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RESEARCH ARTICLE

CRITICAL SUCCESS FACTORS OF POWER SECTOR PROJECTS IN INDIA: A RESEARCH SCOPE

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ABSTRACT

Power is the important infrastructure on which the socio-economic improvement of the country depends. The power transmission (PT) system is at the core of the power industry and which is vibrant to the development of India. As a result, it is crucial that electricity is readily available for the growth of infrastructure, economy and largely improved the quality of living of the people of the country. In spite of the critical nature of PT, the literature relating to the influence factors impact is emergent, with no hypothetical or empirical studies yet conducted to establish the factors elaborate. There are some common influence critical factors for power and non-power linear construction projects to make success the project but some factors are influenced by power sector precisely, especially power transmission projects. Based on literature review, it is found 65 factors in 6 groups potential influencing factors which are influenced to success power project in India. Finally, conclusions are drawn relating to the degree to which this review and analysis may form a theoretical framework that can be tested empirically, on top of providing decisive information with recommendation to Power transmission (PT) project stakeholders to accomplish their significant goals as well as the realisation of the profits involved.

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INTRODUCTION

Electric energy generation is basically of converting primary energy into electrical energy. With the rocketing increase in energy demand in India, there are many barriers in achieving the sustainable and healthy development of the economy and society, such as the energy shortage, structuralism balances, low efficiency, serious pollution and so on. Producing electrical power by means of any energy conversion method is known as electricity generation. The electrical power industry is an integrated process comprised of several functions: power generation, transmission, and distribution and distribution to end users. The transmission systems are the central trunk of the electricity grid. They route the electric power produced by power generation plants to the distribution systems which round out the process to deliver electricity to various customers (Warkentin-Glenn 2006).The electricity is then transmitted and distributed to the consumer end by means of the available transmission and distribution (T&D) system. The T&D system needs special infrastructure, which is very costly. In construction projects, electrical installation is among a range of essential, specialist trades of work (Yik, Lai 2008). Failure to complete electrical installations (e.g. transformer, switchboard) on time would lead to delay in setting up on-site provisions, such as illumination for interior spaces of a building under construction, or power supply for some construction activities, e.g. hoisting operations. Right from the beginning of civilization, human started rising the infrastructure with all his originality to affluence and improve the quality of life. Each creativity influenced lives and society to a great extent. Today, we are calling all those tasks as self-governing projects. Some of the projects have a mesmerizing presence, like the wonderful creation of Taj Mahal, Great Wall of China, and Egyptian Pyramid etc. A journey of building infrastructure, from the ancient moment in time, has evolved as a widespread industry. In a rapidly changing world, the degree of infrastructure project activity in every domain is relentlessly increasing. As infrastructure is the backbone of the economy of any country, project management also constitutes the core function of any infrastructure dealing organization. Energy is the salvation of today's world. The economic health of the country is determined many infrastructure projects, out of that Power Project is one of the main souls and complex in the infrastructure sector. Though the problem of project delay has been widely studied, there is hardly any research has been done on power Transmission and substation project in Power sector projects. A power transmission (PT) project naturally includes the construction of station(s)/substation(s) and transmission line (TL)/transmission lines (TLs). PT stations/substations and TL/TLs contain the construction of numerous types of structures, equipment and structure

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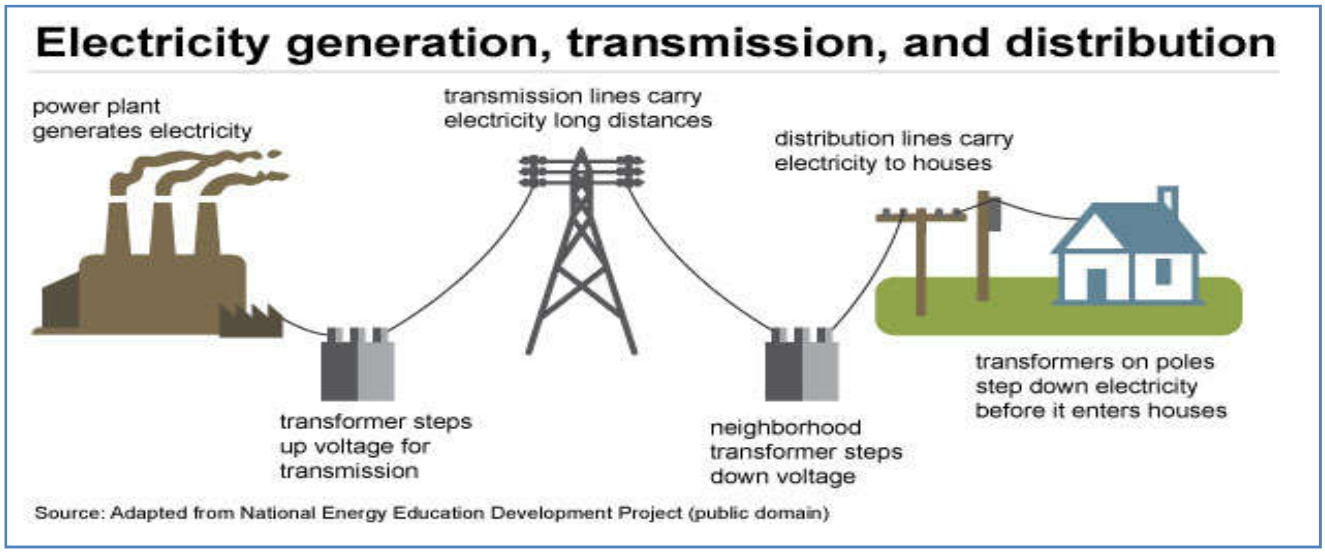


Fig. 1. Power generation, transmission, and distribution

Table 1. Definition of Project in Theory

Reference	Definition of project
(PMI, 2013)	"A project is a temporary Endeavour undertaken to create a unique product, service, or result".
(Kerzner, 2013)	"Projects exist to produce deliverables. A project can be considered to be any series of activities".
(Wysocki, 2011) "A	"A project is a sequence of unique complex, and connected activities that have one goal or purpose and that must be completed by a specific time, within budget, and according to specification".
(Ballard and Howell, 2003)	"Projects are temporary production systems".

foundations, roads, rail-cum-roads, open and closed drains, underground and overhead water tanks, site developing and TL tower foundations. Land acquisition and land development are the key steps complicated in the construction of a station or substation. Other infrastructure, including many equipment foundations are constructed to erect the highly equipment such as transformers and switchgear in the station/substation to step up/down the voltage of the transmitted electricity and to switch equipment for maintenance or divert electricity to alternative TL/TLs. TL carries the high-voltage electricity by conductors from the generation plant, the conductors being supported by towers. The growing demand for electricity and difficulties in developing new electricity sources have augmented the need for transmission capability, which is achieved most efficiently by transmission at very high voltages. Managing a power line project is challenging because PT projects are often located in remote areas, away from existing infrastructure such as water and electricity supplies and thus obviously requires careful planning.

Theoretical Background: The project is considered as a temporary endeavour and it has fixed starting and finished date besides other performance parameters. Project Management plays a vital role to achieve the organizational goals pertaining to projects so as to ascertain project success as an outcome. Power Projects dealing organizations link their projects with business strategies to achieve the goals and objectives. Strategies are actions that lead and direct the use of the resources to accomplish the organization's vision and goals and sustainable viable advantage. The strategies of the business-like internal analysis, organizational structures, and control system have a strong relation to project management and activities.

Project Management: The term Project Management appeared first in 1953 and this was in the United States defense-aerospace industry Johnson (2006). After that the term Project Management has been defined in different ways, depending on individuals, industries and organizations. The Project Management Institute describes it as: "the application of knowledge, tools and techniques to project activities to meet the project requirements" (Project Management Institute, Inc., 2013). Project management as: "an organized common-sense approach that utilizes the appropriate client involvement in order to deliver client requirements that meets expected incremental business value" Wysocki (2011). On the other hand, Kerzner describes project management as designed to control resources and manage within cost, performance and time. He takes it a step further by stating that cost, performance and time are the major constraints on projects. The tactical viewpoint investigates the decisive large image of the project or the broader understanding if the project has accomplished its main goals which were set at the start of the project. It alarms whether the project is meeting the end-user needs in a constructive way or not. The strategic viewpoint looks bottomless into the larger image of project success. It looks at whether the project is really contributing to the economic growth and it has brought about any social changes to society and if the project will be sustainable in the long run. Power projects come under the infrastructure sector, so it can divide into phases: the formulation phase, the mobilization phase and construction phase.

- Formulation phase includes the discussion of the idea, project definition and feasibility study are conducted (Chitkara, 1998).
- Mobilization phase includes the designs, plans, contracts and adequate funding (Chitkara, 1998).
- Construction phase includes the controlling, planning, execution and most importantly the handover to the client (Chitkara, 1998).

Indian Power Projects: India is determined at the present juncture, to re-establish itself at the global level and emerge as the world-class economy, with its concepts and themes such as "Make in India" and "Digital India". It is high time that all the growth contributors from the power sector are reviewed once again and make their shares for the redefinition of India. A professional project management approach is the only way out to overcome the barricades of growth in meeting the power sector targets of India. However, the world looks at us not just because we are mines of talent, but also on basis of our Power project capabilities. Right to use of consistent and inexpensive power is challenging for every aspect of economic and human development. In 1991 the Government of India took the first steps towards power liberalization. India has been a witness to chronic energy dearth and almost one-fifth of its population is without access to power (Manish K Hairat, Sajal Ghosh, 2017). The Central Electricity Authority estimates that by 2021-22, India's electricity demand will be more than twice the level in 2021-22(NITI Aayag, 2015b). By 2040, India is expected to add nearly 600 million new electricity consumers (International Energy Agency, 2015). Besides, assuming a likely compounded annual growth (CAGR) of 7.4% between 2012 to 2047, the level of economic activity in 35 years will generate four times the energy demand (NITI Aayog,2015a) Despite an installed electricity generating capacity of 275 GW (NITI Aaayag, 2015b), India continuous to face persistent and all-encompassing energy poverty. According to census 2011, 80.7 million households live without electricity; 75 million of these are rural areas (Agni hotri and Maithani, 2015). Some 70% of the population at the national level continuous to rely on traditional energy sources such as fuelwood, cow dung and crop residues for household cooking fuel (Rao, Miller,Wang and Byrne, 2009)Peak electric demand stands at 153 GW and is predictable to increase four-fold to 690 GW by 2035-36(Central Electricity Authority 2016b). Low average tariffs, coal shortages and structural inefficiencies account for the failing power sector (World Bank 2008). In 2012, according to official estimates, on average in India transmission and distribution (T & D) losses account for 22.7% of total power output at the national level due to structural bottlenecks (Cecilia tortajada, Udisha Saklani, 2018).

Table 2. Summary of Infrastructure Projects Completed during 12th Year Plan

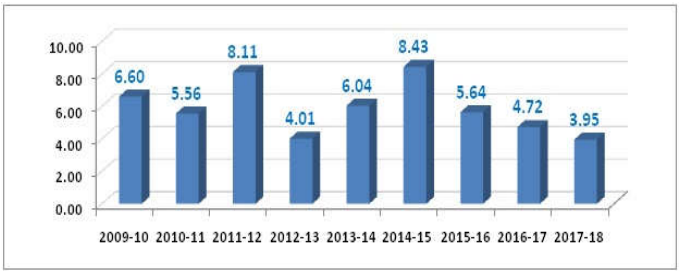
Sector	Number of Projects	Cumulative Expenditure (US$) in billions
Road Transport and Highways	91	8.7
Power	73	16.63
Petroleum	65	19.48
Railways	33	3.81
Steel	20	8.13
Shipping and Ports	20	1.78
Telecommunications	14	4.63
Coal	9	2.26
Fertilizers	6	5.96
Civil Aviation	5	8.61
Urban Development	5	6.78
Atomic Energy	1	1.68

Source: Ministry of Statistics and Programme Implementation (MoSPI) (2012-2017)

Table 3. Total Installed Capacity (As on 31.06.2018)

Sector	MW	% of Total
State Sector	84,627	24.6%
Central Sector	103,761	30.2%
Private Sector	155,511	45.2%
Total	3,43,899	

Source: Central Electricity Authority (CEA)



Source: CEA,

Figure 2. Energy Growth in Percentage

India is the second largest, by population, a country in the world and first when examining its rural Population which amounts to 67.6% of its total 1.267 billion people. 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 (Dimitrios Pappas, Konstantinos J. Chalvatzis, 2017).

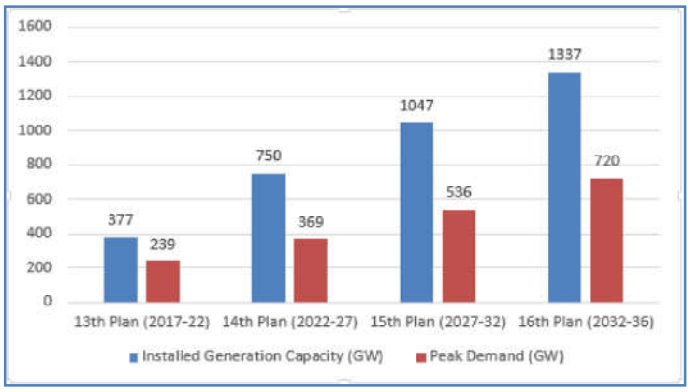


Fig. 3. Installed Capacity vs Demand in GW (Source: Central Electricity Authority, 2016)

The natural resources for electricity generation in India are unevenly dispersed and concentrated in a few pockets. Transmission, an important element in the power delivery value chain, facilitates evacuation of power from generating stations and its delivery to the load centers. For efficient dispersal of power to deficit regions, strengthening the transmission system network, enhancing the Inter-State power transmission system and augmentation the National Grid and enhancement of the transmission system network are required. An extensive network of transmission lines has been developed over the years for evacuating power produced by different electricity generating stations and distributing the same to the consumers. The nominal Extra High Voltage lines in vogue are ± 800 kV HVDC & 765 kV, 400 kV, 230/220 kV, 110 kV and 66 kV AC lines. The capacity of transmission system of 220 kV and above voltage levels, in the country as on 30th September 2018 was 4,00,902 ckm of transmission lines and 8,58,908 MVA of transformation capacity of Substations. Further, as on 30th September 2018, the total transmission capacity of the inter-regional links is 86,450 MW.

Objective

The main purpose of the study was to find out major influence driving factors on power evacuation project success from perspective of EPC contractor. Precisely the paper hunted to significant factors involved:

- Consider the business strategy, contractual aspects, Project Risk, Stakeholder, Infrastructure facility at project site and information technology on power evacuation projects.
- Inspect the challenge of management and making framework of key driving factors.

MATERIALS AND METHODS

The study was used in both descriptive and survey deign. Descriptive research was used by following journal, since it helped to identify the nature of influence factors play on the power projects (Generation, Transmission & Substation and distribution), and other construction, infrastructure projects.

- International Journal of Project Management
- Procedia - Social and Behavioral Sciences
- Energy Procedia
- Procedia Engineering
- Journal of Economics and Sustainable Development
- Project Management Journal
- Journal of Enterprise Information Management
- Journal of Accounting & Organizational Change
- Construction Innovation
- India Renewable and Sustainable Energy Reviews
- International Journal of Engineering Research & Technology

Survey techniques support to collect significant information from different organization (Owner and contractor) through questionnaire.

Literature Review

The sector accounts for 9.3% of the number of projects under implementation and 21.8% of the projects by value. Projects mainly are for setting up thermal power plants, hydro power projects, grid strengthening and transmission network for the sector. 49 projects or 54% of the projects under implementation are facing time overrun w.r.t. latest schedule. 48 projects out of 121 projects being implemented are facing cost overrun.

Table 4. A Big Picture of Project Management

Total number of projects	1,304
Original cost	Rs. 16, 21, 994.6 crore
Anticipated/Revised cost	Rs. 18,38,702.4 crore
Number of projects on schedule	321
Delayed projects	262
Projects with cost overrun	343
Project w/t both time and cost overrun	100

Source: CARE Ratings July11,2018

Hendrickson and Au (1989) pointed out that the management process approach emphasizes the systematic study of management by identifying management functions in an organization and then examining each in detail. There is general agreement regarding the functions of planning, organizing and controlling. Success factors are those inputs to the administrative framework that lead straightforwardly or in a way to the prosperity of the projects (Cookie-Davies, 2002). Treated earlier as a subcategory to production, engineering, and operation management areas, project management is a combination of several disciplines including business and management (Gauthier & Ika, 2012). The organization uses project management to realize business objectives and goals crucial for the success of the organization (Kerzner, 2010). Success factor identification methodologies have been applied practically in several fields such as marketing (Albers, 2010; Kalka, 1996), customer relationship management (Li Kam Wa, 2001), supply chain management (Röderstein, 2009; Schmidt, 2007), information systems (Rockart, 1982), research and development (Trommsdorff, 1990) or strategy (Ganesh & Mehta, 2010; Göttgens, 1996; Grimm, 1983). Several interviewed experts argued that lack of experience or risky business strategies were the main factor for project delays rather than external circumstances beyond the control of the project developer. The perfect bidding strategy does not exist (McCaffer, 1993). According to Singh &Shoura (1996), bidding is a "scientific game." Good judgment, skill, and intuition all play a major role and the outcome is uncertain until everything is finished. No strategy will ever work perfectly 100% of the time, and McCaffer (1993) and Pratt (2004, p. 32) both say that these tools are to be used only as aids and should not replace good judgment or take over the process. The backbone to any bidding strategy is an extensive knowledge of historical bids, knowledge of competitors, and practice. The investment and future cash flows for each compliance option are characteristically different for different industrial units, and the stochastic behaviour of market parameters resulting in uncertain compliance cost often stands out as a real challenge for the unit in devising an optimal compliance strategy (Baldursson and Von der Fehr, 2004).

Practical experiences of auctions are however ambiguous. Various scientific evaluations highlight that some awarded projects do not reach commercial operation by the agreed deadline or are abandoned at some point after the auction (Bayer *et al*., 2016; del Río and Linares, 2014; Lucas *et al*., 2015; Lucas and Gómez, 2017). Aggressive bidding by participants without adequate diligence is a problem. In such cases subsequently, on better understanding of the issues, the project may be stalled or even abandoned by the bidder, forcing delays and additional costs, Satya Narain Gupta, general secretary, Electric Power Transmission Association said (Financial Express,2013)."Contract strategy is an integral part of the project management decision making process because the development of a contract strategy for any project should comprise a thorough assessment of the choices available for the implementation and management of design and construction". Perry (1985) has also given his views on the nature of an effective contract strategy. The Traditional Project Management is mostly focused on planning and process and oriental towards tools and techniques. Planning and controlling the project schedule and budget are typically perceived as the central and sometimes the only activity needs to make success the projects. In most industries, improvements in performance depend on identified opportunities and innovations (Davies *et al*., 2014); however, the construction industry is still struggling with the idea of seizing potential opportunities in projects to overcome poor performance. According to Rezak (2011), "In too many organizations today, business acumen is a missing leadership competency. Managers without business acumen lack an in-depth understanding of how their actions impact the company's profitability; they struggle to articulate and execute on strategy. "Various strategies can integrate knowledge from construction into design. One of the evolving strategies is early contractor involvement (ECI) (K. Molenaar, J. Triplett, J. Porter, S. DeWitt, G. Yakowenko,2007). Contractor is one of

the major stakeholders who can significant contribute towards project success. ECI is all about involving the contractor in the early stage of project development to get assistant in planning and buildability by working together as a team with owner and consultant (M. Rahman, A. Alhassan,2012). It also allows the contractor to engage in the front-end phase. ECI has three major advantages. The first one is, it contributes for better relationships. The second one is, it increases understanding among parties. The last one and probably the most important one is, it decreases the potential of adversarial relationships since the approach demands frequent interaction and communication. Several interviewees discussed the competence of the contractors that are involved in the early phases as another major success factor of ECI. When a client involves contractors at early phases of a project, then the aim of the client is to benefit from the experience that the contractors have from other similar projects. Consequently, the contractor should be qualified and be able to contribute (Paulos Abebe Wondimuab, Eyuell Hailemichaelc, Ali Hosseinia, Jardar Lohnea, Olav Torpa, Ola Lædrea 2016)

Reducing scope creep, improving the scope of work documentation, and the inclusion of sustainable building materials improved social change efforts within affected communities (Zuchowski, 2015). Reducing the liability for engineers increased the likelihood that project leaders included sustainable practices within the scope management strategy (Russell-Smith &Lepech, 2015). Scope management are processes required to ensure the project includes all the work and only the work that is required to complete the project successfully, deliverables include: scope statement; work breakdown structure and formal acceptance (Horine, 2013).Assaf and Al-Hejji (2006) further conducted a survey on 73 causes of delay in large construction projects, and the result showed that the most common cause of delay was “change order”. The high voltage power transmission and substation projects construction includes manifold complex phases, such as project approval, viability study, design, creation, handing over, *etc*. It is a multi faceted procedure with an extended investment sequence, massive investment scale, latest technology requirement and a complex location. A complex and uncertain construction environment may create uncertainties for a project as well as affect project advancement and quality PT projects face various risk factors such as society, policy and law, normal environmental, management and technical risks. Freedman and Katz (2007), accomplishing universal projects with diverse legal, political, cultural, social and infrastructural settings are extra complicated comparatively completing projects in the domestic environment. State-of-the-art research has recognized risk management as a salient part of managing projects and their uncertainty (Turner, 2009; Lehtiranta, 2014).

Many researchers explored that managing risks in real estate and construction projects has been recognized important in order to achieve the project objectives in terms of time, cost, quality, safety and environmental sustainability etc. (Akintoye and Macleod, 1997; Zou *et al*. 2007; Iqbal *et al*. 2015). Speed of construction, location of project, size of project, unfamiliarity of the client with the project etc. are some of characteristics of project which were taken into consideration before selecting the suitable risk response strategy for the risk event (Perry, 1986, p. 211). NITI Aayog, is government policy think tank in India and Manju and Sagar highlighted higher financial and investment risks and lack of expertise in financial institutions for funding renewable energy projects make it commercially risky to start large-scale renewable energy projects in developing countries such as India. Decarbonization of electricity sector by 2050 with require the deployment of clean energy technologies, which may make electricity unaffordable, poor grid relatively due to the increased share of renewable and possibly shortage of certain materials (Sourabh Jain, Nikunj Kumar Jain, W.Jamie 2018). Site accidents not only harm individuals and consume time, but also it is observed that productivity of labour reduces significantly after an accident. Time is also wasted in attending to accidents and replacing the injured person by a person with lesser or irrelevant skills. The Bureau of labour Statistics (2010a) estimated that among the 192 recorded electrocution fatalities in 2008, 53% involved T&D workers who contacted overhead power lines and the National Institute for Occupational Safety and Health (2009) documented that 80% of fatalities among linemen have occurred due to direct contact with T&D power lines. This injury rate caused the Bureau of labour Statistics (2010a, b) to classify T&D line construction and maintenance as one of the most dangerous jobs in the American economy (Alex Albert, Matthew R. Hallowell, 2013). Health and safety have been identified as a parameter which should be used along with the traditional parameters: cost, quality and time, to measure the success of projects. The reasons for considering safety and health are human factor, legislation and financial issues (Adan, 2004). Unfortunately, health, safety and the environment are often neglected on construction sites and rarely managed. Construction workplaces the workers are exposed to hazards of occupational diseases and injuries and the adverse effects of excessively long hours of work. OSHA (2007) requires the use of personal protective equipment (PPE) to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. Cotton *et al*., (2005) noted that the institutional and legal governance frameworks on occupational health and safety in developing countries have little impact.

Land acquisition in India is governed by the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR). Acquiring land, in India, for power project development is a very cumbersome process and requires lots of clearance from various departments like forest department, National Green Tribunal (NGT), ministry of rural development, etc. There are many examples where projects have been delayed or even moved to some other locations due to difficulties in land acquisition. Apart from this, according to Resettlement and Rehabilitation (R & R) Policy, 2007, it is the responsibility of the developer to provide compensation to the displaced communities and thus increases the financial burden on the developers. (Pushpendra Kumar Singh Rathorea, Shailendra Rathoreb, Rudra Pratap Singha, Sugandha Agnihotric). Communication is a crucial part of our everyday life, and the whole world spins around it. Lasswell’s Maxim defines communication as “who says what to whom in what channel with what effect” (Lasswell, 1948; p. 216). Communication is a critical instrument in the area of project management (Rajkumar, 2010). Meredith and Mantel (2006) found that utilizing information technology (IT) has major impact in solving all difficulties, which may appear during project life cycle phases, by presenting a crucial computer application, project management software such as, which may help in decreasing the time and cost that are required to use precise

clarifications for project planning, scheduling, monitoring, and controlling.

mainly responsible for this issue. Improper risks estimation is measured as major serious causes of estimation error.

Table 5. Summaries the factors initiating delay in power generation, power distribution and power transmission

Project Type	Influence Factors	Common Factor for Power and other construction
Power Generation	Delay due to inter-state aspects; Delay in issue of authorization by Central/State authorities; Delay in foreign currency tie-up; Land acquisition and rehabilitation; Delay in procurement of equipment; Delay in delivery of equipment due to failure of supplier to keep up schedule and Difficulties in transporting, equipment to site;	Bad weather; Poor communication and coordination among the project parties; Major change in the scope of work; Inadequate investigation before finalizing technical project report; Change in key personnel in the course of advance planning and execution; Strategic Planning, Clear Object of Projects; Too many change orders from owner; Contractor cash Flow; Site accidents; Price escalation; ineffective site management and supervision by contractors ,Unskilled workforce; Progress payments to contractors or other project parties by the client;
Power Distribution	Tedious review process of government agencies; Over-subjective explanation of regulations by government officer; Unfinished land usage changes; Improper review on applicable regulations, omissions or errors in estimate; Long acquisition duration for architectural permissions; Delay due to other construction projects and public resistance; Lack of awareness among villagers for taking new connections; Delay in finalization of BPL lists by some states; Very poor upstream rural electricity infrastructure in some states; Delays in Panchayat certificates for village electrification as per revised definition; The customers change their priorities for reasons attributable to Political;	
Power Transmission (Line and Substation)	Multi Land owner; Priority for obtaining the Forest Approvals; Timely Approvals from other statutory authorities like Railways; Irrigation, etc.; Stores are to be planned to meet the execution requirements; Diversified & Wide spread distributed Project Area; Extreme Climatic Conditions; Daily Commute to Site; Equipment storage at scattered land; Material transport at transmission line tower; Control and protection scheme change during execution in substation; Improper technical study in bidding stage for substations projects;	

India has historically failed to meet its power sector targets by a significant margin and with tremendous opportunities ahead; the power sector continues to be affected by the shortfall both on generation as well as transmission side (Durgesh Kumar Dubey, 2015). India has recently introduced a market-based energy efficiency policy—Perform Achieve Trade—PAT with the primary objective of stimulating investment to enhance energy efficiency in energy-intensive sectors (BEE, 2011; Bhattacharya and Kapoor, 2012). The scheme allows several alternative compliance options in a cost-effective manner. Under the clean-coal initiative, Government of India mandates the use of clean coal with an ash content of at least 34% in the thermal power sector (MoEF, 2014; TERI, 2015; Dzonzi-Undi *et al*., 2016). The various policies have been proposed in generation and Transmission is currently different implementation stages to overcome the power shortfall in India. However, the big challenge is to make success the project in view of Operation, Tactical and strategy.

The power sector in India has been plagued with a set of problems for meeting the planned targets. One of the major reasons for the delay of a project as experienced by NTPC is non-completion civil work in time. One of the major reasons attributed to non-compliances of schedules is the labour unrest and union strike (Dr D K Chowdhury, 2014). There is the general observation that power project as the construction sector is a long-term trouble for cost overrun and slippage of schedule. The main reason for slippage of power projects are the slow to the progress of civil works, poor geology, flash flood, local agitation, law and order problem, shortage of talent manpower, difficult site conditions, stakeholder expectation etc. (Durgesh Kumar Dubey, 2015). Cost overrun in power plant project is a common universal problem. Inaccurate estimation during primary stage budgeting of the project is

Any surge in worker wages or delayed progress payments from a project client would create cash flow problems to the concerned contractor. In such a case, the client may enter legal dispute with the contractor and must re-tender to search for an alternative contractor (El-Razek *et al*. 2008). “Poor site management and supervision skills” is another important factor that contributes to construction delay. Site management is related to material distribution, commitment of site employees, project monitoring and communication between project parties (Enshassi *et al*. 2009).There is a consensus that shortage of talent in the construction sector is a long-term problem and is likely to continue to push up project costs and risks. The flow of talent into construction and power sector has been gradually drying up as candidates have sought an alternative – and often more lucrative – career options. (Durgesh Kumar Dubey, 2015)

DISCUSSION

After reviewing the 97nos literature from power generation, transmission, distribution, construction, infrastructure, Private Public Partnership etc.; it was identified that hardly studies pointed explicitly at the grounds of influence factor which impact the delay in power-related “power transmission and substation” projects. In contrast to construction project delay attributes, Table 5 summaries the factors initiating delay in power generation, power distribution and power transmission (Line and Substation) projects. It is found that Power generation projects time overrun major factors are different from other construction projects. This is because power project is very complex project compare to other non-power linear construction projects. The main factors of power project are different from encumbrance free land, interstate co-ordination, price variation clause, frequent change scope, mange

government officer and local people, application of information technology etc. Power distribution projects is also different from non-power linear construction projects.

expedite approval of design and drawing, prevent scope creep by avoiding scope change, proper site supervision and procurement in time.

Table 6. Grouping of some influence factors at power transmission and substation projects.

Groups	Factors	Sources
Business Strategy	➢ Strategic Areas that the industry is addressing in a positive manner. ➢ Strategic areas that the industry needs to address with greater emphasis. ➢ The impact on size on strategic management ➢ Clear objectives and understanding ➢ Control optimization ➢ Strategic planning with project management ➢ Organizational structure	Betty W. Y. CHIUa, Joseph H. K. LAIb(2017); Siti Fairus Zakaria, Rosli Mohamad Zin, Ismail Mohamad, Saeed Balubaid, Shaik Hussein Mydin, and EM Roodienyanto Mohd Rahim(2017); Paul S. Chinowsky and James E. Meredith(2000)
Contractual Aspects	➢ Price escalation clause ➢ Payment terms ➢ Claims for time extension ➢ Delay in design and drawing approvals ➢ Type of Contracts ➢ LD Clause	Goutom K. Pall1, Adrian J. Bridge1, Martin Skitmore, Jason Gray (2016); A.Shebob, N. Dawood, R.K. Shah and Q. Xu (2012);
Risk Analysis	➢ Too many change orders from owner. ➢ Improper technical study by the contractor during the bidding stage. ➢ Delay in contractor payment. ➢ Frequent transfer of the officer in charge of implementation from customer site. ➢ Late decision by owner. ➢ Finance problem of client. ➢ Cash flow of electrical contractor. ➢ Poor economic conditions, (currency, inflation rate, est.).	Ghaleb J. Sweis(2013); Shabbab Al Hammadi1 , M. Sadique Nawab(2016); A. Shebob, N. Dawood, R.K. Shah and Q. Xu(2012); Al-Ghafly (1999); Al-Momani (2000); Assaf et al. (1995); Assaf, Al-Hejji (2006); Chan, Kumaraswamy (1997); Doloi et al. (2012)
Stakeholder Perspective	➢ Lack of communication between parties ➢ Labour disputes ➢ Labour strikes ➢ Top management support ➢ Local support ➢ Early engage contractor	Siti Fairus Zakaria, Rosli Mohamad Zin, Ismail Mohamad, Saeed Balubaid, Shaik Hussein Mydin, and EM Roodienyanto Mohd Rahim (2017); Doloi et al. (2012); El-Razek et al. (2008); Semple et al. (1994); Sweis et al. (2008) Dr D K Chowdhury, (2014)
Infrastructure Facilities	➢ Land acquisition ➢ External work due to public agencies (roads and public services) ➢ Adverse impact of on ecological environment ➢ Forest clearance ➢ Logistics ➢ Shortage of construction material ➢ Right of way	A. Shebob, N. Dawood, R.K. Shah and Q. Xu (2012); NaveenUpretia, Raju Ganesh Sunderb, Narendra N. Daleic, Sandeep Gargd(2018); Zhen-Yu Zhao, Yu-Long Chen, Heng Li
Information technology Application	➢ project Management information system ➢ Decision support System (DSS) ➢ Enterprise resource planning (ERP) ➢ System Analysis ➢ E-bidding ➢ Supply chain Management (SCM)	D K Choudhury (2014); Akram Jalal Karim (2011); FrederikAhlemann (2009)

The presence of high voltage power line transmission and substation are significantly different from non-power linear construction projects. Transmission line scope and substations equipment are significantly different. As such it is certainly specific influence factor beyond the others projects and therefore, the need for a dedicated empirical study into interconnection and the relationship between the influence factors inpower transmission projects is convincing and the model should be developed over the lifecycle of a project. In terms of some tentative recommendations for Power transmission projects to avoid delays based on the literature reviewed in this study. As Table-6, Grouping of some influence factors was not discussed at power transmission and substation projects.

Recommendation

Some influence factor which impact delay and cost overrun of project, are considered unavoidable like multi owner encumbrance free land acquisition, hilly terrain, forest clearance etc. As such we focus recommendation based on the group, like effective communication, application Decision support system, Enterprise resource planning, making cleared objective, bidding strategy, implement project site safety rules,

Conclusion

This review has provided insights into strategic aligned with project management, the probable risks, contractual aspects uncertainties, involvement of stakeholder in earlier stage, project infrastructure facilities and information technology application encountered in the implementation of Power transmission (Line and substation) projects and their timely completion. The review also provided insight into the influence factors in power generation, power distribution and non-power linear construction projects and presents the keystone for further study of the influence factors negative impact in Power Transmission projects India. Power Transmission is an essential part of every power system, consequently a foremost inspiration of this review is in its dynamic potential for the improvement of upcoming human civilisation.

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