0.576					
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 7 iterations.							

The retained 46 variables which are loaded adequately with the six factors representing the entire data as shown in Table-4.5.

Table-4.5: Factor Analysis for CSFs for PT Projects as per respondents Input (N=207): Rotated Component Matrix for 6 CSFs with 46 Variables

Variables	Factors	Factors					
		1	2	3	4	5	6
V1	Project Success	0.710					
V2		0.653					
V3		0.709					
V4		0.634					
V5		0.663					
V6		0.638					
V7		0.649					
V8		0.622					
V10	Strategy		0.592				
V11			0.581				
V12			0.641				
V13			0.604				
V14			0.672				
V15			0.596				
V16			0.636				
V17			0.62				
V18			0.663				
V20	Risk				0.574		
V21					0.496		
V22					0.458		
V23					0.607		
V24					0.644		
V25					0.625		
V26					0.608		
V27					0.572		
V28					0.509		
V33	Contract						0.401
V34							0.470
V35							0.544
V36							0.628
V37							0.575
V38							0.518
V39							0.539
V40							0.425
V41							0.476

V42	Stakeholder			0.711			
V43				0.588			
V44				0.600			
V45				0.607			
V46				0.709			
V47				0.701			
V48	Information Technology					0.669	
V49						0.638	
V50						0.705	
V51						0.653	
V52						0.622	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

In line with the collective extent of difference model, which visualizes that for sociologies 50-60% of variance explained is acceptable (Hair et al. 1995; Pett, Lackey, and Sullivan, 2003), 6 factors are found to be valid. The Six factors show the cumulative variance (51.731%) which is more than half of the total variance. The details are shown Table-4.6 in **Appendix-B.**

4.4.3 Interpretation

After having all the caveats checked and rechecked for the successful employment of EFA, a successive step is to interpret the rotated component matrix. The factor identification method had been undertaken earlier during a precise manner so as to succeed in definite factorability. Whereas interpreting the results, the sturdy abstract foundation of the anticipated structure is already specified, the principle behind the anticipated structure is also robust. The researcheruses all the techniques to unearth the foremost logical set of factors. It is absolutely assessed that face validity is established once the extraction is finished on PCA with Varimax rotation resulted in extracted on 6 factors. The shape and appropriateness of the factor solution are established by applying the researcher's discretion and arbitration. As the final method, the factor loadings and Pearson Correlation

test are carried out for every variable, to see the significant role and contribution of each variable isafactor.

4.4.3.1 Factor Loadings

Factor loadings are the result of factor analysis, which fills in as a data reduction intended to explain the relationships between observing variables utilizing a smaller number of factors. Each factor explains a certain amount of total variance in the observed variables. The loading of the coefficients ±0.4 are retained and below ±0.4 are suppressed, to indicate a strong correlation of the variable with the factors. Hair et al. (2010) specify that to suppress the coefficients below 0.5, the sample size should be a minimum of one hundred twenty, while in the current research, the sample size is 207, therefore, factor extraction by suppressing coefficients below 0.3 will be appropriate. On satisfactory factorization, the coding of the factors and variables is done with respective codes. The underlying factor loading and total variance factor-group wise result have been appended in Table-4.7.

Table-4.7: Factor Analysis for CSFs for PT Projects as per respondents Input (N=207): Factors Loading

S. No.	Factor	Variables	Level	Factor Loadings	% of Variance
1	Project Success	Project budget	V1	0.710	10.198
2		Estimated time	V2	0.653	
3		Desired quality	V3	0.709	
4		Stakeholder satisfaction	V4	0.634	
5		Social purpose	V5	0.663	
6		Achieved organization goal	V6	0.638	
7		Satisfaction of team members	V7	0.649	
8		Safety	V8	0.622	

9	Strategy	Leadership strategy	V10	0.592	9.931
10		Bidding strategy	V11	0.581	
11		Effective cash Flow management strategy	V12	0.641	
12		Clear Objectives and understanding	V13	0.604	
13		Cohesive procurement strategy	V14	0.672	
14		Strategy of effective communication	V15	0.596	
15		Market intelligence strategy	V16	0.636	
16		Strategic execution plan aligns with project scope	V17	0.62	
17		Managing Risk Strategy	V18	0.663	
18	Risk	Fund flow of client	V20	0.496	8.402
19		Control of scope creeping	V21	0.458	
20		Team conflict resolution	V22	0.607	
21		Timely subcontractor payment	V23	0.644	
22		Clear and unambiguity scope	V24	0.625	
23		Justified penalty clause	V25	0.608	
24		Timely document and drawing approval	V26	0.572	
25		Price variation clause	V27	0.509	
26		Test list with less frequency	V28	0.574	
27	Contract	Price escalation clause	V33	0.401	8.306
28		Payment terms	V34	0.47	
29		Realistic schedule	V35	0.544	
30		Type of Contract	V36	0.628	
31		Claims for time extension	V37	0.575	
32		Clear and unambiguity scope	V38	0.518	
33		Penalty for delay	V39	0.539	
34		Dispute and Arbitration	V40	0.425	
35		Document approval in time	V41	0.476	
36	Stakeholder	Managing stakeholders	V42	0.711	7.516
37		Public and community support	V43	0.588	
38		Effectively resolving conflicts between stakeholders	V44	0.6	
39		Analyzing the local people influences and relationships	V45	0.607	
40		Early Identify, prioritize and engage key stakeholders	V46	0.709	
41		Top management support	V47	0.701	
42	Information Technology	E-tendering	V48	0.669	7.378
43		Planning & monitoring	V49	0.638	
44		Energy Management and Control system	V50	0.705	
45		Network Management system	V51	0.653	
46		Decision support System (DSS)	V52	0.622	

Mapping of 46 variables from 52 variable (V1-V52) code with the name in the given in Table-4.8 as below:

Table-4.8: Mapping of 46 Variables with Code

Sl. No	Factors	Variables	Level	Code
1	Project Success	Project budget	V1	PCSF1
2		Estimated time	V2	PCSF2
3		Desired quality	V3	PCSF3
4		Stakeholder satisfaction	V4	PCSF4
5		Social purpose	V5	PCSF5
6		Achieved organization goal	V6	PCSF6
7		Satisfaction of team members	V7	PCSF7
8		Safety	V8	PCSF8
9	Strategy	Leadership strategy	V10	SCSF1
10		Bidding strategy	V11	SCSF2
11		Effective cash Flow management strategy	V12	SCSF3
12		Clear Objectives and understanding	V13	SCSF4
13		Cohesive procurement strategy	V14	SCSF5
14		Strategy of effective communication	V15	SCSF6
15		Market intelligence strategy	V16	SCSF7
16		Strategic execution plan aligns with project scope	V17	SCSF8
17		Managing Risk Strategy	V18	SCSF9
18	Risk	Fund flow of client	V20	RCSF1
19		Control of scope creeping	V21	RCSF2
20		Team conflict resolution	V22	RCSF3
21		Timely subcontractor payment	V23	RCSF4
22		Clear and unambiguity scope	V24	RCSF5
23		Justified penalty clause	V25	RCSF6
24		Timely document and drawing approval	V26	RCSF7
25		Price variation clause	V27	RCSF8
26		Test list with less frequency	V28	RCSF9
27	Contract	Price escalation clause	V33	CCSF1
28		Payment terms	V34	CCSF2
29		Realistic schedule	V35	CCSF3
30		Type of Contract	V36	CCSF4
31		Claims for time extension	V37	CCSF5
32		Clear and unambiguity scope	V38	CCSF6
33		Penalty for delay	V39	CCSF7
34		Dispute and Arbitration	V40	CCSF8
35		Document approval in time	V41	CCSF9

36	Stakeholder	Managing stakeholders	V42	STCSF1
37		Trust of Stakeholder	V43	STCSF2
38		Effectively resolving conflicts between stakeholders	V44	STCSF3
39		Communicating with stakeholder	V45	STCSF4
40		Early Identify, prioritize and engage key stakeholders	V46	STCSF5
41		Top management support	V47	STCSF6
42	Information Technology	E-tendering	V48	ITCSF1
43		Planning & monitoring	V49	ITCSF2
44		Energy Management and Control system	V50	ITCSF3
45		Network Management system	V51	ITCSF4
46		Decision support System	V52	ITCSF5

4.4.3.2 Correlation of Factors

After variables have been separated, it is important to analyze whether factor examination demonstrates that it is planned to be estimated; for instance; the components of each variable framed altogether clarify a similar measure within the measurement of the objectives (Doloi, 2009).If factor examination precisely shapes the obtained variables, it is comprehended that there exists an association within these variables. However, it may not depict an ideal relationship. The Pearson Correlation minute relationship coefficient (Pearson correlation coefficient) is a proportion of the quality of a straight relationship between two factors and is denoted by ‘r’. Further, a correlation denotes the quality of the relationship between two factors or factors in a solitary incentive depicted between ‘-1’ and ‘+1’. A positive numeral demonstrates a positive relationship and a negative numeral shows a negative relationship between two variables. Thus, correlation is confined to a straight correlation between variables.

As per the Pearson Correlation conducted on SPSS-25.0, the Correlation coefficients falling in the range of 0.10 and 0.29 depicts little relationship, coefficients in the range of 0.30 and 0.49 demonstrates a medium relationship, and coefficients of 0.50 or above show a strong relationship between variables. Basic factors are extracted from 46 elements with coefficient correlation is greater than 0.3 for all variables. Pearson correlation details

areshown in Table-4.9 to 4.14 in **Appendix-B.** Mapping of the table for reference is shown in Table-4.15 in below:

Table-4.15: Mapping of Pearson Correlation Test for 6 Factors

S. No	Group of Factors	Factors	Code	Significance Level	Table Reference
1	Project Success	Project budget	PCSF1	0.01	Table-4.9 in Appendix-B
2		Estimated time	PCSF2	0.01	
3		Desired quality	PCSF3	0.01	
4		Stakeholder satisfaction	PCSF4	0.01	
5		Social purpose	PCSF5	0.01	
6		Achieved organization goal	PCSF6	0.01	
7		Satisfaction of team members	PCSF7	0.01	
8		Safety	PCSF8	0.01	
9	Strategy	Leadership strategy	SCSF1	0.01	Table-4.10 in Appendix-B
10		Bidding strategy	SCSF2	0.01	
11		Effective cash Flow management strategy	SCSF3	0.01	
12		Clear Objectives and understanding	SCSF4	0.01	
13		Cohesive procurement strategy	SCSF5	0.01	
14		Strategy of effective communication	SCSF6	0.01	
15		Market intelligence strategy	SCSF7	0.01	
16		Strategic execution plan aligns with project scope	SCSF8	0.01	
17		Managing Risk Strategy	SCSF9	0.01	
18	Risk	Fund flow of client	RCSF1	0.01	Table-4.11 in Appendix-B
19		Control of scope creeping	RCSF2	0.01	
20		Team conflict resolution	RCSF3	0.01	
21		Timely subcontractor payment	RCSF4	0.01	
22		Clear and unambiguity scope	RCSF5	0.01	
23		Justified penalty clause	RCSF6	0.01	
24		Timely document and drawing approval	RCSF7	0.01	
25		Price variation clause	RCSF8	0.01	
26		Test list with less frequency	RCSF9	0.01	
27	Contract	Price escalation clause	CCSF1	0.01	Table-4.12 in Appendix-B
28		Payment terms	CCSF2	0.01	
29		Realistic schedule	CCSF3	0.01	
30		Type of Contract	CCSF4	0.01	
31		Claims for time extension	CCSF5	0.01	
32		Clear and unambiguity scope	CCSF6	0.01	
33		Penalty for delay	CCSF7	0.01	
34		Dispute and Arbitration	CCSF8	0.01	
35		Document approval in time	CCSF9	0.01	

36	Stakeholder	Managing stakeholders	STCSF1	0.01	Table-4.13 in Appendix-B
37		Trust of Stakeholder	STCSF2	0.01	
38		Effectively resolving conflicts between stakeholders	STCSF3	0.01	
39		Communicating with stakeholder	STCSF4	0.01	
40		Early Identify, prioritize and engage key stakeholders	STCSF5	0.01	
41		Top management support	STCSF6	0.01	
42	Information Technology	E-tendering	ITCSF1	0.01	Table-4.14 in Appendix-B
43		Planning & monitoring	ITCSF2	0.01	
44		Energy Management and Control system	ITCSF3	0.01	
45		Network Management system	ITCSF4	0.01	
46		Decision support System	ITCSF5	0.01	

After factor analysis the CSFs framework with 46 variables shown in Figure-4.3

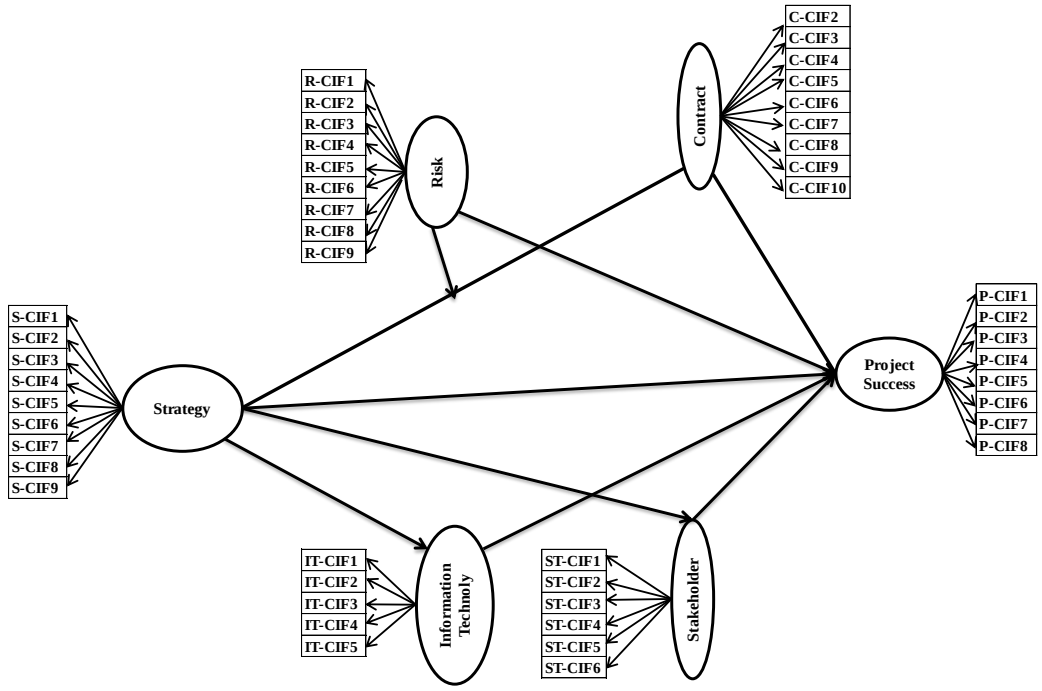

Figure-4.3: CSFs Framework with Resultant 46 Variables after Factor Analysis Along with Codes

4.5 "HYPOTHESIS TESTING"

The investigation and validation progress are divided into four steps. The first step in the methods of RII is ranking the significance of each factor, the second step Regression

analysis includes multicollinearity and autocorrelation, the third step is evaluating factor structure through multiple regression analysis (MRA) (moderator and mediator process), and finally, the fourth step assesses the concurrence validity of the factor as explained by evaluation of hypotheses. SPSS-25.0 data analysis tool is employed for the purpose of analysis.

4.5.1 Hypothesis Testing Recap

Table 4.16 recapitulates the hypotheses defined and their mapping with the IV and DVs to evaluate the relationship of CSFs and their impact on PS. The relationship cited in literature formed the basis of the relationship.

Table 4.16: Hypothesis Testing Recap

Hypothesis (Symbol)	Sub-hypothesis (Symbol)	Independent Variable (IV) Critical Success Factors	Dependent Variable (DV)	Key Evaluation
H1	H1a	Strategy	Project Success	Direct impact
	H1b	Contract	Project Success	Direct impact
	H1c	Stakeholder	Project Success	Direct impact
	H1d	Information Technology	Project Success	Direct impact
	H1e	Risk	Project Success	Direct impact
H2	H2a	Risk	Project Success	Moderating impact between Strategy and Project Success
	H2b	Contract	Project Success	Mediating impact between Strategy and Project Success
	H2c	Stakeholder	Project Success	Mediating impact between Strategy and Project Success
	H2d	Information Technology	Project Success	Mediating impact between Strategy and Project Success

4.5.2 Ranking of the Extracted Factors

Different analysts (Assaf et al. 1995; Faridi and El-Sayegh, 2006; Iyer and Jha, 2005; Kumaraswamy and Chan, 1998) believe that the Mean and SD of every factor is not well suited to measure rankings. This is because they do not repeat their relationship among themselves, thus the present research study uses Relative Important Index (RII) which is determined with the accompanying conditions.

RII = Σ W / (N * A) ---------- (1)

Where; W = weight of each factor as perceived (respondents) within a range of 1 to 5
A = the highest weight (5, here,) and
N = Total respondents
RII does not indicate the relationship between the factors.

Table-4.17 shows the Factor's mean and RII in **Appendix-B.**

The **RII result shows Strategy, Risk, Contract, Stakeholder and Information Technology are CSFs for PT project**. Table- 4.17 shows that in group wise ranking, the Project Success proved to be the most important factor (mean=4.14 & RII=0.83); followed by Strategy (mean=4.03 & RII=0.81); Risk(mean=3.89 & RII-0.78), Contract (mean=3.87 & RII=0.77); Information Technology (mean=3.87, RII=0.77) and Stakeholder (mean= 3.81 & RII=0.76).

4.5.3 Intercorrelation and Autocorrelation

Multicollinearity: Multicollinearity is a condition which involves exceptionally high inter-correlations or intertwined relationships among the independent factors (Heinecke, 2011). It can thus be defined as a kind of aggravation in the data set, which if present, leads to the unreliability of the measurable derivations constructed regarding the data.

Multicollinearity can likewise be recognized with the assistance of tolerance and it's reciprocal, called Variance Inflation Factor (VIF). If the estimation of Tolerance is under 0.2 or 0.1 and, at the same time, the estimation of VIF is 10 or more, the multicollinearity is high.

In multiple regression, the VIF is utilized to denote multicollinearity. Computationally, it can be determined as the reciprocal of tolerance: $1/ (1 - R^2)$. Every other thing being constant, researchers prefer to have lower levels of VIF, as higher levels of VIF are known to influence the outcomes of multiple regression analysis adversely. Reality shows that the utility of VIF, as unmistakable from tolerance, is that VIF explicitly shows the extent of the expansion in the standard error related to a specific beta weight. This happens because of multicollinearity. Different proposals for satisfactory degrees of VIF have been published in the literature. However, an estimation of 10 has been prescribed as the greatest degree of VIF (e.g., Hair et al. 1995; Kennedy, 1992; Marquardt, 1970; Neter, Wasserman, and Kutner, 1989). The VIF suggestion of 10 relates to the tolerance proposal of 0.10 (i.e., 1/0.10 = 10). Moreover, an extreme VIF estimation of 5 (e.g., Rogerson, 2001) and even 4 (e.g., Pan and Jackson, 2008) can also be found in the literature. The researcher can use any of the foundations as per the needs and objectives of the study. Multicollinearity is estimated by VIF as well as tolerance. An issue of multicollinearity can be suggested, on the probability that VIF esteems surpass 4.0, or the tolerance level is under 0.2 (Hair et al., 2010).

Table-4.18 shows Tolerance value and VIF value for Strategy (0.571>0.2) and (1.752<2.5), for Risk (0.560>0.2) and (1.786<2.5), for Contract (0.425>0.2) and (2.356<2.5), for Stakeholder (0.533>0.2) and (1.876<2.5) and for Information Technology (0.519>0.2) and (1.928<2.5).Hence the model is free from the problem of multicollinearity.

Durbin Watson Test: The Durbin Watson (DW) measurement is a test for autocorrelation in the residuals of regression. The Durbin-Watson measurement will have a value from 0

and 4. Value of 2.0 implies no autocorrelation is recognized in the sample. Further, a dependable guideline is that the test measurement values which lie between 1.5 - 2.5 are moderately ordinary. Values beyond this range could cause concern. Field (2009), recommends that the values under 1 or above 3 are a positive reason for concern.

Table 4.18 reflects Durbin-Watson value of 2.106 which is within range of 1 to 3, and no autocorrelation is recognized in the identified critical success factors. Thus, it is found that all tolerance values are greater than 0.2 and VIF values are less than 2.5. Hence the model proves to be a good fit.

Table-4.18: Multicollinearity and Autocorrelation

Factors	Collinearity Statistics		Durbin-Watson
	Tolerance	VIF	
Strategy	0.571	1.752	2.106
Contract	0.425	2.356	
Stakeholder	0.533	1.876	
Information Technology	0.519	1.928	
Risk	0.56	1.786	
a. Dependent Variable: PS			

4.5.4 Multiple Regression Analysis

In the study, Strategy, Risk, Contract, Information Technology and Stakeholder factors as IDVs and Project Success as DV have been obtained from the factor analysis in the previous chapter and its foundation in the existing literature. The stepwise regression model is framed with these factors as categorical variables to measure the overall impact of Project Success by individual attributes and can be expressed as follows:

$$\mathbf{Y = a + b_1X_1 + b_2X_2 + ... b_mX_m + e \text{ ---------- (2)}}$$

Here, Y - dependent variable, ‘a’- constant and intercepts at Y-axis; b_1 to b_m- estimated regression coefficients; X_1 to X_m-predictors or independent variables, ‘e’-error term.

The proposed framework is selected as an optimum model based upon the correlation strength (R^2) asadirect measure of percentage of variance explained (Field, 2005). However, a better measure of strength in the model is adjusted R^2 values as the value of R^2 changes with the addition of new IDVs in the model. The adjusted R^2 values and the deviation from R^2 values generalizes the predictive strength of the dependent variable in the model (Doloi, 2009). Lesser the difference between values of $R^2$and adjusted $R^2$is, stronger the model proves to be (Field, 2005). Identical R^2 and adjusted R^2 values suggest an ideal situation.

Hypothesis 1 (H1): Direct impact of CSFs on Project Success

Step-1: Regression Analysis is carried out between all 5 independent factors and dependent factors (Project Success).

Table-4.19, it is found that Model-1 is significant($p=0.00<0.05$) and 39.1% is variance explained on the dependent variable (Project Success) by another independent variable (Strategy, Risk, Contract, Stakeholder and Information Technology). Statistically, it can be concluded as Strategy is significant predictor ($p=0.020$) of PS and one-unit change of Strategy impacts 0.168-unit change in Project Success. Risk is a significant predictor ($p=0.025$) and one-unit change of Risk impact 0.178 unit of Project Success. A Stakeholder is significant ($p=0.046$) and one-unit change of Stakeholder impact changes 0.130 unit of Project Success. Information Technology is significant($p=0.011$) and one-unit change of Information Technology impact 0.158-unit change in Project Success. However, Contract is not significant ($p=0.162$) with Project success.

Table-4.19: Multiple Regression Analysis- All 5 Independent Factors

Model Summary[b]									
Model	**R**	**R^2**	**Adjusted R^2**	**SE of the Estimate**	**Change Statistics**				
					R^2 Change	**F Change**	**df1**	**df2**	**Sig. F Change**
1	.637[a]	0.405	0.391	0.5718	0.405	27.417	5	201	0.000
a. Predictors: (Constant), Information, Risk, Strategy, Stakeholder, Contract									
b. Dependent Variable: PS									

Coefficients[a]					
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**
	b	***se***	***β***		
(Constant)	1.203	0.267		4.505	0.000
Strategy	0.168	0.072	0.168	2.336	0.020
Risk	0.178	0.079	0.164	2.255	0.025
Contract	0.120	0.086	0.117	1.403	**0.162**
Stakeholder	0.130	0.065	0.149	2.006	0.046
Information Technology	0.158	0.062	0.193	2.553	0.011
a. Dependent Variable: PS					

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

Step-2: **Regression Analysis is done between other 4 independent factors (Risk, Contract, Stakeholder and Information technology) and Project Success after dropping Strategy factor.**

In Table-4.20, it is found that Model-2 is significant (p=0.00<0.05) and 37.7% variance is explained as dependent variable (Project Success) by another independent variable (Risk, Contract, Stakeholder and Information Technology).Statistically it can be concluded as Risk is significant (p=0.011) and one-unit change of Risk impacts 0.204 unit of Project Success. Stakeholder is significant s(p=0.013) and one-unit change of Stakeholder impact 0.161 unit of Project Success.

Information Technology is also significant(p=0.003) and one-unit change of Information Technology impact 0.183-unit change of Project Success. But again, Contract is not significant (p=0.053) with Project success.

Table-4.20: Multiple Regression Analysis- 4 Independent Factors (Drop-Strategy)

Model Summary[b]									
Model	**R**	**R^2**	**Adjusted R^2**	**SE of the Estimate**	**Change Statistics**				
					R^2 Change	**F Change**	**df1**	**df2**	**Sig. F Change**
2	.624[a]	0.389	0.377	0.5781	0.389	32.196	4	202	0.000
a. Predictors: (Constant), Information, Risk, Stakeholder, Contract									
b. Dependent Variable: PS									

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**
		b	***se***	***β***		
2	(Constant)	1.396	0.257		5.436	0.000
	Risk	0.204	0.079	0.187	2.577	0.011
	Contract	0.164	0.084	0.160	1.949	**0.053**
	Stakeholder	0.161	0.064	0.185	2.504	0.013
	Information technology	0.183	0.062	0.223	2.961	0.003
a. Dependent Variable: PS						

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

Step-3: Regression Analysis is done between other 4 independent factors (Strategy, Contract, Stakeholder and Information technology) and Project Success after dropping Risk

In Table-4.21, it is found that Model-3 is significant(p=0.00<0.05) and 37.8% variance explained as dependent variable (Project Success) by another independent variable (Strategy, Contract, Stakeholder and Information Technology).Statistically it can be concluded as Strategy is significant (p=0.009) and one-unit change of Strategy impacts 0.190-unit of Project Success.

Contract is significant(p=0.033) and one-unit change of Contract impacts 0.177-unit of Project success. Stakeholder is significant(p=0.018) and one-unit change of Stakeholder impacts 0.154 unit of Project Success. IT is significant(p=0.005) and one-unit change of Information Technology impact 0.177-unit change of Project Success.

Table-4.21: Multiple Regression Analysis- 4 Independent Factors (Drop-Risk)

Model Summary[b]									
Model	**R**	**R^2**	**Adjusted R^2**	**SE of the Estimate**	**Change Statistics**				
					R^2 Change	**F Change**	**df1**	**df2**	**Sig. F Change**
3	.625[a]	0.390	0.378	0.5776	0.390	32.345	4	202	0.000
a. Predictors: (Constant), Strategy, Information, Stakeholder, Contract									
b. Dependent Variable: PS									

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**
		b	***se***	***β***		
3	(Constant)	1.419	0.252		5.636	0.000
	Contract	0.177	0.083	0.173	2.144	0.033
	Stakeholder	0.154	0.065	0.177	2.392	0.018
	Information Technology	0.177	0.062	0.216	2.851	0.005
	Strategy	0.190	0.072	0.191	2.649	0.009
a. Dependent Variable: PS						

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

Step-4: Regression Analysis done between other 4 independent factors (Strategy, Risk, Stakeholder and Information technology) and Project Success when Contract is dropped.

It is found that Model-4 is significant($p=0.00<0.05$) and 38.8% variance explained as dependent variable (Project Success) by another independent variable (Strategy, Risk, Stakeholder and Information Technology).Statistically it can be as Strategy is significant($p=0.007$) and one-unit change of Strategy changes 0.190-unit of Project Success. Risk is significant ($p=0.006$) and one-unit change of Contract changes 0.211-unit of Project success. Stakeholder is significant ($p=0.017$) and one-unit change of Stakeholder impacts 0.152 unit of Project Success. IT is significant ($p=0.002$) and one-unit change of IT impacts 0.185-unit change of Project Success. Results are shown in Table 4.22.

Table-4.22: Multiple Regression Analysis- 4 Independent Factors (Drop-Contract)

Model Summary[b]									
Model	R	R^2	Adjusted R^2	SE of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
4	.632[a]	0.400	0.388	0.5732	0.400	33.618	4	202	0.000
a. Predictors: (Constant), Risk, Strategy, Information, Stakeholder									
b. Dependent Variable: PS									

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	p
		b	*se*	*β*		
4	(Constant)	1.263	0.264		4.782	0.000
	Stakeholder	0.152	0.063	0.174	2.400	0.017
	Information Technology	0.185	0.059	0.226	3.134	0.002
	Strategy	0.190	0.070	0.191	2.708	0.007
	Risk	0.211	0.076	0.194	2.787	0.006
a. Dependent Variable: PS						

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

Step-5: Regression Analysis done between other 4 independent factors (Strategy, Risk, Contract and Information technology) and Project Success when Stakeholder is dropped.

In Table-4.23, it is found that Model-5 is significant(p=0.00<0.05) and 39.4% variance explained as dependent variable (Project Success) by another independent variable (Strategy, Risk, Contract and Information Technology). Statistically it can be concluded as Strategy is significant(p=0.006) and one-unit change of Strategy impact 0.197-unit of Project Success. Risk is significant(p=0.010) and one-unit change of Risk impact 0.205-unit of Project success. Contract is notsignificant(p=0.057) with Project Success. Information Technology is significant(p=0.003) and one-unit change of Information Technology impact 0.183-unit change of Project Success.

Table-4.23: Multiple Regression Analysis- 4 Independent Factors (Drop-Stakeholder)

Model Summary[b]									
Model	R	R^2	Adjusted R^2	SE of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
5	.627[a]	0.394	0.382	0.5761	0.394	32.775	4	202	0.000
a. Predictors: (Constant), Contract, Strategy, Risk, Information									
b. Dependent Variable: PS									

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	p
		b	*se*	*β*		
5	(Constant)	1.226	0.269		4.559	0.000
	Information Technology	0.183	0.061	0.223	2.991	0.003
	Strategy	0.197	0.071	0.197	2.780	0.006
	Risk	0.205	0.078	0.188	2.607	0.010
	Contract	0.161	0.084	0.157	1.918	**0.057**
a. Dependent Variable: PS						

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

Step-6: Regression Analysis done between other 4 independent factors (Strategy, Risk, Contract and Stakeholder) and Project Success when Information Technology is dropped.

Table-4.24, reveals that Model-6 is significant(p=0.00<0.05) and 37.4% variance explained as dependent variable (Project Success) by another independent variable (Strategy, Risk, Contract and Stakeholder). Statistically, it can be concluded as Strategy is significant(p=0.006) and one-unit change of Strategy impact 0.199-unit of Project Success. Risk is significant(p=0.010) and one-unit change of Risk impact 0.205-unit of Project success. Contract is significant significant(p=0.024) and one-unit change of Contract impact 0.188-unit of Project success. Stakeholder is significant(p=0.012) and one-unit change of Information Technology impact 0.163-unit change of Project Success.

Table-4.24: Multiple Regression Analysis- 4 Independent Factors (Drop-Information Technology)

Model Summary[b]									
Model	R	**R^2**	**Adjusted R^2**	**SE of the Estimate**	**Change Statistics**				
					R^2 Change	**F Change**	**df1**	**df2**	**Sig. F Change**
6	.621[a]	0.386	0.374	0.5796	0.386	31.774	4	202	0.000
a. Predictors: (Constant), Stakeholder, Risk, Strategy, Contract									
b. Dependent Variable: PS									

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**
		b	***se***	***β***		
6	(Constant)	1.197	0.271		4.422	0.000
	Strategy	0.199	0.072	0.199	2.774	0.006
	Risk	0.205	0.079	0.189	2.584	0.010
	Contract	0.188	0.082	0.183	2.275	0.024
	Stakeholder	0.163	0.064	0.187	2.532	0.012
a. Dependent Variable: PS						

***b*-Coefficient; *se*-Standard Error; *β*- Beta; P-Significant Value**

It is observed that all CSFs have a significant impact on PS, except Contract factor which becomes significant when the Risk factor is dropped. However, Risk is related to all other factors in PT project and Contract is one of the vital factors in the PT project so that Contract cannot be eliminated. Which necessitates to conducting moderator and mediator process regression analysis to check the moderating impact of a Risk factor as conducted in consequent sections.

Step-7: Risk has potential as moderator factor.

Testing the hypothesis that project success is a function of multiple success factors and more precisely, whether risk factor moderates the relationship between strategy and project success, a hierarchical regression analysis is conducted. Table-4.25 shows that Adjusted-R^2increase by adding of Risk factor.

Table-4.25: Adjusted R^2 Increase after Adding Risk

Model Summary									
Model	**R**	**R^2**	**Adjusted R^2**	**SE of the Estimate**	**Change Statistics**				
					R^2 Change	**F Change**	**df1**	**df2**	**Sig. F Change**
1	.625[a]	0.39	0.378	0.5776	0.39	32.345	4	202	0
2	.637[b]	0.405	0.391	0.5718	0.02	5.085	1	201	0.025
a. Predictors: (Constant), Information Technology, Strategy, Stakeholder, Contract									
b. Predictors: (Constant), Information Technology, Strategy, Stakeholder, Contract, Risk									
c. Dependent Variable: PS									

It is found as below in Table-4.25.

Model-1 is significant (p=0.00<0.05) without interaction factor Risk [F (4,202) =32.345, P=0.00<0.05]. The independent factors Strategy, Contract, Stakeholder and Information Technology are significant with Project Success and the total impact of 43.160% on Project Success.

Model-2 is significant with interaction factor Risk [F (5,201) =27.417, P=0.00<0.05], R^2 and adjusted R^2 difference is small 0.014 which indicates the robustness of the model.

From the above results and analysis, H1 holds is concluded as sub-hypotheses

H1a: Strategy has a significant positive relation to Project Success.

H1b: Contract has a significant positive relation to Project Success as a condition of either drop of Risk factor, or drop of Information Technology.

H1c: Stakeholder has a significant positive relation to Project Success.

H1d: Information technology has a significant positive relation to Project Success.

H1e: Risk has significant Relation with Project Success

Hypothesis 2 (H2): Indirect impact of CSFs between Strategy and Project Success (Mediator and Moderator)

The detailed mediator and moderator impact have been analyzed where Project Success is a dependent factor, Strategy is an independent factor, Risk is moderator factor and Contract, Stakeholder and Information Technology are used as mediator factor. The indirect impact of CSFs is tested between Strategy factor (IDV) and Project Success (DV) specifically to strengthen the inclusion of Strategy as one of CSFs in the framework after literature review along with other CSFs, as this being the first study to take Strategy factor as IDV to impact Project Success. The indirect impact is explained with Andre F. Hayes Process.

Andrew F. Hayes Mediation Process Model-4- Mediation means a situation whentheeffect of IDV (CSF here) on the DV can best be explained with a third mediator factor; which is caused by the independent factor and is itself a cause for the dependent factor. For instance, in this case, in place of X affecting Y directly, X is affecting the mediator M, and M, in turn, affecting Y. Thus, X and Y, in this case, said to have an indirect causal relationship. This is explained with a path diagram/model below.

Step-1: From Table-4.26 it is found that considering independent factor Strategy and mediator factor Contract, Stakeholder and Information Technology together cause (R^2= 0.39) 39% variance in Project Success.

a) Strategy has a positive effect and significant (*b*=0.19, *se*=0.07, p=0.01) relation with Project Success and change of one-unit Strategy, changes 0.19-unit Project Success.

b) Contract has a positive effect and significant (*b*=0.18, *se*=0.08, p=0.03) relation with Project Success and change of one-unit Contract results in a change of 0.18-unit Project Success.

c) Stakeholder has a positive significant (*b*=0.15, *se*=0.06, p=0.02) relation with Project Success and change of one-unit Stakeholder results in a change of 0.15-unit Project Success.

d) Information Technology has a positive significant (*b*=0.18, *se*=0.06, p=0.00) relation with Project Success and change of one-unit Information Technology results in a change of 0.18-unit Project Success.

Table-4.26: Andrew F. Hayes Mediation Process Model-4

OUTCOME VARIABLE: Project Success						
Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.62	0.39	0.33	32.35	4	202	0.00
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
Constant	1.42	0.25	5.64	0.00	0.92	1.92
Strategy	0.19	0.07	2.65	0.01	0.05	0.33
Contract	0.18	0.08	2.14	0.03	0.01	0.34
Stakeholder	0.15	0.06	2.39	0.02	0.03	0.28
Information Technology	0.18	0.06	2.85	0.00	0.05	0.30

***b*-Coefficient; *se*-Standard Error; P-Significant Value**

Y= 1.42+ 0.19X1+0.18X2+0.15X3+0.18X4+ 0.25 ----------(3)

Where, Y=Project Success

X1= Strategy

X2= Contract

X3= Stakeholder

X4= Information Technology

The Figure-4.4 shows the mediator factor Contract, Stakeholder and Information Technology effect between the independent factor Strategy and dependent factor Project Success.

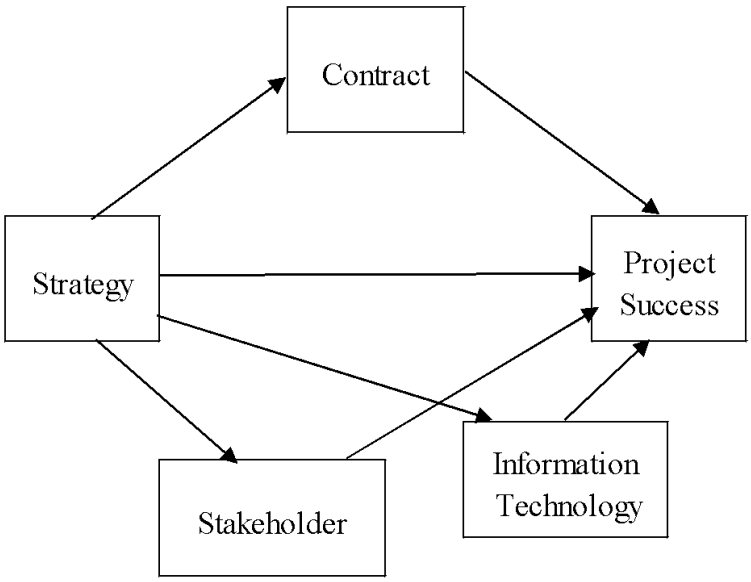

Figure-4.4: Mediator Factor Relation with DV, IDV and MV- Hypothesis H1a, H1b, H1c and H1d

From Table-4.27 it is found that the total effect and direct effect of independent strategy factor and dependent project success factor is positive and significant.

The indirect effect is tested using non-parametric bootstrapping. It infers that the population indirect effect is '0' if null of '0' lies between the lower and upper bound of 95% CI, and indirect effect is non-zero If '0' falls outside the CI. In this model, the total indirect effect is 0.31 and statistical significance is 95%, CI (0.18, 0.46). Contract indirect effect is 0.10 and statistical significance is 95%, CI (0.02, 0.22). Stakeholder indirect effect is 0.10 and statistical significance is 95%, CI (0.00, 0.19). Information Technology indirect effect is 0.11 and statistical significance is 95%, CI (0.00, 0.25).

Table-4.27: Direct and Indirect Effect

Total effect of X on Y					
Effect	***se***	**t**	**p**	**LLCI**	**ULCI**
0.50	0.06	8.32	0.00	0.38	0.62
Direct effect of X on Y					
Effect	***se***	**t**	**p**	**LLCI**	**ULCI**
0.19	0.07	2.65	0.01	0.05	0.33
Indirect effect(s) of X on Y:					
	Effect	**Boot SE**		**Boot LLCI**	**Boot ULCI**
TOTAL	0.31	0.07		0.18	0.46
Contract	0.10	0.06		0.02	0.22
Stakeholder	0.10	0.05		0.00	0.19
Information Technology	0.11	0.06		0.00	0.25

***se*- Standard error**

Step-2: Table-4.28 shows the path (direct effect) from Strategy has is positive effect and significant (*b*=0.50, *se*=0.06, p=0.00) on Project Success. One unit of Strategy change leads to a change of 0.50 unit of Project Success.

Y_1=2.12+0.50X+0.06 ---------- (4)

Table-4.28: Strategy Direct Impact on Project Success

OUTCOME VARIABLE: Project Success						
Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.5	0.25	0.4	69.2	1	205	0
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
constant	2.12	0.25	8.6	0.00	1.64	2.61
Strategy	0.50	0.06	8.32	0.00	0.38	0.62

***b*-Coefficient; *se*-Standard Error; P-Significant Value**

Step-3: Table- 4.29 shows Strategy has direct effect and significant (*b*=0.57, *se*=0.06, p=0.00) relation with Contract. One-unitchangeof strategy effects of 0.57-unit change Contract.

M1=1.57+0.57X+0.06 ---------- (5)

Table-4.29: Mediator Factor Contract

OUTCOME VARIABLE: Contract						
Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.58	0.34	0.34	106.12	1	205	0.00
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
constant	1.57	0.23	6.96	0.00	1.13	2.02
Strategy	0.57	0.06	10.3	0.00	0.46	0.68

***b*-Coefficient; *se*-Standard Error; P-Significant Value**

The Figure- 4.5 shows the mediating effect of contract.

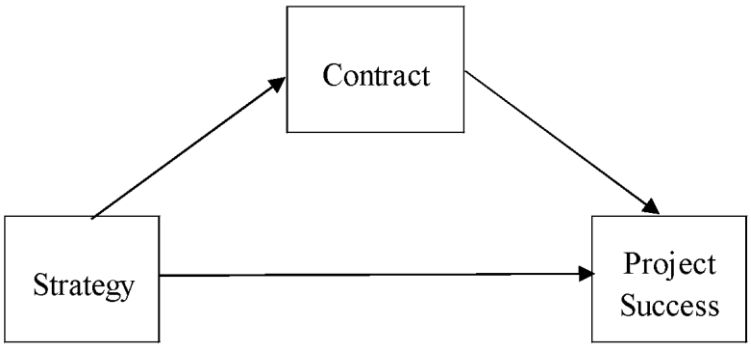

Figure-4.5: Contract Mediator Factor-Hypothesis H2b

From the above discussion the hypothesis is concluded as below:

H2b: Contract has mediating effect between Strategy and Project Success resulted from above discussion.

Step-4: The Table-4.30 shows the direct path direct Strategy has a positive effect and significant (*b*=0.62, *se*=0.07, p=0.00) on Stakeholder. One unit of Strategy change leads to change to 0.62-unit Stakeholder.

M2=1.32+0.62X+0.07 ---------- (6)

Table-4.30: Mediator Factor Stakeholder

OUTCOME VARIABLE: Stakeholder						
Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.54	0.29	0.5	84.61	1	205	0.00
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
constant	1.32	0.28	4.77	0.00	0.77	1.86
Strategy	0.62	0.07	9.20	0.00	0.49	0.75

***b*-Coefficient; *se*-Standard Error; p-Significant Value**

The Figure- 4.6 shows the mediating effect of Stakeholder

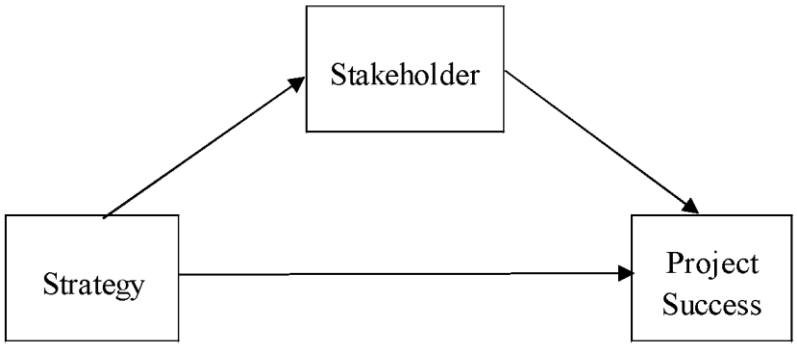

Figure-4.6: Stakeholder Mediator Factor-Hypothesis H2c

From the above discussion the hypothesis is concluded as below:

H2c: Stakeholder has significant positive relation to Project Success.

Step-5: Table-4.31 shows the direct path effect from Strategy has positive effect and significant (*b*=0.65, *se*=0.07, p=0.00) on Information Technology. One unit of Strategy change results in a change of 0.65-unit Stakeholder. As a framework evaluation for Information Technology Factor as a mediating effect in equation-7.

M3=1.26+0.65X+0.07 ---------- (7)

Table-4.31: Mediator Factor Information Technology

OUTCOME VARIABLE: Information Technology						
Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.53	0.28	0.57	81.34	1	205	0.00
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
constant	1.26	0.29	4.26	0.00	0.67	1.84
Strategy	0.65	0.07	9.02	0.00	0.51	0.79

***b*-Coefficient; *se*-Standard Error; p-Significant Value**

The Figure- 4.7 shows the mediating effect of Information Technology.

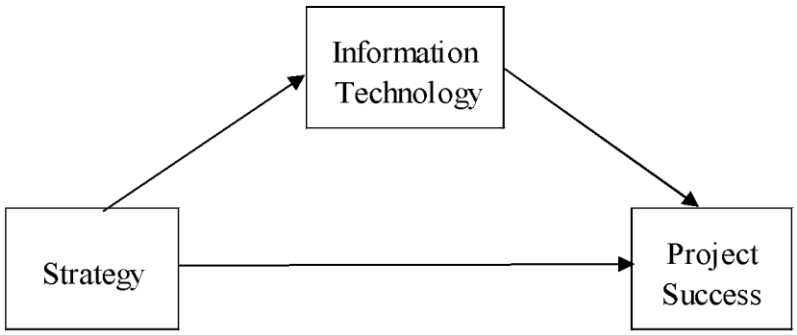

Figure-4.7: Information Technology as a Mediator Factor- Hypothesis H2d

From the above results, the hypothesis is concluded as

H2d: Information technology has mediating effect between Strategy and Project success.

Moderation Process Model-1: A moderator variable outline the conditions for which any given predictor relates to DV and when this relationship exists. Moderation suggeststheeffect of interaction, wherein the introduction of a moderating variable changes the direction/magnitude of the relationship.

Table- 4.32; reveals that the value of R^2 increased by 0.02 (ΔR^2= 0.02 after adding risk factor with another factor strategy, contract, stakeholder and information technology, pertaining to the condition that the value of other independent variables is '0' (Field, 2018). Hence, the risk factor is used as a moderator variable. So, Risk has a moderator (W) effects between Strategy(X) and dependent variable project Success(Y). According to Hayes (2018), the researcher should be used while referring to the effects of X and W is not 'main effects' or the effects of those variables controlling the interaction.

Table-4.32: Moderator Factor Risk

Test(s) of highest order unconditional interaction(s):					
	R^2-change	**F**	**df1**	**df2**	**p**
X*W	0.02	5.5271	1	203	0.0197
Focal predict: Strategy (X)					
Mod var: Risk (W)					

It is found in Table 4.33, that the interaction term is statistically significant because zero is not lain between the confidence interval (*b*= -0.18, *se*= 0.08, p=0.02) in this model, indicating that Risk is a significant moderator of the effect as a moderator between Strategy on the Project Success. In this model Risk as moderator factor has total 35% overall impact between Strategy and Project Success.

a) Strategy has positive relation and significant (*b*=0.29, *se*=0.07, p=0.00) with Project Success conditional Risk=0.

b) Also, Risk has positive relation and significant (*b*=0.36, *se*=0.07, p=0.00) with Project Success conditional other variable=0.

c) The interaction (Risk * Strategy) is statistically negative relation and significant because zero is not lie between confidence intervals (*b*= -0.18, *se*= 0.08, p=0.02).

Table-4.33: Andrew F. Hayes Moderation Process Model-1 Test of Factors for Success of PT projects as tested in Selected 14 companies (N=207)

Model Summary						
R	**R^2**	**MSE**	**F**	**df1**	**df2**	**p**
0.59	0.35	0.35	36.77	3	203	0.00
Model						
	b	***se***	**t**	**p**	**LLCI**	**ULCI**
constant	4.19	0.05	91.94	0.00	4.10	4.28
Strategy	0.29	0.07	4.27	0.00	0.16	0.42
Risk	0.36	0.07	5.07	0.00	0.22	0.50
Interaction	-0.18	0.08	-2.35	0.02	-0.34	-0.03

***b*-Coefficient; *se*-Standard Error; p-Significant Value**

Risk managing and controlling is required throughout the project so, Risk is not considered any conditional moderator factor. Table 4.34, reveals:

a) (-ve) side Standard Deviation (i.e. at -0.6651) Risk factor, has positive effect(*b*)=0.4116 and significant because zero is not between confidential intervals (*b*=0.4116, ***se*** = -0.0728, p=0.00). So, the Risk factor has a moderating relationship between strategy and project success.
b) Similarly, at the mean (i.e. at 0.1127) on the center as a moderator factor Risk has positive Effect*(b*)=0.2694 and significant (zero is not between confidential intervals) (*b*= 0.2694, *se*=0.0709, p=0.0002) between Strategy and Project Success.
c) Finally, at (+ve) side Standard Deviation (i.e. 0.6683) on the center, Risk has positive relation, but non-significant (*b*= 0.1678, *se*=0.0964, p=0.0832) between Strategy and Project Success.

Table-4.34: Conditional effects of the focal predictor at values of the moderator(W) Test of Factors for Success of PT projects as tested in Selected 14 companies (N=207)

Risk	Effect	*se*	t	p	LLCI	ULCI
-0.6651	0.4116	0.0728	5.6505	0.00	0.268	0.5552
0.1127	0.2694	0.0709	3.8018	0.0002	0.1297	0.4091
0.6683	0.1678	0.0964	1.7408	0.0832	-0.0223	0.358

***b*-Coefficient; *se*-Standard Error; p-Significant Value**

Table-4.35, Johnson and Neyman (1936) output show that the slope between strategy(X) and Project Success(Y) becomes positive over tests of Risk as moderator (W) variable. The S. No. 1 to 18 on the Risk variable where the relationship between strategy and project success is statistically significant ($p \leq 0.05$) and the increase of Standard Deviation effect is decreasing.

Table-4.35: Johnson Neyman Output Conditional effect of focal predictor at values of the moderator: Test of Factors for Success of PT projects as tested in Selected 14 companies (N=207)

Sl. No	Risk	Effect	*se*	t	p	LLCI	ULCI
1	-1.887	0.635	0.143	4.432	0.000	0.353	0.918
2	-1.737	0.608	0.133	4.568	0.000	0.345	0.870
3	-1.587	0.580	0.123	4.718	0.000	0.338	0.823
4	-1.437	0.553	0.113	4.881	0.000	0.330	0.776
5	-1.287	0.525	0.104	5.055	0.000	0.320	0.730
6	-1.137	0.498	0.095	5.235	0.000	0.310	0.685
7	-0.987	0.471	0.087	5.409	0.000	0.299	0.642
8	-0.837	0.443	0.080	5.557	0.000	0.286	0.600
9	-0.687	0.416	0.074	5.645	0.000	0.271	0.561
10	-0.537	0.388	0.069	5.629	0.000	0.252	0.524
11	-0.387	0.361	0.0661	5.461	0.000	0.231	0.491
12	-0.237	0.333	0.0651	5.117	0.000	0.205	0.462
13	-0.087	0.306	0.0663	4.615	0.000	0.175	0.437
14	0.063	0.279	0.0694	4.012	0.000	0.142	0.415
15	0.213	0.251	0.0743	3.381	0.001	0.105	0.398
16	0.363	0.224	0.0805	2.778	0.006	0.065	0.383
17	0.513	0.196	0.0879	2.234	0.027	0.023	0.370
18	0.592	0.182	0.0922	1.972	0.050	0.000	0.363
19	0.663	0.169	0.0961	1.757	0.080	-0.021	0.358
20	0.813	0.141	0.105	1.347	0.179	-0.066	0.348
21	0.963	0.114	0.1143	0.997	0.320	-0.111	0.340
22	1.113	0.087	0.1241	0.698	0.486	-0.158	0.331

***b*-Coefficient; *se*-Standard Error; p-Significant Value**

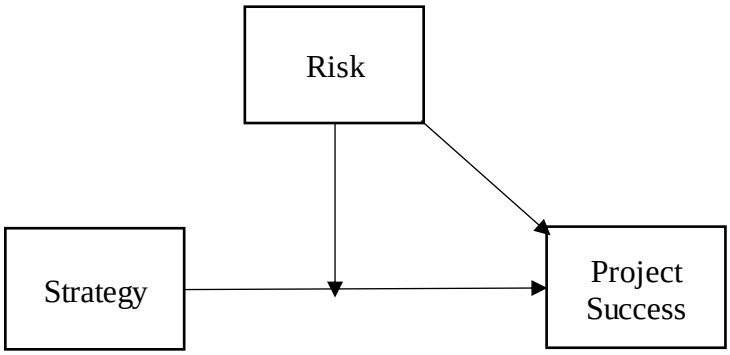

Figure-4.8: Moderator Factor of Risk – Hypothesis H2a

The above Figure-4.8 shows Risk factor has a moderating effect between Strategy and Project Success.

From Table- 4.35, it is found below

$W=i_m+ax+bx'+e_m$ ---------- (8)

W=4.19+0.29x+0.36x'+0.05 ---------- (8a)

Thus, the following Hypothesis can be concluded as below:

H2a: Risk has a moderating effect on the relationship between strategy and project success.

With the above results and discussion, all hypotheses testing results are arranged in Table 4.36 pertaining to novelty, support and findings reinforce the need and importance of the research being carried out to develop a CSFs framework for PT projects as shown in Figure- 4.9.

Table-4.36: Hypothesis Testing Reuslts

Hypothesis (Symbol)	Sub-hypothesis (Symbol)	Hypothesis Description	Previous Literature/ New Hypothesis	Hypothesis Supported/Not-Supported	Findings
H1	H1a	Strategy has significant positive relation to Project Success.	New	Supported	Strategy has direct significant impact on Project Success.
	H1b	Contract has significant positive relation to Project Success.	New	Supported when Risk is dropped	Contract has direct significant impact on Project Success.
	H1c	Stakeholder has significant positive relation to Project Success.	New	Supported	Stakeholder has direct significant impact on Project Success.
	H1d	Information technology has significant positive relation to Project Success.	New	Supported	Information Technology has direct impact on Project Success.
	H1e	Risk has significant positive relation to Project Success.	New	Supported	Risk has direct impact on Project Success.
H2	H2a	Risk has moderating effect on the relationship between strategy and project success.	New	Supported	Risk has moderating impact between Strategy and Project Success.
	H2b	Contract has mediating effect between strategy and project success.	New	Supported	Contract has mediating impact between Strategy and Project success.
	H2c	Stakeholder has mediating effect between strategy and project success.	New	Supported	Stakeholder has mediating impact between Strategy and Project Success.
	H2d	Information technology has mediating effect between strategy and project success.	New	Supported	Information Technology has mediating impact between Strategy and Project Success.

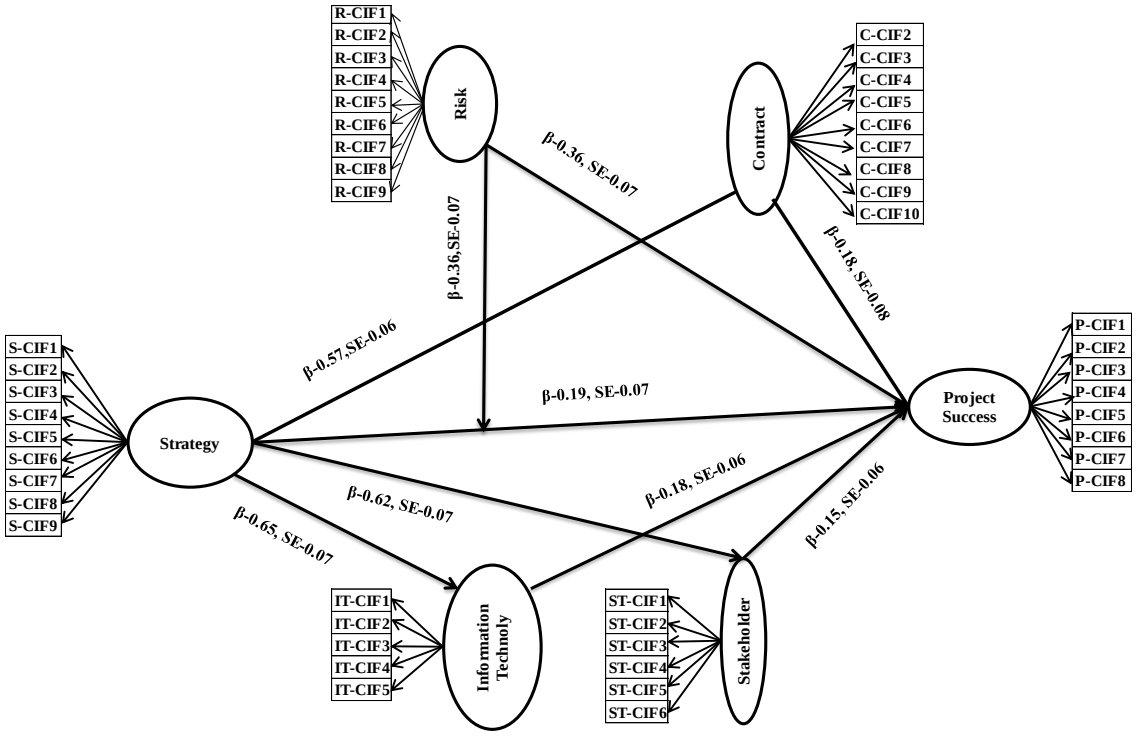

Figure-4.9: CSFs framework with Direct, Moderating and Mediating Relation with Project Success

4.6 "THE CHAPTER SUMMARY"

Based on the outcome of various statistical tests done for the purpose of analysis, many interesting findings have come to light. Tests like factor analysis; KMO and Bartlett's Test; reliability test; relative importance index; correlations and regressions analysis has been instrumental in analyzing the data and inferring important information from it. In Chapter 4, the Principal Component Analysis derived six groups namely a) project success (dependent), b) strategy (independent), c) risk (moderator), d) contract (mediator), e) stakeholder (mediator), and f) information technology (mediator) as the key success factors that drive the Indian power transmission projects. Finally, the regression analysis (Andrew F. Hayes Mediation Process Model- 1&4, Analysis-Regression Based) is conducted to find

out the determinants of project success. This revealed the dimensions and project success that directly affect the independent factor strategy. The moderator factor risk affects a more powerful relationship between Strategy and Project Success. The other three mediator factors viz., contract, stakeholder and information technology are found to affect strategy and project success. Additionally, it is deduced that the overall project success of the power transmission project is affected by all the five dimensions of factors but to varying degrees.

Thus, all the research objectives have been successfully attained, and all the alternate hypotheses have been accepted. The next chapter will present the conclusions for the research along with the limitations of the study.

CHAPTER5

CONCLUSIONS

The power sector assumes a crucial job in the monetary development and human improvement of any nation. It improves the quality of life of human beings and the biotic of this circle. Power utilization is one of the most significant files for estimating the improvement level of a country. The interest for power in a developing nation like India is colossal and is developing consistently. Regardless of the increasing population, transmission and distribution limit in the course of the last Five-year plan periods (2012-2017) saw that development sought after in power has consistently surpassed the stockpile limit enlargement.

India's power transmission (PT) projects comprise the imperative supply routes of the whole power value chain. It is implied that the development of the power division is dependent upon the advancement of a vigorous and non-collapsible transmission arrangement. The method of improvement of power transmission extends insignificant as making arrangements for the development of things to come lattice. A PT project is generally appealing for infrastructure investment interest in India.

Critical Success Factors (CSFs) allude to the exercises that must be finished to an exclusive requirement of value so as to accomplish the objectives of the project. CSFs are an approach to organize certain errands as the project plan is being executed. CSFs are central components of PT projects that it sees as generally as critical to its project success. A part of strategic development and project management, of PT projects execution EPC organizations, frequently build up a rundown of CSFs that relates to their statement of purpose and essential destinations.

The whole power sector value chain vitally holds tight the money related practicality of PT projects and necessities to concentrate on improving project execution by fulfilment within time, cost, and quality. Opportune fruition of PT projects is exceptionally significant to the advancement in India. The unpredictability of work engaged with power ventures and the

inclusion of a few gatherings like government, ecological, offices, proprietor, contractors, and subcontractors make the convenient fruition of PT extends an extremely challenging task. The projects get delayed due to several reasons which weaken the economy of a nation.

The present, with a focus on critical success factors of power transmission projects, is undertaken with fourteen (14) power transmission project executed organizations including public and private (11 privates and 3 publics) in India. A pre-tested survey tool, questionnaire, are administered to 300 respondents of those 14 organizations. Out of 300 questionnaires, 207 valid responses are received, giving a response rate of 69%.

5.1 "FINDINGS OF THE STUDY"

The study resulted in numerous findings that build up the existing body of knowledge around the critical success factors of PT projects. The results of the study reflect the importance and impact of the CSFs of PT projects. Results further institute the need to implement the CSFs framework in PT projects. The findings of the study have been divided into three sections according to the research objectives i.e. identification of the CSFs; impact of CSFs on project success; CSFs framework to show the relationship between the CSFs and project success directly and indirectly. The crucial benefit of the study is new findings shown in Table 5.1. The findings highlight that all proposed CSFs do impact the success of PT projects in India give rise to future research.

Table 5.1: New Findings Summary

Project Success Predictors	Description of New Finding from Study
Critical Success Factors	Strategy, Contract, Risk, Stakeholder and Information Technology were identified as critical success factors of PT projects found to impact project success.
Strategy	Strategy emerged as the most important factors among identified factors, to positively impact the PT project success and further mediated and moderated by Risk, Contract, Stakeholder and Information Technology. Strategy was not taken as a predictor of project success in previous literature.
Risk	Risk, as a predictor of Project Success has direct significant impact on PS, but at the same time Contract factor becomes insignificant in the presence of Risk and significant when Risk is dropped. Further Risk established to have a significant positive impact as a moderating factor between Strategy and PS.
Contract	Significant impact of Contract factor on PS was found only when Risk factor was dropped. Further Contract factor established to have significant positive impact as a mediator between Strategy and PS.
Stakeholder	Stakeholder found to have significant positively impact the PT project success, PS, and further showed mediating positive impact between Strategy and PS.
Information Technology	Information Technology found as important CSF with significant direct positive impact on PS as well as mediating impact between Strategy and PS.
CSFs Framework	All CSFs found to be crucial to the PT Project Success and the framework developed showed valid with Project Success as dependent factor, Strategy as Independent factor, Risk as Moderator factor and Contract, Stakeholder and Information Technology as mediating factors.

5.1.1 Identification of CSFs

- All 52 variables' Skewness values lie between -2 and +2 and Kurtosis values lie between -2 to +2. Hence, it is concluded that the data are normally distributed.

- Through factor analysis it is found that 52 variables grouped into six factors (Project Success, Strategy, Risk, Contract, Stakeholder and Information Technology) with 46 valid variables and these six factors variance is 51.73% which is more than 50 percent.

- All factors' Tolerance value found greater than 0.2 and VIF value less than 2.5. Therefore, multicollinearity does not any concern.

- Durbin Watson test for measurement of autocorrelation in the residuals from a statistical regression analysis resulted in a value of 2.106 which lies between 1.5 and 2.5. So, there is no concern for autocorrelation.

- Ranking of factors revealed Project Success (RII-0.83) as the most important factor, followed by Strategy (RII-0.81); Risk (RII-0.78), Contract (RII-0.77); Information Technology (RII-0.77) and Stakeholder (RII-0.76), irrespective of independent and dependent variables.

5.1.2 Impact of CSFs on Project Success

CSFs impact and relation has been found through Multiple Regression Analysis for their direct impact, moderator impact and mediator impact on PS.

5.1.2.1 Direct Impact

The direct impact of all the CSFs on PS found to be significant i.e. Strategy (b=0.190, se=0.072, p=0.009) on Project Success, Contract (b=0.177se=0.083, p=0.033) on PS only

when Risk factor was dropped, Stakeholder (*b*=0.154, *se*=0.065, p=0.018) and Information Technology (*b*=0.177, *se*=0.072, p=0.005).

Where, *b*-coefficient, *se*-standard error and p-significance level.

5.1.2.2 Mediating Impact

Andrew F. Hayes Moderation Process Model-4 test showed that on considering independent factor Strategy and mediator factors as Contract, Stakeholder and Information Technology, together, had 39% the impact (R^2= 0.39) on Project Success. As mediator factor, Contract had direct impact (*b*=0.18, *se*=0.08, p=0.01), Stakeholder with direct impact (*b*=0.15, *se*=0.06, p=0.02) and Information technology with direct Impact (*b*=0.18, *se*=0.06, p=0.00).

5.1.2.3 Moderating Impact

The results of Andrew F. Hayes Moderation Process Model-1 test found that Risk had a significant moderator effect (*b*= -0.1828, *se*= 0.0778, p=0.0197) between Strategy and Project Success. MRA showed an increase of 0.02 in R^2 value after adding risk factor with other factors i.e. Strategy, Contract, Stakeholder and Information Technology. Hence, the Risk factor resulted in a moderator factor.

5.1.2.4 CSFs Framework

Based on the results of Andrew F. Hayes Moderation Process Model-1 and Andrew F. Hayes Moderation Process Model-4 the CSFs framework is designed and revealed in Figure 7.1

Andrew F. Hayes Moderation Process Model-1 The total model impacted by 35 percent with one-unit of Project Success factor changed by the change of 0.29-unit Strategy and 0.36-unit Risk.

Andrew F. Hayes Mediation Process Model-4 The regression analysis total model impacted by 39 percent. One unit of Project Success changed by 0.19-unit change in Strategy, 0.18-unit change in Contract, 0.15-unit change in Stakeholder and 0.18-unit change in Information Technology.

Thus, in CSFs framework all CSFs are crucial to the PT Project success and the framework developed showed valid with Project Success as a dependent factor, Strategy as Independent factor, Risk as Moderator factor and Contract, Stakeholder and Information Technology as mediating factors. The CSFs framework has shown in Figure-4.9 in the previous Chapter-4.

5.2 "RECOMMENDATIONS"

The following suggestions are given to the practitioners after analyzing the results of the study:

- The identification of CSFs of PT projects is very vital to the success of the project and the business goal. There must be universal acceptance of the significance of these CSFs practices across the power sector organizations.

- There is a strong need to institutionalize the CSFs framework implementation while PT projects are undertaken so as to not only make practitioners aware of these CSFs but its framework too.

- The proposed framework has demonstrated the straight forward approach to generate efficient results while executing PT projects and redefining the practices to execute successful PT projects within the scope of time, cost and budget.

5.3 “LIMITATION OF THE STUDY”

A few limitations to this research are identified during the entire progression of research as mentioned here.

- Although there is an abundance of existing literature on the critical concepts of this study, specifically Project Success, its factors, Critical Success Factors, power sector, construction sector, oil and gas sector, strategy, risk, stakeholder, contract and information technology, there is limited or no research on its application in the power transmission sector of India. This restricted the researcher’s ability to compare the findings obtained from the primary research in this study to existing literature, thus limiting the validity of the primary findings to a small extent.
- Despite the fact that there are many power transmissions organization in India, the sample size of this research is 14 organization only. This is due to the time and budgetary restrictions, which prevented the researcher from including the remaining companies in the ambit of this study. Thus, the robustness and generalizability of the findings of this research may be limited to an extent.
- As it is pointed out in the literature review that critical success factors differ from country to country and culture to culture, the findings of this study are suitable for Indian organization and countries that share similar work culture and infrastructure only. This further restricts the scope to generalize the findings of primary research on a large scale.
- Although this study identified five critical success factors, it is possible that there are many other such CSFs that play an active role in the power transmission sector of India.

5.4 “FUTURE RESEARCH”

After analyzing the results of the study, that there is strong need to institutionalize the CSFs framework implementation while PT projects are undertaken so as to not only make practitioners aware of these CSFs but to its framework too.

The proposed framework demonstrated the straight-forward approach to generate efficient results while executing PT projects and redefining the practices to execute successful PT projects within scope, time and budget.

The research proposes further research in future as follows:

- This study is the first of its kind to investigate the critical success factors for project success of power transmission project in India. It is anticipated that this study will derive a foundation on which further research can be conducted for the improvement of project performance in the power sector with different statistical tools.
- It is needed to investigate potential improvements in the implementation of project management systems of PT Projects in India. Based on the critical success factors in this study, other CSFs can be explored for project management of PT projects.
- The critical success factors found to be most influential in this study could be utilized in future work which examines different situations and environments.
- It is recommended that the methodology used in this research should be applied to PT project executed in other countries, thereby increasing the data available for future comparisons for different delay causes and critical success factors.

Biblography

1. Alsuliman, J. A. (2019), “Causes of Delay in Saudi Public Construction Projects”, Alexandria Engineering Journal, **Volume 58**, Issue 2, “pp”. 801-808.

2. Amoatey, C. T.; and Ankrah, A. N. O. (2017), “Exploring Critical Road Project Delay Factors in Ghana”, Journal of Facilities Management, **Volume 15**, Issue 2, “pp”.110-127.

3. Almarri, K. and Boussabaine, H. (2017), "Interdependency of the Critical Success Factors and Ex-Post Performance Indicators of PPP Projects", Built Environment Project and Asset Management, **Volume 7**, Issue 5, “pp”. 546-556.

4. Alaloul, W. S.; Liew, M. S.; Zawawi, N. A. W. A (2016), “Identification of Coordination Factors Affecting Building Projects Performance”, Alexandria Engineering Journal, **Volume 55**, Issue 3, “pp”. 2689-2698.

5. Adwan, E. J.; and Al-Soufi, A. (2016), “A Review of ICT Technology in Construction”, International Journal of Managing Information Technology (IJMIT), **Volume 8**, Issue3/4, “pp”.1-21.

6. Amor, R.; Betts, M.; Coetzee, G.; and Sexton, M. (2016), “Information Technology for Construction: Recent Work and future Direction”, International Journal of Managing Information Technology (IJMIT)”, **Volume 7**, Issue 16, “pp”. 245-258.

7. Awwal, M. I. (2014), “Importance of Strategic Aspect in Project Management: A Literature Critique”, International Journal of Supply Chain Management, **Volume 3**, Issue 4, “pp”. 96-99.

8. Aziz, R. F.; and Hafez, S. M. (2013), “Applying Lean Thinking in Construction and Performance Improvement”, Alexandria Engineering Journal, **Volume 52**, Issue 4, “pp”. 679-695.

9. Akogbe, R. K. T. M.; Feng, X.; and Zhou, J. (2012), “Importance and Ranking Evaluation of Delay Factors for Development Construction Projects in Benin”, KSCE Journal of Civil Engineering, **Volume 17**, Issue 6, “pp”. 1-10.

10. Abdullah, A.A.; Rahman, H.A.; Harun, Z.; Alashwal, A.M.; and Beksin, A.M. (2010), “Literature Mapping: A Bird’s Eye View on Classification of Factors Influencing Project Success”, African Journal of Business Management, **Volume 4**, Issue 19, “pp”. 4174-4182.

11. Ahlemann, F.; Teuteberg, F.; Vogelsang, K., (2009) “Project management standards – Diffusion and application in Germany and Switzerland”, International Journal of Project Management, **Volume 27**, Issue 3, “pp”.292-303.

12. Achterkamp, M.C., Vos, J.F.J., (2008), “Investigating the Use of The Stakeholder Notion in Project Management Literature, A Meta-Analysis” International Journal Project Management, **Volume 26**, Issue7, “pp”. 749–757.

13. Abd El-Razek, M. E.; Bassioni, H. A.; and Mobarak, A. M. (2008), “Causes of Delay in Building Construction Projects in Egypt”, Journal of Construction Engineering and Management, **Volume 134**, Issue 11, “pp”. 831-841.

14. Ali, B.; Sopian, K.; Yen, C. H.; Mat, S.; and Zaharim, A. (2008), “Key Success Factors in Implementing Renewable Energy Programme in Malaysia”, WSEAS Transactions on Environment and Development, **Volume 4**, Issue 12, “pp”. 1141-1150.

15. Atul, A.; and Martin, S. (2008), “Construction Project Management in India”, International Journal of Construction Management, **Volume 8**, Issue2, “pp”. 65-77.

16. Aaltonen, K., Jaakko, K., &Tuomas, O. (2008), “Stakeholder Salience in Global Projects” International Journal of Project Management, **Volume 26**, Issue 5, “pp”. 509–516.

17. Angeles, R. and Nath, R. (2007), "Business-To-Business E-Procurement: Success Factors and Challenges to Implementation", Supply Chain Management, **Volume 12**, Issue 2, “pp”. 104-115.

18. Assaf, S. A.; and Hejji, S. A. (2006), “Causes of delay in large construction projects”, International Journal of Project Management, **Volume 24**, Issue 4, “pp”. 349–357.

19. Atkinson R, (1999) “Project Management: Cost, Time and Quality, Two Best Guesses and A Phenomenon, It’s Time to Accept Other Success Criteria”, International Journal of Project Management, **Volume 17**, Issue 6, “pp”. 337-342.

20. Archer, N. P.; and Ghasemzadeh, F. (1999), “An Integrated Framework for Project Portfolio Selection”, International Journal of Project Management **Volume 17**, Issue 4, “pp”. 207-216.

21. Assaf S.A.; Al-Khalil M.; and, Al-Hazmi M. (1995), “Causes of delays in large building construction projects‖”, ASCE Journal Management Engineering, **Volume 11**, Issue2, “pp”. 45–50.

22. Ashley, D.B.; Bonner, J.J. (1987), “Political Risks in International Construction” Journal Construction Engineering Management, **Volume 113**, Issue 3, “pp”.447-467.

23. Argyris, C. (1971), Management Information Systems: The Challenge to Rationality and Emotionality”, Management Science, **Volume 17**, Issue6, “pp”. 275-292.

24. Betty W. Y. C and Joseph H. K. L (2017), “Project Delay: Key Electrical Construction Factors in Hong Kong”, Journal of Civil Engineering and Management, **Volume 23**, Issue7, “pp”. 847–857.

25. Bekr, G. A. (2015), “Causes of Delay in Public Construction Projects in Iraq”, Jordan Journal of Civil Engineering, **Volume 9**, Issue2, “pp”. 149–162.

26. Buertey, J.I.T.; Kaku, M.A.; and Kumi, T.A. (2014), “Delays to Large Construction Projects in Ghana : A Risk Overview”, Journal of Civil Engineering and Architecture, **Volume 8**, Issue3, “pp”. 367-377.

27. Balamurali, G.; and Thanushkodi, K. (2013), “Transmission System Expansion Planning for Indian States: A Proactive and Realistic Approach”, IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) ISSN: 2278-1676 **Volume 4**, Issue 2, “pp”. 28-37.

28. Bhattacharyya, S. C. and Dey, P. K. (2007), "Managing Risk in A Large Rural Electrification Programme In India", Impact Assessment and Project Appraisal, **Volume 25**, Issue 1, "pp". 15–26.

29. Bakens, W.; Foliente, G.; and Jasuja, M. (2005), "Engaging Stakeholders in Performance-Based Building: Lessons from the Performance-Based Building (Pebbu) Network", Building Research & Information, **Volume 33**, Issue 2, "pp".149-158.

30. Baloia, D.; and Priceb, A. D. F. (2003), "Modelling Global Risk Factors Affecting Construction Cost Performance", International Journal Project Management, **Volume 21**, Issue 4, "pp". 261-269.

31. Baccarini, D. (1999), "The Logical Framework Method for Defining Project Success", Project Management Journal, **Volume 30**, Issue 4, "pp". 25-32.

32. Belassi, W.; and Tukel, O. I. (1996), "A New Framework for Determining Critical Success/Failure Factors in Projects", International Journal of Project Management **Volume 14**, Issue 3, "pp". 141-151.

33. Chiu, B. W. Y.; and, Lai, J. H. K. (2017), "Project Delay: Key Electrical Construction Factors in Hong Kong", Journal of Civil Engineering and Management, **Volume 23**, Issue7, "pp". 847–857.

34. Choudhury, D. K. (2014), "Project Management Information Systems for Construction of Thermal Power Plant: A Case Study with Special Reference to National Thermal Power Corporation Ltd., India", International Journal of Engineering Research & Technology (IJERT) **Volume 3**, Issue 3, "pp". 2352-2377.

35. Ciupuliga, A. R. and Cuppen, A. (2013), "The Role of Dialogue in Fostering Acceptance of Transmission Lines: The Case of a France–Spain Interconnection Project", Energy Policy, **Volume 60**, Issue C, "pp" 224-233.

36. Costello, A.B. and Osborne, J.W. (2005) "Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from Your Analysis", Practical Assessment, Research and Evaluation, **Volume 10**, "pp". 1-9.

37. Chan, A. P. C.; Scott, D.; and Chan, A. P L. (2004), "Factors Affecting the Success of a Construction Project", Journal of Construction Engineering and Management, **Volume 130**, Issue 1, "pp". 153-155.

38. Cookie-Davies, T. (2002), "The Real Success Factors on Projects", International Journal of Project Management, **Volume 20**, "pp". 185-190.

39. Chua, D. K. H., Kog, Y. C., and Loh, P. K. (1999), "Critical Success Factors for Different Project Objectives", Journal Construction Engineering Management, **Volume 125**, Issue 3, "pp". 142–150.

40. Cooper, J.R. (1998), "A Multidimensional Approach to the Adoption of Innovation", Management Decision, **Volume 36**, Issue 8, "pp". 493-502.

41. Crowley, L. G.; and Karim, M. A. (1995), "Conceptual Model of Partnering", Journal of Management in Engineering, **Volume 11**, Issue 5, "pp". 33-39.

42. Chatterjee, S.; Jamieson, L.; and Wiseman, F. (1991), "Identifying Most Influential Observations in Factor Analysis" Marketing Science, **Volume 10**, Issue 2, "pp". 145–160.

43. Cliff, N., and Hamburger, C. D. (1967), "The study of sampling errors in factor analysis by means of artificial experiments", Psychological Bulletin, **Volume 68**, Issue 6, "pp". 430–445.

44. Dong, J.; Liu, D.; Wang, D.; and Zhang, Q. (2019), "Identification of Key Influencing Factors of Sustainable Development for Traditional Power Generation Groups in a Market by Applying an Extended MCDM Model", Sustainability **Volume 11**, Issue 6, "pp". 1-30.

45. Divi, V. V.; and, Sundara, K. P. (2017), "Analyzing Delay Factors in Indian Affecting Construction Projects", International Journal of Civil Engineering and Technology (IJCIET) **Volume 8**, Issue 4, "pp". 1938–1953.

46. Dinesh, K. R. (2016), "Causes and Effects of Delays in Indian Construction Projects", International Research Journal of Engineering and Technology (IRJET), **Volume 03**, Issue 04, "pp". 1831-1837.

47. Davis, K. (2014), “Different Stakeholder Groups and Their Perceptions of Project Success”, International Journal of Project Management, **Volume 32**, “pp”. 189–201.

48. Deeppa, K. and Krishnamurthy, I. (2014), “Analysis of Time and Cost Overruns in Infrastructure Projects”, NICMAR Journal of Construction Management and Research, **Volume XXIX**, Issue 3, “pp”. 7-19.

49. Doloi, H. (2013), “Cost Overruns and Failure in Project Management: Understanding the Roles of Key Stakeholders in Construction Projects” Journal Construction Engineering Management, **Volume 139,** Issue 3, “pp”. 267-279.

50. Ding, L. Y.; and Zhou, C. (2013), “Development of Web-Based System for Safety Risk Early Warning in Urban Metro Construction”, Automation in Construction, **Volume 34**, “pp” 45–55.

51. Doloi, H.; Sawhney, A.; Iyer, K. C.; and Rentala, S. (2012), “Analyzing Factors Affecting Delays in Indian Construction Projects”, International Journal of Project Management, **Volume 30**, Issue 4, “pp” 479-489.

52. Dalcher, D. (2012), "The Nature of Project Management: A Reflection on The Anatomy of Major Projects by Morris And Hough", International Journal of Managing Projects in Business, **Volume 5**, Issue 4, “pp”.643-660.

53. Damiebi, D. F and Nazatul, S. A. R (2011), “An Evaluation of Critical Success Factors in Oil and Gas Project Portfolio in Nigeria”, African Journal of Business Management, **Volume 5**, Issue 6, “pp”. 2378-2395.

54. Davison, B. and Sebastian, R.J. (2009a) ‘’The Relationship Between Contract Administration Problems and Contract Type’’, Journal of Public Procurement, **Volume 9**, Issue 2, “pp”.262–286.

55. Doloi, H. (2009), “Analysis of Pre-Qualification Criteria in Contractor Selection and Their Impacts on Project Success”, Construction Management and Economics, **Volume 27**, “pp”. 1245-1263.

56. Debande, O.; and Ottersten, E. K. (2004), "Information and Communication Technologies: A Tool Empowering and Developing the Horizon of the Learner," Higher Education Management and Policy, OECD Publishing, **Volume 16**, Issue2, “pp”. 31-61.

57. Dissanayaka, S. and kumaraswamy, M. (1999), "Evaluation of Factors Affecting Time and Cost Performance In Hong Kong Building Projects", Engineering, Construction and Architectural Management, **Volume 6**, Issue 3, “pp”. 287-298.

58. Dvir, D.; Lipovetsky, S.; Shenhar, A.; and Tishler, A. (1998), “In Search of Project Classification: A Non-Universal Approach to Project Success Factors”, Research Policy, **Volume** 27, “pp”. 915–935.

61.Doherty. J. M. (1997), “A Survey of Computer Use in The New Zealand Building and Construction Industry”, Electronic Journal of Information technology in Construction, **Volume** 2, “pp”.1-13.

59. Donaldson, T.; and Preston, L.E. (1995), “The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications”, Academy of Management Review, **Volume 20**, Issue1, “pp”. 65-91.

60. Dey, P.; Tabucanon, M. T.; and Ogunlana, S. O.(1994), “ Planning For Project Control Through Risk Analysis: A Petroleum Pipeline-Laying Project”, International journal of project Management, **Volume 12**, Issue1, “pp”. 23-33.

61. De Wit, A. (1988), “Measurement of Project Success”, International Journal of Project Management, **Volume 6**, Issue 3, “pp”. 164-170.

62. Davis, R. T. (1987), “Strategic Planning Revisited”, Stanford, CA: Graduate School of Business, Stanford University.

63. Eyiah-Botwe, E.; Aigbavboa, C.O.; and Thwala, W.D. (2016), “Critical Success Factors for Enhanced Stakeholder Management in Ghana”, Socioeconomic – The Scientific Journal for Theory and Practice of Socio-economic Development, **Volume 5**, Issue10, “pp”. 153-170.

64. El-Naway, O.; Mahdi, I.; Badwy, M.; and Al-Deen, A. G. (2015), "Developing Methodology for Stakeholder Management to Achieve Project Success", International Journal of Innovative Research in Science, Engineering and Technology, **Volume 4**, Issue 11, "pp". 1051 – 1066.

65. Enshassi, A. (2009), "Factors Affecting the Performance of Construction Projects in The Gaza Strip", Journal of Civil Engineering and Management, **Volume 15**, Issue 3, "pp". 269–280.

66. Enshassi, A.; Choudhry, R. M.; Mayer, P. E.; and Shoman, Y. (2008), "Safety Performance of Subcontractors in the Palestinian Construction Industry", Journal of Construction in Developing Countries, **Volume 13**, Issue 1, "pp". 51-62.

67. El-Sayegh, S. (2008), "Risk Assessment and Allocation in the UAE Construction Industry", International Journal of Project Management, **Volume 26**, "pp". 431-438.

68. El-Diraby, T.E.; Osman, H.; and El-Gohary, N.M. (2006), "Stakeholder Management for Public Private Partnerships", International Journal of Project Management, **Volume 24**, Issue 7, "pp". 595-604.

69. El-Ghandour, W., & Al-Hussein, M. (2004), "Survey of Information Technology Applications in Construction" Construction Innovation, **Volume 4**, Issue 2, "pp". 83–98.

70. Frefer AA; Mahmoud M.; Haleema H.; and Almamlook, R. (2018), "Overview Success Criteria and Critical Success Factors in Project Management", Industrial Engineering & Management, **Volume 7**, Issue1, "pp". 1-6.

71. Fallahnejad, M. H. (2013), "Delay Causes in Iran Gas Pipeline Projects", International Journal of Project Management, **Volume** 31, "pp".136–146.

72. Fiberesima, D. D.; and Rani, N. S. A. (2011), "An Evaluation of Critical Success Factors in Oil and Gas Project Portfolio in Nigeria", African Journal of Business Management **Volume 5**, Issue 6, "pp". 2378-2395.

73. Fagbenle, O.I.; and Adeosun, O.A. (2010), “Identification of Contractors Needs in The Selection of Construction Subcontractors in Nigeria”, European Scientific Journal, **Volume 8**, Issue 21, “pp”. 138-151.

74. Freeman, R. E., Martin, K., and Parmar, B. (2007), “Stakeholder Capitalism”, Journal of Business Ethics, **Volume 74**, Issue 4, “pp”. 303–314.

75. Faridi, A. S., & El-Sayegh, S. M. (2006), “Significant Factors Causing Delay in The UAE Construction Industry”, Construction Management and Economics, **Volume 24**, Issue11, “pp”. 1167–1176.

76. Finch, P. (2003), “Applying the Slevin-Pinto Project Implementation Profile to An Information Systems Project”, Project Management Journal, **Volume 34**, Issue 3, “pp”. 32-39.

77. Flanagan, R.; and Marsh, L. (2000), "Measuring The Costs and Benefits of Information Technology in Construction", Engineering, Construction and Architectural Management, **Volume 7**, Issue 4, “pp”. 423-435.

78. Freeman, M.; and Beale, P. (1992), “Measuring Project Success”, Project Management Journal, **Volume 23**, Issue 1, “pp”. 8–17.

79. Garg, A. and Ghatak, A. (2020), “An Empirical Study on Power Evacuation Projects’ Performance: A Strategic Layout in the Indian Context”, Asia-Pacific Journal of Management Research and Innovation, **Volume 16,** Issue 1, “pp” 31-42.

80. Ghatak, A. and Garg, A. (2019), “Critical Success Factors of Power Sector Projects in India: A Research Scope”, International Journal of Current Research, **Volume 11,** Issue 02, “pp” 1275-1284**.**

81. Ghatak, A. (2018), “Critical Factors Impact: on Power Evacuation Systems in India”, Universal Review, **Volume 7**, Issue XII, “pp” 1532-1540.

82. Ghatak, A. and Garg, A. (2019), “Risk Management in Power Evacuation Projects – NTCP Model”, **Volume 4**, Issue 1, “pp” 5-14

83. Gebrehiwet, T.; and Luo, H. (2017), “Analysis of Delay Impact on Construction Project Based on RII and Correlation Coefficient: Empirical Study”, Procedia Engineering, **Volume 196**, “pp”. 366 – 374.

84. Gardezi, S. S. S.; Manarvi, I. A.; and Gardezi, S. J. S. (2014), “Time Extension Factors in Construction Industry of Pakistan”, Procedia Engineering, **Volume 77**, “pp”. 196-204.

85. Gunduz, M.; Nielsen, Y.; &Ozdemir, M. (2013), “Quantification of Delay Factors Using the Relative Importance Index Method for Construction Projects in Turkey”, Journal of Management in Engineering, **Volume 29**, Issue2, “pp”. 133–139.

86. Gupta, A.: Gupta, M. C.; and Agrawal, R. (2013), "Identification and Ranking of Critical Success Factors for BOT Projects in India", Management Research Review, **Volume 36**, Issue 11, “pp”. 1040-1060.

87. Gharaibeh, H.M. (2013), “Managing the Cost of Power Transmission Projects: Lessons Learned”, Journal of Construction Engineering and Management**, Volume 139**, Issue 8, “pp”. 1063-1067.

88. Gottschalk, P.; and Solli-Saether, H. (2005), “Critical success factors from IT outsourcing theories: an empirical study”, Industrial Management & Data Systems, **Volume 105**, Issue 6, “pp”. 685-702.

89. Goodpaster, K. E. (1991), “Business Ethics and Stakeholder Analysis”, Business Ethics Quarterly, **Volume 1**, “pp”. 53-73.

90. Hermawati, W.; and Rosaira, I. (2017), “Key Success Factors of Renewable Energy Projects Implementation in Rural Areas of Indonesia”, Journal of STI Policy and Management, **Volume 2**, Issue 2, “pp”. 111–125.

91. HanbinLuob, T. G. (2017), “Analysis of Delay Impact on Construction Project Based on RII and Correlation Coefficient: Empirical Study”, Procedia Engineering **Volume 196**, “pp”. 366 – 374.

92. Hayes, A. F. (2017), "Partial, Conditional, And Moderated Mediation: Quantification, Inference, And Interpretation", Communication Monographs, **Volume 85**, Issue 1, "pp". 4–40.

93. Hajiagha, S. H. R.; Shokouhinia, M.; and Hashemi, S. S. (2016), "Success Criteria in Oil, Gas and Petrochemical Projects", International Conference on Electrical, Mechanical and Industrial Engineering (ICEMIE 2016), "pp". 241-247.

94. Heravi, A., Coffey, V., Trigunarsyah, B., (2015), "Evaluating the level of stakeholder involvement during the project planning processes of building projects" International Journal Project Management, **Volume 33**, Issue 5, "pp". 985–997.

95. Hwang, B. G.; and Lim, E. J. (2013), "Critical Success Factors for Key Project Players and Objectives: Case Study of Singapore", Journal of Construction Engineering and Management, **Volume 139**, Issue 2, "pp". 204-215.

96. Hassanein, A. A. G., &Afify, H. M. F. (2007), "A Risk Identification Procedure for Construction Contracts—A Case Study of Power Station Projects in Egypt", Civil Engineering and Environmental Systems, **Volume 24**, Issue 1, "pp". 3–14.

97. Ibironke, O. T.; Oladinrin, T.O.; Adeniyi, O; and Eboreime, I. V. (2013), "Analysis of Non-Excusable Delay Factors Influencing Contractors' Performance in Lagos State, Nigeria", Journal of Construction in Developing Countries, **Volume 18**, Issue1, "pp". 53–72.

98. Ilieş, L.; Crişan, E.; And Mureşan, I. N. (2010), "Best Practices in Project Management", Review of International Comparative Management, **Volume11**, Issue 1, "pp". 43-51.

99. Jayasudha, K.; and Vidivelli, B. (2016), "Analysis of Major Risks in Construction Projects", ARPN Journal of Engineering and Applied Sciences, **Volume 11**, Issue 11, "pp". 6943-6950.

100. Jha, K. N. and Iyer K.C. (2006), "Critical Factors Affecting Schedule Performance: Evidence from Indian Construction Projects", Journal of Construction Engineering and Management, **Volume 132**, Issue 8, "pp". 871-881.

101. Jha, K. N. and Iyer, K. C. (2006), "Critical Factors Affecting Quality Performance in Construction Projects", Total Quality Management, **Volume 17**, Issue 9, "pp". 1155–1170.

102. Iyer, K.C. and Jha, K.N. (2005), "Factors Affecting Cost Performance: Evidence from the Indian Construction Projects", International Journal of Project Management, **Volume 23**, "pp". 283-295.

103. Jugdev K and Müller R (2005), "A Retrospective Look at Our Evolving Understanding of Project Success" Project Management Journal; **Volume 36**, Issue 4; "pp". 19-31.

104. Jaafari, A. (2001), "Management of Risks, Uncertainties and Opportunities on Projects: Time for A Fundamental Shift", International Journal of Project Management, **Volume 19**, Issue 2, "pp". 89–101.

105. Kanchana, S.; and, Janani, S. (2018), "A Study on Factors Affecting Estimation of Construction Project", International Research Journal of Engineering and Technology (IRJET), **Volume 05**, Issue 11, "pp". 1154-1157.

106. Kanchana, S.; Niranjan, V.; and Karthick, G.A. (2018), "A Study on Factors Affecting Contract Management in Construction Industry", International Journal of Latest Engineering and Management Research (IJLEMR), **Volume 03**, Issue 03, "pp". 24-26.

107. Khodeir, L. M., & Mohamed, A. H. M. (2015), "Identifying the Latest Risk Probabilities Affecting Construction Projects in Egypt According to Political and Economic Variables from January 2011 To January 2013" HBRC Journal, **Volume 11**, Issue 1, "pp".129–135.

108. Karim, A. J. (2011), "The value of Competitive Business Intelligence System (CBIS) to Stimulate Competitiveness in Global Market", International Journal of Business and Social Science, **Volume 2**, Issue 19, "pp". 196-203.

109. Kumar, A.; Kumar, K.; Kaushik, N.; Sharma, S.; and Mishrad, S. (2010), "Renewable Energy in India: Current Status and Future Potentials", Renewable and Sustainable Energy Reviews, **Volume14**, Issue 8, "pp". 2434–2442.

110. Karlsen, J. T. (2008), “Forming Relationships with Stakeholders in Engineering Projects” European Journal of Industrial Engineering, **Volume 2**, Issue1, “pp”. 35-49.

111. Koutsikouri, D.; Austin, S.; and Dainty, A. (2008),"Critical Success Factors in Collaborative Multidisciplinary Design Projects", Journal of Engineering, Design and Technology, **Volume 6**, Issue 3 “pp”. 198 – 226.

112. Kaler, J (2003), “Differentiating Stakeholder Theories”, Journal of Business Ethics, **Volume 46**, “pp”.71-83.

113. Karlsen, J.T. (2002), “Project Stakeholder Management, Engineering Management Journal”, **Volume14**, Issue 4, “pp”. 19-24.

114. Kaplan, R.S.; and Norton, D. P. (2001), “Transforming the Balanced Scorecard from Performance Measurement to Strategic Management: Part II”, American Accounting Association, **Volume 15**, Issue 2, “pp”. 147–160.

115. Kagioglou, M., Cooper, R., Aouad, G. and Sexton, M. (2000), "Rethinking construction: The Generic Design and Construction Process Protocol", Engineering, Construction and Architectural Management, **Volume 7,** Issue 2, “pp”. 141-153.

116. Kieffer, K.M. (1999), “An Introductory Primer on the Appropriate Use of Exploratory and Confirmatory Factor Analysis”, Research in the Schools, **Volume 6**, Issue 2, “pp”. 75-92.

117. Kumaraswamy, M. M., & Chan, D. W. M. (1998), “Contributors to Construction Delays”, Construction Management and Economics, **Volume 16**, Issue 1, “pp”. 17–29.

118. Kerzner, H. (1987), “In Search of Excellence in Project Management”, Journal of Systems Management, **Volume 38**, Issue 2, “pp”.30-40.

119. Kaiser, H. F., and Rice, J. (1974). Little jiffy, mark IV. Educational and psychological measurement, **Volume 34**, Issue 1, “pp”. 111-117.

120. Kaiser, H. F. (1960), “The Application of Electronic Computers to Factor Analysis”, Educational and Psychological Measurement, **Volume 20**, “pp”. 141-151.

121. Li, X., Chalvatzis, K. J., & Pappas, D. (2017), "China's Electricity Emission Intensity In 2020 – An Analysis at Provincial Level", Energy Procedia, ***Volume* 142***, "pp" 2779–2785.*

122. Littau, P.; Jujagiri, N.J.; Adlbrecht, G. (2010), "25 Years of Stakeholder Theory in Project Management Literature (1984–2009)" Project Management Journal, **Volume 41**, "pp". 17–29.

123. Lai, J.H.K. and Yik, F.W.H. (2009), "Perception of Importance and Performance of the Indoor Environmental Quality of High-Rise Residential Buildings", Building and Environment, **Volume 44**, Issue 22, "pp" 352-360.

124. Luu, T.V., Kim, S., Tuan, N.V. and Ogunlana, S.O. (2009), "Quantify schedule risk in construction projects using Bayesian belief networks", International Journal of Project Management, **Volume** 27, Issue 1, "pp" 39-50.

125. Lee, Q. (2007), "Implementation Lean Manufacturing", Institute of Management Services Journal, **Volume 51**, Issue3, "pp". 14−19.

126. Ling, F. Y. Y.; and Hoi, L. (2006), "Risks Faced by Singapore Firms When Undertaking Construction Projects in India", International Journal of Project Management, **Volume 24**, Issue 3, "pp". 261-270.

127. Landin, A.; and Olander, S. (2005), "Evaluation of Stakeholder Influence in The Implementation of Construction Projects", International Journal of Project Management, **Volume 23**, Issue 4, "pp". 321-328.

128. Love, P. E. D., Irani, Z., & Edwards, D. J. (2004), "A Rework Reduction Model for Construction Projects", IEEE Transactions on Engineering Management, **Volume 51**, Issue4, "pp". 426–440.

129. Lim, C. S.; and Mohamed, M. Z. (1999), "Criteria of Project Success and Exploratory Re-Examination", International Journal of Project Management, **Volume17**, Issue 4, "pp". 243- 248.

130. Liu, A.M.M.; and Walker A. (1998), “Evaluation of Project Outcomes”, Construction Management and Economics, **Volume 16**, “pp”. 209-219.

131. Lemmon, D. and Early, S. (1996), "Strategy & management at Amoco Pipeline Company", Planning Review, **Volume 24**, Issue 1, “pp”. 12-14.

132. Lissitz, R. W., and Green, S. B. (1975). “Effect of The Number of Scale Points on Reliability: A Monte Carlo Approach”, Journal of Applied Psychology, **Volume 60**, Issue1, “pp”. 10-13.

133. Mokan, K. V.; Lee, T. C.; and Ramlan, R. (2019), “The Critical Success Factors for Renewable Energy Projects Implementation”, International Journal of Recent Technology and Engineering (IJRTE), **Volume 8**, Issue- 1C2, “pp”. 225-229.

134. Maqbool, R; Rashid, Y; Sultana, S.; and Sudong Y. (2018), “Identifying the Critical Success Factors and Their Relevant Aspects for Renewable Energy Projects; An Empirical Perspective”, Journal of Civil Engineering and Management, **Volume 24**, Issue 3, “pp”. 223 237.

135. Mohammed, I. A.; and Alshaoush, O. S. (2018), “Critical Success Factors for The Public-Private Partnership in Electric Infrastructure Projects in Hadhramout-Yemen”, International Journal of Civil Engineering and Technology (IJCIET), **Volume 9**, Issue 9, “pp”. 1971–1984.

136. Mackhaphonh, N.; And Jia, G. (2017),” Megaprojects in Developing Countries and Their Challenges”, International Journal of Business, Economics and Management Works, **Volume 4**, Issue 11, “pp”. 6-12.

137. Mossalam, A., Arafa, M. (2016), “The Role of Project Manager in Benefits Realization Management as A Project Constraint/Driver”, Housing and Building National Research Center, **Volume 12**, “pp”. 305-315.

138. Mir, F.A.; and Pinnington, A.H. (2014), “Exploring the Value of Project Management: Linking Project Management Performance and Project Success”, International Journal of Project Management, **Volume 32**, “pp”. 202-217.

139. Micheal, J.; Deepak, T.J.; Venishri.P; and Tong, I. S.Y. (2014)," Ranking the Factors that Influence the Construction Project Management Success: Malaysian Perspective", Civil and Environmental Research, **Volume 6**, Issue1, "pp". 80-88.

140. Marzouk, M. M. and, El-Rasas, T. I. (2014), "Analyzing Delay Causes in Egyptian Construction Projects", Journal of Advanced Research, **Volume 5**, Issue 1, "pp". 49-55.

141. Mok, K.Y., Shen, G.Q., Yang, J., (2014), "Stakeholder Management Studies in Mega Construction Projects A Review and Future Directions", International Journal Project Management, **Volume 33**, Issue 2, "pp". 446–457.

142. Muller, R.; and Jugdev, K. (2012), "Critical Success Factors in Projects Pinto, Slevin, And Prescott – The Elucidation of Project Success", International Journal of Managing Projects in Business, **Volume 5**, Issue 4, 2012 "pp". 757-775.

143. Muller, R.; and Turner, J.R. (2007), "Matching the Project Manager's Leadership Style to Project Type", International Journal of Project Management, **Volume 25**, "pp". 21-32.

144. Morris, P.W.G.; Crawford, L; Hodgson, D.; Shepherd, M.M.; and Thomas, J. (2006), "Exploring the Role of Formal Bodies of Knowledge in Defining A Profession – The Case of Project Management", International Journal of Project Management, **Volume 24**, "pp". 710-721.

145. Miller, R.; and Lessard, D. (2001), "Understanding and Managing Risks in Large Engineering Projects", International Journal of Project Management, **Volume 19**, Issue 8, "pp". 437-443.

146. Mills A (2001), "A Systematic Approach to Risk Management for Construction", Structural Survey, **Volume 19**, Issue 5, "pp". 245-252.

147. MacCallum, R. C.; Widaman, K. F.; Zhang, S. and Hong, S. (1999), "Sample Size in Factor Analysis", Psychological Methods, **Volume 4**, "pp". 84-99.

148. Monczka, R. M.; Petersen, K.J.; Handfield, R. B.; and Ragatz, G.L. (1998)," Success Factors in Strategic Supplier Alliances: The Buying Company Perspective", Decision Sciences **Volume 29**, Issue 3, "pp". 553-577.

149. Mitchell R.K.; Agle B.R.; and Wood, D.J. (1997), "Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts", Academy of Management Review, **Volume 22**, Issue 4, "pp".Munns, A.K.; and Bjeirmi, B.F. (1996) "The Role of Project Management in Achieving Project Success" International Journal of Project Management, **Volume 14**, "pp". 81-87.

150. Mintzberg, H. (1994), "The Fall and Rise of Strategic Planning", Harvard Business Review, **Volume 72**, Issue1, "pp". 107-114.

151. McCabe, D. L.; and Narayanan, V. K. (1991). "The Life Cycle of the PIMS and BCG Models," Industrial Marketing Management, **Volume 20**, "pp". 347-352.

152. Nallathiga, R.; Shaikh, H. D.; Shaikh, T. F.; and Sheik, F. A. (2017), "Factors Affecting the Success/ Failure of Road Infrastructure Projects Under PPP In India", KICEM Journal of Construction Engineering and Project Management, **Volume 7**, Issue 4, "pp". 1-12.

153. Nundwea, M.; and Mulengab, M. N. (2017), "Delays in Construction of Electrical Power Transmission Lines in Zambia', American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS), **Volume30**, Issue 1, "pp". 82-96.

154. Norizam, A.; and Malek, M. A. (2013), "Developing Critical Success Factors (CSFs) for Effective Construction Management in Malaysia Industry", Asian Social Science; **Volume 9**, Issue 9, "pp". 211-218.

155. Nallathiga, R.; Kumar, M. K.; Kumar, D.V.; and Kumar, G. A. (2012), "Determinants of the Success of Real Estate Projects: A Study of Select Firms in Hyderabad", NICMAR Journal of Construction Management, **Volume XXVII**, Issue II & III, "pp". 38-52.

156. Ntayi, M.J., Eyaa, S. and Ngoma, M. (2010a), "Moral Disengagement and Social Construction of Procurement Officer's Deviant Behaviors", Journal of Management Practice and Policy, **Volume11**, Issue 4, "pp".95–110.

157. Nitithamyong, P.; and Skibniewski, M. J. (2006), "Key Success/Failure Factors and Their Impacts on System Performance of Web-Based Project Management Systems in Construction", Electronic Journal of Information Technology in Construction, **Volume19**, "pp". 39-59.

158.Nguyen L.D., Ogunlana S.O., and Lan D.T.X. (2004), "A Study on Project Success Factors in Large Construction Projects in Vietnam", Engineering, Construction and Architectural Management, **Volume** 11, Issue 6, "pp" 404-413.

159. Newcombe, R. (2003), "From Client to Project Stakeholders: A Stakeholder Mapping Approach", Construction Management and Economics, **Volume 21**, Issue 8, "pp". 841-848.

160. Onyango, L. B.; Bwisa, H.; and Orwa, G. (2017), "Critical Factors Influencing the Implementation of Public Infrastructure Projects in Kenya: A case of Thika Sub-County, Kiambu County Kenya", International Journal of Scientific and Research Publications, **Volume7**, Issue 5, "pp". 200-211.

161. Oluka, P.N. and Basheka, B.C. (2013) "Determinants and Constraints to Effective Procurement Contract Management in Uganda: A Practitioner's Perspective", International Journal Logistics Systems and Management, **Volume 17**, Issue 1, "pp".104–124.

162. Osorio, P. C. F. (2014), "Critical Success Factors in Project Management: An Exploratory Study of an Energy Company in Brazil", Global Journal of Management and Business Research: An Administration and Management **Volume 14**, Issue10, "pp". 39-50.

163. Olawale, Y.A. and Sun, M. (2010), "Cost and Time Control of Construction Projects: Inhibiting Factors and Mitigating Measures in Practice", Construction Management and Economics, **Volume 28**, "pp". 509-526.

164. Olander, S.; and Landin, A., (2008), "A Comparative Study of Factors Affecting the External Stakeholder Management Process", Construction Management and Economics, **Volume 26**, Issue 6, "pp". 553-561.

165. Olander, S. (2007), "Stakeholder Impact Analysis in Construction Project Management", Construction Management and Economics, **Volume 25**, Issue 3, "pp". 277–287.

166. Olander, S.; and Landin, A., (2005), "Evaluation of Stakeholder Influence in The Implementation of Construction Projects" International Journal Project Management, **Volume 23**, Issue 4, "pp". 321–328.

167. Olsena, T. E.; and Osmundsenb. P. (2005), "Sharing of Endogenous Risk in Construction", Journal of Economic Behavior & Organization, **Volume 58**, "pp". 511–526.

168. Odeh, A. M.; and Battaineh, H. T. (2002), "Causes of Construction Delay: Traditional Contracts", International Journal of Project Management, **Volume 20**, Issue 1, "pp". 67-73.

169. Pall, G. K., Bridge, A. J., Gray, J., &Skitmore, M. (2019), "Causes of Delay in Power Transmission Projects: An Empirical Study" Energies, **Volume 13**, Issue 1, "pp".1-29.

170. Pall, G. K.; Bridge, A. J.; Skitmore, M.; and Gray, J. (2016), "Comprehensive Review of Delays in Power Transmission Projects", IET Generation, Transmission and Distribution, **Volume 10**, Issue14, "pp". 3393-3404.

171. Pawar, A. C.; Marawar, S. D.; Bhalerao, N. V. (2016), "A Methodology for Ranking of Causes of Delay for Residential Projects", International Research Journal of Engineering and Technology (IRJET), **Volume 03**, Issue 06, "pp". 224-231.

172. Pawar, C. S.; Jain, S. S.; and Patil, J. R. (2015), "Risk Management in Infrastructure Projects in India", International Journal of Innovative Research in Advanced Engineering (IJIRAE), **Volume 2**, Issue 4, "pp". 172-176.

173. Pham, L. H.; and Hadikusumo, H. (2014), "Schedule Delays in Engineering, Procurement, and Construction Petrochemical Projects in Vietnam", International Journal of Energy Sector Management, **Volume 8**, Issue 1, "pp". 3-26.

174. Polat, G.; Okay, F.; and Eray, E. (2014), "Factors Affecting Cost Overruns in Micro-Scaled Construction Companies", Procedia Engineering, **Volume 85**, "pp". 428–435.

175. Patil, S. K.; Gupta, A. K.; Desai, D. B. and Sajane, A. S. (2013), "Causes of Delay in Indian Transportation Infrastructure Projects", IJRET: International Journal of Research in Engineering and Technology, **Volume 2**, Issue 11, "pp". 71-80.

176. Pheng, L. S.; and Chuan, Q. T. (2006), "Environmental Factors and Work Performance of Project Managers in the Construction Industry", International Journal of Project Management, **Volume 24**, "pp". 24–37.

177. Peansupap, V.; and Walker, D. (2005) "Factors Affecting ICT Diffusion: A Case Study of Three Large Australian Construction Contractors", Engineering, Construction and Architectural Management, **Volume 12**, Issue1, "pp".21-37.

178. Pillai, N. V.; and Kannan, K.P. (2001), "Time and Cost Overruns of the Power Projects in Kerala", Centre for Development Studies Thiruvananthapuram, "pp". 1-54.

179. Patti, T.; and Kathy, B. (1997), "A Creative Approach to Strategic Planning." CMA Magazine, **Volume 71**, Issue 6, "pp". 20-22.

180. Pinto, J. K.: and Slevin, D. P. (1988), "Project Success: Definitions and Measurement Techniques", Project Management Journal, **Volume XIX**, Issue 1, "pp". 67-72.

181. Pinto, J. K.: and Slevin, D. P. (1987), "Critical factors in successful project implementation", IEEE Transactions Engineering Management, EM, **Volume 34**, Issue1, "pp". 22-27.

182. Redda, Y., and Turner, R. (2018), "Mapping the Success Dimensions of Large Oil and Gas Projects", Society of Petroleum Engineers Annual Technical Conference and Exhibition. "pp". 1-10.

183. Ruqaishi, M. and Bashir, H. A. (2015), "Causes of Delay in Construction Projects in the Oil and Gas Industry in the Gulf Cooperation Council Countries: A Case Study, Journal of Management in Engineering, **Volume 31**, Issue 3, "pp".1-8.

184. Rajablu, M.; Marthandan, G.; and Yusoff, W.F.W., (2015), "Managing for stakeholders: the role of stakeholder-based management in project success" Asian Social Science, **Volume 11**, Issue 3, "pp". 111–125.

185. Ramanathan, C.; Narayanan, S. p.; and Idrus, A. B. (2010), "Construction Delays Causing Risks on Time and Cost - a Critical Review", Australasian Journal of Construction Economics and Building, **Volume 12**, Issue 1, "pp". 37-57.

186. Rendon, R.G. (2008), "Procurement Process Maturity: Key to Performance Measurement'', Journal of Public Procurement, **Volume 8**, Issue 2, "pp".200–214.

187. Rowlinson, S.; and Cheung, Y. K.F. (2008), "Stakeholder Management through Empowerment: Modelling Project Success", Construction Management and Economics, **Volume 26**, "pp". 611-623.

188. Raz T, Shenhar A. J.; Dvir D. (2002), "Risk Management, Project Success and Technological Uncertainty", R&D Management, **Volume 32**, Issue 2, "pp".101–109.

189. Rockart, J. (1982), "The Changing Role of the Information Systems Executive: A Critical Success Factors Perspective", In: Sloan Management Review, **Volume 23**, Issue 1, "pp". 3-13.

190. Rockart, J. F. (1979), "Chief Executives Define Their Own Data Needs", Harvard business review, **Volume 57**, Issue 2, "pp". 81-93.

191. Rogers, E. M. (1976), "New Perspectives on Communication and Development", Communication Research, **Volume 3**, Issue 2, "pp". 99–106.

192. Soomro, F. A.; Memon, M. J.; Chandio, A. F.; Sohu, S.; and Soomro, R. (2019), "Causes of Time Overrun in Construction of Building Projects in Pakistan", Engineering, Technology & Applied Science Research **Volume 9**, Issue 1, "pp". 3762-3764.

193. Singh, S.; Bala, A.; Dixit, S.; and Varshney, D. (2018), "Critical Analysis of Causes of Delay in Residential Construction Projects in India", International Journal of Civil Engineering and Technology (IJCIET), **Volume 9**, Issue 1, "pp". 330–345.

194. Sudirman, W. B.; and Simanjuntak, M. R. A. (2018), "Risk Factor Identification for EPC Contract of Power Plant Projects using In-House Form of General Conditions of Contract in Indonesia", Journal of Scientific and Engineering Research, **Volume 5**, Issue 4, "pp".309-319.

195. Sharma, A.; Chodankar, D.P.; and Priolkar, J.G. (2017), "Power Sector in India: Issues, Challenges & Prospects", International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, **Volume 5**, Issue 6, "pp". 194-199.

196. Samsudin, S. B, and Hasanan, N. B. (2017), "Strengthen the Critical Success Factors (CSFs) Implementing Total Productive Maintenance in Power Generation Industry", International Journal of Accounting & Business Management **Volume 5**, Issue 2, "pp". 53-67.

197. Sovacoola, B. K.; Burkec, M.; Bakerb, L.; Kotikalapudib, C. K.; and Wlokasd, H. (2017), "New Frontiers and Conceptual Frameworks for Energy Justice", Energy Policy, **Volume 106**, "pp". 677-691.

198. Saleh, A. A.; Mohammed A. H.; Abdullah, M. N. (2015), "Critical Success Factors for Successful Energy Management Implementation towards Sustainability in Malaysian Universities", International Journal of Industrial and Manufacturing Engineering **Volume 9**, Issue3, "pp". 572-580.

199. Sepasgozar, S. M. E.; Razkenari, M. A.; and Barati, K. (2015), "The Importance of New Technology for Delay Mitigation in Construction Projects", American Journal of Civil Engineering and Architecture, Volume **3**, Issue 1, "pp".15-20.

200. Song, D.; Zhang, X.; and Sun, Y. (2013), "Risk Identification for PPP Waste-To-Energy Incineration Projects in China", Energy Policy, **Volume 61**, "pp". 953-962.

201. Saraf, D. D.; (2013), “Study of Factors Affecting Performance of Construction Project”, International Journal of Science and Research (IJSR), **Volume4**, Issue 5, “pp”. 1339-1341.

202. Song, J.; Song, D.; Zhang, X.; and Sun, Y.(2013),” Risk identification for PPP waste-to-energy incineration projects in China”, Energy Policy, **Volume61**, Issue C, “pp”. 953-962.

203. Shukla, U. K. and Thampy, A. (2011), “Analysis of Competition and Market Power in The Wholesale Electricity Market in India”, Energy policy, **Volume** 39, Issue 5 “pp” 2699-2710.

204. Singh, R. (2010), “Delays and Cost Overruns in Infrastructure Projects: Extent, Causes and Remedies”, Economic & Political Weekly, **Volume xlv,** Issue 21, “pp”. 43-54.

205. Shen, L. Y.; Wu, G.W.C.; Ng, C. S.K. (2001), “Risk Assessment for Construction Joint Ventures in China”, Journal of Construction Engineering and Management, **Volume 127**, Issue 1, “pp”. 77-81.

206. Shenhar, A. J.; Dvir, D.; Levy, O.; and Maltz, A. C. (2001). “Project Success: A Multidimensional Strategic Concept”, Long Range Planning, **Volume 34**, Issue 6, “pp”. 699-725.

207. Skyrius, R. (2001), “Business Decision Making, Managerial Learning and Information Technology”, Informing Science, “pp”. 479-486.

208. Shenhar, A.J.; Poli, M.; and Lechler, T. (2000), “A new framework for strategic project management, in T. Khalil (ed.)”, Management of Technology VIII, University of Miami, Miami, FL.

209. Smith, G. R., and Bohn, C. M. (1999), “Small to Medium Contractor Contingency and Assumption of Risk” Journal of Construction Engineering and Management, ASCE, **Volume 125**, Issue2, “pp”. 101–108.

210. Shenhar, A.; Levy, O.; and Dvir, D. (1997), “Mapping the Dimensions of Project Success”, Project Management Journal, **Volume 28**, Issue 2, “pp”. 5–13.

211. Savage, G. T.; Nix, T. W.; Whitehead, C. J.; and Blair, J.D. (1991), “Strategies for Assessing and Managing Organizational Stakeholders”, Academy of Management Executive, **Volume 5**. Issue 2, “pp”. 61-75.

212. Tsiga, Z.; Emes, M; and Smith, A. (2017), “Critical success factors for projects in the petroleum industry”, Procedia Computer Science, **Volume 121**, “pp”. 224–231.

213. Tsiga, Z.; Emes, M; and Smith, A, (2016), “Critical Success Factors for the Construction Industry”, PM World Journal, **VolumeV**, Issue VIII, “pp”. 1-12.

214. Tabish, S.Z.S.; and Jha, K.N. (2012), “Success Traits for a Construction Project”, Journal of Construction Engineering and Management, **Volume 138**, “pp”. 1131-1138.

215. Teddlie, C., & Yu, F. (2007), “Mixed Methods Sampling: A Typology with Examples”, Journal of Mixed Methods Research, **Volume 1**, Issue 1, “pp”. 77-100.

216. Turner, J. R.; and Müller, R. (2005), “The Project Manager’s Leadership Style as A Success Factor on Projects: A Literature Review”, Project Management Journal, **Volume 36**, Issue 1, “pp”. 49-61.

217. Turner, J. R. (2004), “Five Necessary Conditions for Project Success”, International Journal of Project Management, **Volume22**, Issue 5, “pp”. 349-350.

218. Turner, J. R.; and Simister, S. J. (2001), “Project Contract Management and A Theory of Organization”, International Journal of Project Management, **Volume19**, “pp”. 457–464.

219. Thomas, J. L.; Skulmoski, G. J.; Williamson, E. and Jergeas, G. F. (2000), “Stakeholder Management on Construction Projects”, AACE International Transactions, **Volume 12**, Issue 1-5, “pp”. 12.1-12.6.

220. Thompson, P.; and Brooks, K. (1997), “A Creative Approach to Strategic Planning”, CMA Magazine, **Volume71**, Issue 6, “pp”. 20-22.

221. Thompson, B.; and Daniel, L. G (1996),” Factor Analytic Evidence for the Construct Validity of Scores: A Historical Overview and Some Guidelines”, Educational and Phsycological Measurement, **Volume 56**, Issue 2, “pp”. 197-208.

222. Trent, R. J.: and Monczka, R. M. (1994), “Effective Cross-Functional Sourcing Teams: Critical Success Factors”, International Journal of Purchasing and Materials Management, **Volume 30**, Issue3, “pp”. 2–11.

223. Ugwu, O. O.; and Kumaraswamy, M. M. (2007), “Critical Success Factors for Construction ICT Projects – Some Empirical Evidence and Lessons for Emerging Economies”, Electronic Journal of Information Technology in Construction, **Volume 12**, “pp”. 231-249.

224. Uher, T. E.; and Toakley, A. R. (1999), “Risk Management in The Conceptual Phase of a Project”, International Journal of Project Management, **Volume 17**, Issue 3, “pp”. 161-169,

225. Venkatesh, P. K.; and Venkatesan, V. (2017), “Delays in Construction Projects: A Review of Causes, Need and Scope for Further Research”, Malaysian Construction Research Journal, **Volume 23**, Issue3, “pp”. 89-113.

226. Varghese, G.; and Eapen, L. M. (2016), “Power Sector in India- Recent Challenges and Measures Undertake”, Asian Journal of Research in Business Economics & Management, **VolumeVI**, Issue I, “pp”. 7-14.

227. Vos J.F.J.; and Achterkamp M.C. (2006), “Stakeholder Identification in Innovation Projects – Going Beyond Classification” European Journal of Innovation Management, **Volume 9**, Issue2, “pp”.161-178.

228. Wai, S. H.; Yusof, A. M.; Ismail, S.; and Ng, C. A. (2013), “Exploring Success Factors of Social Infrastructure Projects in Malaysia”, International Journal of Engineering Business Management, **Volume 5**, “pp”. 1-9.

229. Wiguna, I. P. A.; and Scott, S. (2006), “Relating risk to project performance in Indonesian building contracts”, Construction Management and Economics, **Volume24**, “pp”. 1125–1135.

230. Wang, S. Q.; Dulaimi, M. F.; and Aguria, M. Y. (2004), “Risk Management Framework for Construction Projects in Developing Countries”, Construction Management and Economics, **Volume22**, “pp”. 237–252.

231. Westerveld, E. (2003), “The Project Excellence Model®: Linking Success Criteria and Critical Success Factors”, International Journal of Project Management, **Volume21**, Issue 6, “pp”. 411-418.

232. Wateridge, J. (1998), “How can IS/IT projects be measured for success?”, International Journal of Project Management, **Volume 16**, Issue 1, “pp”. 59–63.

233. Wood, D.J. & Gray, B. (1991), “Toward A Comprehensive Theory of Collaboration”, Journal of Applied Behavioral Sciences, **Volume27**, Issue 2, “pp”.139-162.

234. Yang, J.; Nisar, T. M.; and Prabhakar, G. P. (2017), “Critical Success Factors for Build–Operate– Transfer (BOT) Projects in China”, Irish Journal of Management, **Volume36**, Issue 3, “pp”. 147-161.

235. Yau, N.-J., & Yang, J.-B. (2012), “Factors Causing Design Schedule Delays in Turnkey Projects in Taiwan: An Empirical Study of Power Distribution Substation Projects” Project Management Journal, **Volume43**, Issue 3, “pp”. 50–61.

236. Yang, J.; Shen, G. Q.; Drew, D. S.; and Ho, M. (2010), “Critical Success Factors for Stakeholder Management: Construction Practitioners’ Perspectives”, Journal of Construction Engineering and Management, **Volume136**, Issue 7, “pp”. 778-786.

237. Yang, J.; Shen, G. Q.; Ho, M.; Drew, D. S.; and Chan, A. P. C. (2009), “Exploring Critical Success Factors for Stakeholder Management in Construction Projects”, Journal of Civil Engineering and Management, **Volume15**, Issue 4, “pp”. 337–348.

238. Zhao, Z. Y.; and Chen, Y. L. (2018), “Critical factors affecting the development of renewable energy power generation: Evidence from China”, Journal of Cleaner Production, **Volume184**, “pp”. 466-480.

239. Zhao, Z. Y; Zuo, J; Zillante, G; and Wang, X. W (2010),” Critical success factors for BOT electric power projects in China: Thermal power versus wind power”, Renewable Energy, **Volume35**, “pp”. 1283–1291.

240. Zhang, X. (2005), “Critical Success Factors for Public–Private Partnerships in Infrastructure Development”, Journal of Construction Engineering and Management **Volume 131**, Issue 1, “pp”. 3-14.

Book Reference

1. APM, (2006), “Project Management Body of Knowledge”, 5th ed. Association of Project Management, High Wycombe.

2. Artto, K.; and Dietrich, P. (2004), “Strategic business management through multiple projects. in PWG Morris & JK Pinto (eds)”, The Wiley Guide to Managing Projects. John Wiley & Sons Inc., London, “pp”. 144-176.

3. Arbnor and B. Bjerke, “Methodology for Creating Business Knowledge,” Sage, Los Angeles, 1997/1981.

4. Anthony, R. N.; Dearden, J.; and Vancil, R. F. (1972), “Management Control Systems”, Homewood, Illinois: R. D. Irwin, “pp”. 147-158.

5. Banaitiene, N.; and Banaitis, A. (2012), “Risk Management in Construction Projects” Risk Management – Current Issues and Challenges, Publisher: Intech, “pp”.429-448, “Chap”. 19,

6. Barney, J. B.; and Hesterly, W. S. (2008), “Strategic Management and Competitive Advantage: Concepts and Cases”, 2nd edition. New Jersey. Pearson Prentice Hall.

7. Bannerman, P. L. (2008), “Defining Project Success: A Multilevel Framework”, Project Management Institute, “pp”. 1-13.

8. Bryman, A.; and Bell, E. (2003), “Business Research Methods”, Oxford University Press, Oxford.

9. Bjork, B. (1997), “A framework for discussing information technology applications in construction” in CIB Working Commission W78 workshop." Information Technology Support for Construction Process Re-engineering", Cairns, Australia, 1997.

10. Baker B.N., Murphy D.C. and Fisher D., (1983), “Factors affecting project success”, In: D.I. Cleland and W.R. King (Eds), Project Management Handbook, Van Nostrand Reinhold, New York, “pp”. 669-685.

11. Bartlett, M. S. (1954), “A note on the multiplying factors for various chi-square approximation” Journal of Royal Statistical Society, 16(Series B), 296-8.

12. Chinyio, E., &Olomolaiye, P. (2010), “Introducing Stakeholder Management. Construction Stakeholder Management”, Blackwell Publishing Ltd., “pp”. 1–12.

13. Cleland, D. I.; and Bidanda, B. (2009), “Project Management Circa 2025”, Newtown Square, PA: Project Management Institute.

14. Carpenter, M.A.; and Sanders, W.G. (2007), “Strategic Management: A Dynamic Perspective”, New Jersey: Pearson Prentice Hall.

15. Cova, B., Salle, R., (2006), “Communications and stakeholders”, In: Pryke, S., Smyth, H. (Eds.), The Management of Complex Projects: A Relationship Approach, Blackwell, UK, “pp”. 131–146.

16. Collis, J.; and Hussey, R. (2003), “Business Research: a practical guide for undergraduate and postgraduate students”, second edition. Basingstoke: Palgrave Macmillan Press Ltd.

17. Crawford, L. (2002), “Profiling the Competent Project Manager”, In D. P. Slevin, D. I. Cleland, and J. K. Pinto (Eds.), The Frontiers of Project Management Research, Newton Square, PA: Project Management Institute, “pp”. 151-176.

18. Chinowsky, P.S. (1999a), “Strategic Corporate Management for Civil Engineering”, New York: Oxford University Press.

19. Cleland, D. I.; and King, W. R. (1983), “Systems Analysis and Project Management”, McGraw-Hill, New York.

20. Debbie, S.; Caroline, J.; Mark, W.; and Shailey, M. (2005), “User Interface Design and Evaluation”, Morgan Kaufmann Series in Interactive Technologies, San Francisco: Morgan Kaufman.

21. DeVellis, R. F. (2003), “Scale development: theory and applications (2nd ed.)”, Newbury Park: Sage Publications.

22. Enshassi, A. (2010). “The contractor-subcontractor relationship: The general contractor’s view” School of Engineering, IUG., Palestine.

23. Easterby-Smith, M.; Thorpe, R.; and Lowe, A. (2002) Management Research: An Introduction (2nd edition), London, Sage Publication.

24. Field, A. (2018), “Discovering Statistics Using IBM SPSS Statistics”, Social Science, SAGE Publications.

25. Field, A. (2009), “Discovering Statistics Using SPSS (3rd ed.)”, California, Sage Publications Inc.

26. Fellows, R. and Liu, A. (2003), “Research Methods for Construction”, Blackwell Science.

27. Hayes, A. F. (2018), “Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression Based Approach Second Edition”, published by The Guilford Press in their Methodology in the Social Sciences series.

28. Hair, J. F.; Black, W.C., Babin, B.J. and Anderson, R.E. (2010), “Multivariate Data Analysis. 7th Edition”, Pearson, New York.

29. Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). Multivariate data analysis. Englewood Cliffs, NJ: Prentice-Hall.

30. Jolowo, M., Deepak, T. J., &Venishri, P. (2014), Civil & Environmental Research 6, Issue1; (2014).

31. Johnson, G.; Scholes, K.; and Whittington, R. (2005), “Exploring Corporate Strategy” 7th edition. Harlow: FT Prentice Hall Financial Times.

32. Jamieson, A.; and Morris, P.W.G., (2004), "Moving from Corporate Strategy to Project Strategy" reprinted in Morris P. W. G and Pinto, J. (eds), 2004, The Wiley Guide to Managing Projects, Wiley and Sons, USA.

33. Kerzner, H. (2009) “Project Management: A Systems Approach to Planning, Scheduling, and Controlling” John Wiley & Sons.

34. Mullaly, M. E. & Thomas, J. (2010). Re-thinking project management maturity: perspectives gained from explorations of fit and value. Paper presented at PMI® Research Conference: Defining the Future of Project Management, Washington, DC. Newtown Square, PA: Project Management Institute.

35. Meredith, J.R. & Mantel, S.J. (2006). Project Management – a Managerial Approach (6th Edition). John Wiley & Sons, New.

36. Minocha, S. (2006), “Dissertation Preparation and Research Methods”, Harlow, Pearson.

37. Polonsky, M. J.; and Waller, D. S. (2005), “Designing and managing a research project: A business student's guide”, Thousand Oaks, Calif: Sage Publications.

38. Perry, J.G. (1985), “The development of contract strategies for construction projects”, (Ph.D. thesis 1985.).

39. Porter, M. (1985), “Competitive advantage”, New York: Free Press.

40. Rendon, R. G. (2009a). “Contract Changes Management.” In G. A. Garrett (Ed.), Contract Administration: Tools, Techniques and Best Practices, Riverwoods, IL: CCH, “pp”. 69-87.

41. Rendon, R. G. (2009b). Contract Management Process Maturity: Empirical Analysis of Organizational Assessments (Technical Report NPS-CM-09-124), Acquisition Research Program, Naval Postgraduate School, Monterey, CA.

42. Rostaldas, A., (2008), “Applied Project Management – How to Organize, Plan and Control Projects”, Tapir Academic Press, Trondheim.

43. Rogerson, P. A. (2001), “Statistical methods for geography”, London: Sage.

44. Rowlinson, S. (1999), “Selection criteria. In Procurement Systems: A Guide to Best Practice” Rowlinson, S. and McDermott, P. (Eds), London, E. and F.N. Spon: “pp”. 276-99.

45. Shenhar, A. and Dvir, D. (2010), “ReinventandoGerenciamento De Projetos” An Abordagem Diamante AoCrescimento E InovacaoBem-Sucedidos. Sao Paulo: M. Books.

46. Shenhar, A. J., &Dvir, D. (2007), “Reinventing project management: the diamond approach to successful growth and innovation”, Boston, MA: Harvard Business Press.

47. Smith, N.J., Merna, T. and P. Jobling. (2006), “Managing risk in construction projects”, Oxford: Blackwell.

48. Schwager, H. P. (2004), “Organizational strategies to address stakeholder relationships: A customer portal perspective”, PhD thesis. Aubum University.

49. Saunders, M.; Lewis, P.; and Thornhill, A. (2003), “Research Methods for Business Students”, Harlow: Pearson Education Limited.

50. Sudman, S.; and Bradburn, N.M. (1983), “Asking Questions: A Practical Guide to Questionnaire Design” San Francisco, CA: Jossey-Bass.

51. Tabachnick, B. G., &Fidell, L. S. (2007), “Using Multivariate Statistics (5th ed.)”, New York: Allyn and Bacon.

52. Trochim, W.M. and Donnelly, J.P. (2006), “The Research Methods Knowledge Base”, 3rd Edition, Atomic Dog, Cincinnati, OH

53. Tabachnick, B.G., &Fidell, L.S. (2001), “Using Multivariate Statistics (5th ed.)”, Pearson: Needham Heights, MA.

54. Whitley, P. (2002), “Motivation”, Oxford: Capestone Publishing.

Conference Reference

1. Abylova, V.; and Salykova, L. N. (2019), “*Critical Success Factors in Project Management: A Comprehensive Review*”, Project Management Development – Practice and Perspectives 8th International Scientific Conference on Project Management in the Baltic Countries, Riga, University of Latvia, “pp”. 254-262.

2. Abdullah, W.; Maimun, W.; and Ramly A. (2006), “*Does Successful Project Management Equates to Project Success*”, International Conference of Cognitive Informatics Beijing, China, “pp”. 1-13.

3. Cullen, M.D.M.; Calitz, A.P.; and Nel, N. (2015), "*Project Management for Strategic Management Implementation in the Energy Sector* ", Conference: 9th International Business Conference (IBC 2015), At Victoria Falls, Zambia, "pp". 1-19.

4. Crawford, L. (2000), "*Profiling the Competent Project Manager*", Proceedings of PMI Research Conference, Project Management Institute, Paris, France, Sylva, NC, "pp". 3-15.

5. Hajiagha, S. H. R.; Shokouhinia, M.; and Hashemi, S. S. (2016), "*Success Criteria in Oil, Gas and Petrochemical Projects*", International Conference on Electrical, Mechanical and Industrial Engineering (ICEMIE 2016), Phuket, Thailand, "pp". 241-247.

6. Hartman, F. T. (2000), "The role of TRUST in project management". Paper presented at PMI® Research Conference 2000: Project Management Research at the Turn of the Millennium, Paris, France. Newtown Square, PA: Project Management Institute.

7. Jaakkola, K. (2004), "*A Way to Successful and Strategic Contract Management*", Nordnet- International Project Management Conference ('Successful project management - art, science and culture'), Finland, "pp".1-6.

8. Karim, K.; and Marosszeky, M. (1999), "*Process Monitoring for Process Re-Engineering – Using Key Performance Indicators*", International Conference on Construction Process Reengineering, CPR 99, Sydney, 12–13 July.

9. Mai, S. H.; Wang, J. Q.; and Vu, H. A. (2016), "*Risk Evaluation and Control of EPC Hydropower Construction Project in Vietnam*", International Conference on Civil, Transportation and Environment (ICCTE 2016), "pp".206-215.

10. Nallathiga, R.; Wakhloo, A.; and Bhattacharya, A. (2015), "*Stakeholders' Assessment of Delays in Infrastructure Projects and Their Causal Factors*", Proceedings of PMI Research and Academic Conference, National Institute of Industrial Engineering (NITIE), Mumbai, "pp".1-26.

11. Niazai, G. A. and Gidado, K. (2012), "*Causes of Project Delay in the Construction Industry in Afghanistan*", EPPM2012, University of Brighton, UK, "pp".63-74.

12. Ramlee, N.; Tammy, N.J.; Raja Mohd Noor, R.N.H.; AinunMusir, A.; Abdul Karim, N.; Chan, H.B.; and Mohd Nasir, S.R. (2015), "*Critical Success Factors for Construction Project*", International Conference on Advanced Science, Engineering and Technology (ICASET) AIP Conf. Proc. 1774, "pp". 030011-1–030011-6.

13. Sadeghi, B.; Mortaheb, M. M.; and Kashani, H. (2016), "*Defining Mitigation Strategies for Recurring EPC Contract Risks*", Construction Research Congress, Conference, "pp". 2773-2782.

14. Salama, M.; Hamid M. A. E.; and Keogh, B. (2008), "*Investigating the Causes of Delay Within Oil and Gas Projects in The U.A.E.*", 24th Annual ARCOM Conference, Association of Researchers in Construction Management, "pp". 819-827.

15. Steinfort, P.; and Walker, D (2007), "*Critical Success Factors in Project Management Globally and How They May Be Applied to Aid Projects*", in D. Baccarini (ed.) Proceedings of the PMOZ Achieving Excellence-4th Annual Project Management Australia Conference, Bisbrone, Australia, "pp". 1-13.

16. Sreepuram, P., Rao, A.K. (2006) "*Build Organization Capabilities to Utilize IT*", Proceedings of the World Conference for Design and Construction, INCITE/ITCSED 2006, New Delhi, India, **Volume4**, "pp".72-80.

17. Samson, M.; and Lema, N. M. (2002), "Development of Construction Contractors Performance Measurement Framework", 1st International Conference of Creating A Sustainable, "pp". 1-10.

18. Tabish, S.Z.S.; and Jha, K.N. (2011), "*Important Factors for Success of Public Construction Projects*", 2nd International Conference on Construction and Project Management, **Volume15**, IACSIT Press, Singapore, "pp". 64-68.

19. Ugwu, O., Ng, S., and Kumaraswang, M. (2003), "*Key Enabler in It Implementation A Hong Kong Construction Industry Perceptive in Towards A Vision for It in Civil Engineering*", 12. Conference Proceedings of 4th Joint symposium on IT in Civil Engineering, IT conference, "pp'. 315-326.

Web Reference

1. Aberdeen Group, (2003), “The Spending Analysis Benchmark Report”, Survey Report from www.aberdeen.com, accessed on 10/11/2019.

2. Caralli, R. A, (2004), “The Critical Success Factor Method: Establishing a Foundation for Enterprise Security Management (CMU/SEI-2004-TR-010)”, Software Engineering Institute, Carnegie Mellon University, 2004, www.sei.cmu.edu/library/abstracts/reports/04tr010.cfm, accessed on 09/09/2019.

3. Gaskin, J. (2013a), “SEM Series Part 2: Data Screening”, Retrieved from http://www.youtube.com/watch?v=1KuM5e0aFgU, Accessed 10 October 2015, accessed on 5/01/2020.

4. Handzic, M. (2001),” Does More Information Lead to Better Informing”, The Bank of New South Wales, Australia. [Online] Available: http://ecommerce.lebow.drexel.edu/eli/pdf/hanEBKDoesM.pdf, Accessed on 22/02/2020.

5. PEPDS (2004), “Success factors, Performance Evaluation and Professional Development System”, available at: www.buffalostate.edu/offices/hr/PEPDS/sf/, Accessed on 12/12/2019.

6. The CHAOS Report (1994), The Standish Group, http://www.standishgroup.com/sample_research/chaos_1994_1.php, Accessed on 17/11/2019.

Appendix-A

Questionnaire Set-I

Some factors that may be considered significant for the success of Power Transmission (PT) projects listed below. Please tick in an appropriate box that represents your appraisal about the importance of impact of these factors in PT Project, rating them on the scale of 1-5

Please tick on appropriate box according to scale of 1-5 as given below:

1- No impact 2- Negligible Impact 3-Marginal Impact 4-Moderate Impact 5-Major Impact

1. Project Success

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
Project budget					
Estimated time					
Desired quality					
Stakeholder satisfaction					
Social purpose					
Achieved organization goal					
Satisfaction of team members					
Safety					
Increase Market Share					

2. Strategy

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
Leadership strategy					
Bidding strategy					
Effective cash Flow management strategy					
Clear Objectives and understanding					
Cohesive procurement strategy					
Strategy of effective communication					
Market intelligence strategy					
Strategic execution plan aligns with project scope					
Managing Risk Strategy					
Communication strategy					

3. Risk

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
Fund flow of client					
Control of scope creeping					
Team conflict resolution					
Timely subcontractor payment					
Opposition from social Bodies					
Suspension of work					
Accidents and safety					
Avoid to Changes in design					
Test list with less frequency					
Stable Government					
Available of construction material at project site					
Geographical location of Project					

4. Contract

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
Price variation clause					
Payment terms					
Realistic schedule					
Type of Contract					
Claims for time extension					
Clear and unambiguous scope					
Justified penalty clause					
Dispute and Arbitration					
Timely document and drawing approval					
Force Majeure clause					

5. Stakeholder

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
Managing stakeholders					
Trust of Stakeholder					
Effectively resolving conflicts between stakeholders					
Communicating with stakeholder					
Early Identify, prioritize and engage key stakeholders					
Top management support					

6. Information Technology

Factors	No impact	Negligible Impact	Marginal Impact	Moderate Impact	Major Impact
E-tendering					
Planning & monitoring					
Energy Management and Control system					
Network Management system					
Decision support System					

General Information

Name of respondent:

Designation:

Name of organization:

Location:

Gender (Please Tick √): □M □F

Age Group in yrs. (Please Tick √): - □20-30 □31-40 □41-50 □51-60 □Above

Experience in yrs. (Please Tick √): □1-5 □ 6-10 □11-15 □16-20 □21-25 □26- above

Project Handle in million (Please Tick √): □1-200 □201-400 □401-600 □601-800 □801-1000 □Above1000

End of Interview. Thank you very much

Appendix-B

Table-4.1: Descriptive statistics: Skewness and Kurtosis

Variables	Factor	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
V1	Project Success	4.29	0.905	-1.202	0.169	0.792	0.337
V2		4.087	1.0155	-0.878	0.169	-0.142	0.337
V3		4.179	0.9813	-1.113	0.169	0.621	0.337
V4		4.053	1.0530	-0.913	0.169	0.010	0.337
V5		4.072	1.0837	-0.977	0.169	-0.011	0.337
V6		4.217	0.9785	-1.171	0.169	0.605	0.337
V7		4.121	1.0144	-0.978	0.169	0.057	0.337
V8		4.121	1.0334	-1.018	0.169	0.280	0.337
V9		3.855	1.0964	-0.646	0.169	-0.637	0.337
V10	Strategy	4.121	1.0520	-1.128	0.169	0.549	0.337
V11		4.043	1.0488	-0.903	0.169	0.018	0.337
V12		4.077	0.9773	-0.944	0.169	0.213	0.337
V13		3.981	1.0792	-0.780	0.169	-0.406	0.337
V14		3.865	1.1152	-0.705	0.169	-0.473	0.337
V15		4.097	0.9855	-0.994	0.169	0.272	0.337
V16		4.068	1.0682	-0.980	0.169	0.071	0.337
V17		3.976	1.0495	-0.766	0.169	-0.404	0.337
V18		4.068	1.0265	-0.925	0.169	0.050	0.337
V19		3.855	0.9696	-0.447	0.169	-0.775	0.337

V20		3.952	1.0828	-0.969	0.169	0.265	0.337
V21		3.981	1.0143	-0.666	0.169	-0.567	0.337
V22		3.836	1.0848	-0.682	0.169	-0.374	0.337
V23		3.986	1.0215	-0.854	0.169	0.095	0.337
V24		3.792	1.1407	-0.694	0.169	-0.398	0.337
V25		3.855	1.0964	-0.668	0.169	-0.442	0.337
V26		3.797	1.0916	-0.493	0.169	-0.796	0.337
V27		3.879	1.0658	-0.728	0.169	-0.311	0.337
V28	**Risk**	3.908	1.0222	-0.640	0.169	-0.468	0.337
V29		3.778	1.0878	-0.553	0.169	-0.717	0.337
V30		3.797	1.0508	-0.523	0.169	-0.606	0.337
V31		3.729	1.1210	-0.577	0.169	-0.601	0.337
V32		3.831	1.1040	-0.687	0.169	-0.372	0.337
V33		3.874	1.0583	-0.664	0.169	-0.370	0.337
V34		3.845	1.0406	-0.704	0.169	-0.334	0.337
V35		3.874	1.1120	-0.776	0.169	-0.362	0.337
V36		3.957	1.0672	-0.808	0.169	-0.202	0.337
V37		3.826	1.1055	-0.630	0.169	-0.449	0.337
V38	**Contract**	3.831	1.1344	-0.690	0.169	-0.429	0.337
V39		3.845	1.0817	-0.617	0.169	-0.530	0.337
V40		3.918	1.0419	-0.745	0.169	-0.281	0.337
V41		3.754	1.0438	-0.448	0.169	-0.754	0.337

V42	**Stakeholder**	3.899	1.0355	-0.616	0.169	-0.554	0.337
V43		3.802	1.0947	-0.451	0.169	-0.772	0.337
V44		3.787	1.1334	-0.644	0.169	-0.563	0.337
V45		3.744	1.0960	-0.504	0.169	-0.633	0.337
V46		3.768	1.0991	-0.592	0.169	-0.474	0.337
V47		3.865	1.1109	-0.673	0.169	-0.576	0.337
V48	**Information Technology**	3.942	1.0868	-0.801	0.169	-0.212	0.337
V49		3.816	1.1555	-0.646	0.169	-0.641	0.337
V50		3.850	1.1708	-0.731	0.169	-0.465	0.337
V51		3.889	1.1157	-0.774	0.169	-0.224	0.337
V52		3.850	1.1414	-0.711	0.169	-0.501	0.337

Table-4.6: Factor Analysis applied for CSFs of PT Projects (N=207): Total Variance Explained

Total Variance Explained									
Variables	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	14.082	30.614	30.614	14.082	30.614	30.614	4.691	10.198	10.198
2	2.426	5.274	35.888	2.426	5.274	35.888	4.568	9.931	20.129
3	2.200	4.783	40.671	2.200	4.783	40.671	3.865	8.402	28.532
4	1.909	4.151	44.822	1.909	4.151	44.822	3.821	8.306	36.837
5	1.780	3.870	48.691	1.780	3.870	48.691	3.457	7.516	44.353
6	1.398	3.039	51.731	1.398	3.039	51.731	3.394	7.378	**51.731**
7	1.200	2.609	54.340						
8	1.160	2.521	56.861						
9	1.097	2.385	59.246						
10	1.048	2.278	61.523						
11	1.020	2.217	63.741						
12	0.956	2.079	65.820						

13	0.941	2.046	67.865						
14	0.912	1.982	69.847						
15	0.867	1.886	71.733						
16	0.816	1.774	73.507						
17	0.774	1.683	75.190						
18	0.757	1.645	76.835						
19	0.668	1.452	78.287						
20	0.655	1.425	79.712						
21	0.644	1.401	81.113						
22	0.618	1.343	82.456						
23	0.573	1.246	83.702						
24	0.516	1.122	84.823						
25	0.498	1.082	85.905						
26	0.474	1.030	86.935						
27	0.472	1.026	87.961						
28	0.461	1.002	88.964						
29	0.441	0.959	89.923						
30	0.431	0.936	90.859						
31	0.416	0.904	91.763						
32	0.382	0.830	92.592						
33	0.368	0.799	93.392						
34	0.336	0.730	94.122						
35	0.316	0.686	94.808						
36	0.308	0.669	95.477						
37	0.282	0.612	96.089						
38	0.242	0.525	96.614						
39	0.234	0.508	97.122						
40	0.219	0.476	97.599						
41	0.216	0.470	98.069						
42	0.210	0.457	98.526						
43	0.193	0.419	98.945						
44	0.177	0.385	99.330						
45	0.169	0.368	99.699						
46	0.139	0.301	100.00						
Extraction Method: Principal Component Analysis.									

4.9: Project Success Factors for Success of PT projects as Tested in Selected 14 Organization (N=207)

Pearson Correlations								
	PCSF1	PCSF2	PCSF3	PCSF4	PCSF5	PCSF6	PCSF7	PCSF8
PCSF1	1							
PCSF2	.374**	1						
PCSF3	.597**	.428**	1					
PCSF4	.376**	.486**	.479**	1				
PCSF5	.479**	.572**	.540**	.465**	1			
PCSF6	.510**	.450**	.414**	.408**	.356**	1		
PCSF7	.501**	.489**	.539**	.448**	.398**	.458**	1	
PCSF8	.445**	.392**	.505**	.520**	.556**	.300**	.403**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.10: Strategy Factors for Success of PT projects as Tested in Selected 14 Organization (N=207)

Pearson Correlations									
	SCSF1	SCSF2	SCSF3	SCSF4	SCSF5	SCSF6	SCSF7	SCSF8	SCSF9
SCSF1	1								
SCSF2	.325**	1							
SCSF3	.477**	.347**	1						
SCSF4	.348**	.430**	.383**	1					
SCSF5	.486**	.466**	.540**	.522**	1				
SCSF6	.424**	.376**	.395**	.522**	.405**	1			
SCSF7	.373**	.444**	.362**	.460**	.464**	.367**	1		
SCSF8	.368**	.429**	.376**	.424**	.528**	.411**	.361**	1	
SCSF9	.348**	.417**	.406**	.426**	.373**	.517**	.456**	.448**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.11: Risk Factors for Success of PT projects as tested in Selected 14 Organization (N=207)

Pearson Correlations									
	RCSF1	RCSF2	RCSF3	RCSF4	RCSF5	RCSF6	RCSF7	RCSF8	RCSF9
RCSF1	1								
RCSF2	.400**	1							
RCSF3	.349**	.315**	1						
RCSF4	.462*	.448**	.487**	1					
RCSF5	.393**	.420**	.325**	.322**	1				
RCSF6	.380**	.451**	.486**	.410**	.395**	1			
RCSF7	.412**	.365**	.379**	.428**	.438**	.393**	1		
RCSF8	.386**	.485**	.314**	.351**	.479**	.417**	.350**	1	
RCSF9	.446**	.398**	.458**	.431**	.438**	.483**	.362**	.386**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.12: Contract Factors for Success of PT projects as tested in Selected 14 Organization (N=207)

Pearson Correlations									
	CCSF1	CCSF2	CCSF3	CCSF4	CCSF5	CCSF6	CCSF7	CCSF8	CCSF9
CCSF1	1								
CCSF2	.447**	1							
CCSF3	.469**	.357**	1						
CCSF4	.419**	.378**	.306**	1					
CCSF5	.348**	.382**	.387**	.335**	1				
CCSF6	.441**	.442**	.327**	.334**	.442**	1			
CCSF7	.403**	.374**	.385**	.360**	.323**	.425**	1		
CCSF8	.437**	.390**	.388**	.359**	.301**	.420**	.402**	1	
CCSF9	.441**	.434**	.484**	.368**	.406**	.308**	.424**	.454**	1

**. Correlation is significant at the 0.01 level (2-tailed).

4.13: Stakeholder Factors for Success of PT projects as tested in Selected 14 Organization (N=207)

Pearson Correlations						
	STCSF1	STCSF2	STCSF3	STCSF4	STCSF5	STCSF6
STCSF1	1					
STCSF2	.475**	1				
STCSF3	.528**	.443**	1			
STCSF4	.469**	.471**	.503**	1		
STCSF5	.521**	.418**	.537**	.474**	1	
STCSF6	.566**	.585**	.498**	.526**	.523**	1

**. Correlation is significant at the 0.01 level (2-tailed)

4.14: Information Technology Factors for Success of PT projects as tested in Selected 14 Organization (N=207)

Pearson Correlations					
	ITCSF1	ITCSF2	ITCSF3	ITCSF4	ITCSF5
ITCSF1	1				
ITCSF2	.475**	1			
ITCSF3	.462**	.525**	1		
ITCSF4	.523**	.549**	.578**	1	
ITCSF5	.467**	.568**	.517**	.524**	1

**. Correlation is significant at the 0.01 level (2-tailed)

Table-4.17: Ranking of Factors for Success of PT projects as tested for the Selected 14 organization (N=207)

Sl. No	Group of Factors	Factors	Factor Code	Mean	Mean of Group	RII	RII of Group
1.	Project Success	Project budget	PCIF1	4.27	4.14	0.85	0.83
2.		Estimated time	PCIF2	4.09		0.82	
3.		Desired quality	PCIF3	4.18		0.84	
4.		Stakeholder satisfaction	PCIF4	4.05		0.81	
5.		Social purpose	PCIF5	4.07		0.81	
6.		Achieved organization goal	PCIF6	4.22		0.84	
7.		Satisfaction of team members	PCIF7	4.12		0.82	
8.		Safety	PCIF8	4.12		0.82	
9.	Strategy	Leadership strategy	SCSF1	4.12	4.03	0.82	0.81
10.		Bidding strategy	SCSF2	4.04		0.81	
11.		Effective cash Flow management strategy	SCSF3	4.08		0.82	
12.		Clear Objectives and understanding	SCSF4	3.98		0.8	
13.		Cohesive procurement strategy	SCSF5	3.86		0.77	
14.		Strategy of effective communication	SCSF6	4.1		0.82	
15.		Market intelligence strategy	SCSF7	4.07		0.81	
16.		Strategic execution plan aligns with project scope	SCSF8	3.98		0.8	
17.		Managing Risk Strategy	SCIF9	4.07		0.81	

18.	Risk	Fund flow of client	RCSF1	3.95	3.89	0.79	0.78
19.		Control of scope creeping	RCSF2	3.98		0.8	
20.		Team conflict resolution	RCSF3	3.84		0.77	
21.		Timely subcontractor payment	RCSF4	3.99		0.8	
22.		Test list frequency	RCSF5	3.79		0.76	
23.		Changes in design	RCSF6	3.85		0.77	
24.		Opposition from social Bodies	RCSF7	3.8		0.76	
25.		Suspension of work	RCSF8	3.88		0.78	
26.		Accidents and safety	RCSF9	3.91		0.78	
27.	Contract	Price escalation clause	CCSF1	3.83	3.87	0.77	0.77
28.		Payment terms	CCSF2	3.87		0.77	
29.		Realistic schedule	CCSF3	3.85		0.77	
30.		Type of Contract	CCSF4	3.87		0.77	
31.		Claims for time extension	CCSF5	3.95		0.79	
32.		Clear and unambiguous scope	CCSF6	3.83		0.77	
33.		Justified penalty clause	CCSF7	3.83		0.77	
34.		Dispute and Arbitration	CCSF8	3.85		0.77	
35.		Timely document and drawing approval	CCSF9	3.92		0.78	
36.	Stakeholder	Managing stakeholders	STCSF1	3.90	3.81	0.78	0.76
37.		Trust of Stakeholder	STCSF2	3.81		0.76	
38.		Effectively resolving conflicts between stakeholders	STCSF3	3.79		0.76	
39.		Communicating with stakeholder	STCSF4	3.75		0.75	
40.		Early Identify, prioritize and engage key stakeholders	STCSF5	3.77		0.75	
41.		Top management support	STCSF6	3.86		0.77	

42.	Information Technology	E-tendering	ITCSF1	3.94	3.87	0.79	0.77
43.		Planning & monitoring	ITCSF2	3.82		0.76	
44.		Energy Management and Control system	ITCSF3	3.86		0.77	
45.		Network Management system	ITCSF4	3.89		0.78	
46.		Decision support System (DSS)	ITCSF5	3.85		0.77	

Appendix-C

Published Papers