

# **STUDY ON THE FACTORS INFLUENCING PERFORMANCE OF ROAD CONSTRUCTION INDUSTRY**

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## **Abstract**

Road development is an important component of the economic development in Sri Lanka. Although respective governments have recognized the importance of improving the road network in the country, expenditure in areas such as defense, multipurpose development projects and decentralized administration has taken priority, resulting in only scanty investment in road development, especially in rural areas. Today, the present government is planning to improve, rehabilitate and develop existing road network by giving equal weightage to both urban and rural areas within a reasonable period of time aiming to facilitate the rapid economic growth which is the top priority of the government. Accordingly, number of road improvement projects has been planned and some of them are in progress. However, it is learned that the majority of these road projects do not perform as expected especially within time, cost and quality standards due to various factors.

The study is aimed at identifying the factors affecting the performance of the road construction projects in progress and to suggest practical and appropriate solutions to overcome the prevailing deficiencies in order to improve their performance. Thirty engineers have been selected from the Road Construction Industry to represent the Employer, the Engineer and the Contractor organizations for the study. Individual discussions and focus group discussion have been conducted to gather information. In addition, a well-designed questionnaire has been administered to collect primary data. All thirty engineers responded and completed the questionnaire with additional comments.

Number of significant factors influencing the performance of the Road Construction Contracts has been identified. The most significant factors have been well recorded and conclusions were made including the practical solutions to resolve them.

Keywords: Construction, Industry, Roads, Performance, Sri Lanka

## **1.0 Introduction**

The construction industry everywhere faces problems and challenges. However, in developing countries, these problems and challenges are present alongside a general situation of socio-economic stress, chronic resource shortages, institutional weaknesses and a general inability to deal with the key issues. There is also evidence that the problems have become greater in extent and severity in recent years.

Construction industry development is a deliberate process to improve the capacity and effectiveness of the industry to meet the demand for building and civil engineering products, and to support sustained national economic and social development objectives. Construction Industry development promotes increased value for money to industry clients as well as environmental responsibility in the delivery process and the viability and competitiveness of domestic construction enterprises.

The construction sector produces a wide range of products, from individual houses to major infrastructure such as roads, power plants, railway, irrigation, industry buildings etc. The construction industry is a broad conglomeration of industries and sectors which add value in the creation & maintenance of fixed assets within the built environment.

International Labour Organization (ILO) defines the industry as “the construction sector produces a wide range of products, from individual houses to major infrastructure such as roads, power plant and petrochemical complexes. In most countries output is roughly equally divided between housing, other buildings and civil engineering projects. Although attention is mostly focused on new construction, the renovation and maintenance of existing structures accounts almost 50% of total construction output in some of the more developed economies and even greater share of employment”. In the Sri Lankan context: Construction Industry is the 4<sup>th</sup> Largest sector contributing 6-7% to the GDP over past decade, Provides employment to 4-5% of labour force and contribute around 30% to trade balance (**Article on “Construction Industry**). A unique characteristic of construction is: “The construction industry has characteristics that separately are shared by other industries but in combination appear in construction alone” (Hillebrandt, 1984). Some unique characteristics are: The final product is large, heavy, expensive and shared over a large geographical area; The product is made specially to the requirement of each individual customer; Design is separated from construction (except for design and built construction); Production take place at the site itself; Affected by the external environment and Price of the product is determined in advance. Construction industry is composed by an integration of various Stakeholders such as; Clients, Consultants, Contractors, Plant hirers, Material Manufactures & Suppliers, Research & Development Organizations, Regulatory Bodies, Insurance Organizations, Skill Development Institutions, Financing Institutions, Environmental Lobbies etc. Some special features of the Sri Lankan Construction Industry are: Male dominated; has very high backward linkages and sell mainly to the service sector.

According to the Annual Survey of Construction Industries-Department of Census & Statistics, Sri Lanka Value of work done in the Construction Industry by Public Sector is accounted for 85 % and the balance is by the Private Sector. Road Construction Industry takes a major share of the Public Sector in the last few years. According to the annual Survey of Construction Industry- Department of Census & Statistics, Sri Lanka -2007, the public sector share for roads & bridges is around 55%.

## **1.1 Problems and requirements**

The construction industry, by nature, has many special problems and requirements. The importance of taking measures to improve the performance of the construction industry has now been recognized in several countries at various levels of socio-economic development.

Dedicated agencies have been formed in many countries to administer the continuous improvement of the industry, although they have different objectives, responsibilities and levels of authority. In the UK, the Construction Industry Board is an industry initiative, whereas its counterpart institutions in developing countries are Government agencies. They include the Construction Industry Development Board of Malaysia, the Institute for Construction Training and Development of Sri Lanka and the National Construction Council of Tanzania. Singapore’s Building and Construction Authority is also a Government agency.

A regional initiative to coordinate efforts and pool resources where necessary must be provided to many of the institutions that are industry inspired, or involve the industry’s active participation. Such initiatives potentially have greater sustainability and chances of success because the main stakeholders and beneficiaries are directly included in the planning and implementation process.

Considering the nature of the industry's needs and problems, and resource constraints, mere formation of an agency does not guarantee the success of construction industry development. An important point worth stressing is that construction industry development is a continuous process. A number of countries at different levels of development have recently formulated long-term plans for improving their construction industries.

The construction industry should be transformed from an industry which is "dirty, dangerous and demanding" to one which is "professional, productive and progressive".

Desired outcomes of a construction industry development initiative are a professional, productive and progressive industry; a knowledge workforce; superior capabilities through synergistic partnerships; integrated process for high buildability; contributor to wealth through cost competitiveness; and construction expertise as an export industry.

Construction firms from developing countries will play an increasingly greater role in the global market in future. The way in which these companies can actively help to upgrade their national construction industry should also be studied.

Another issue is the possibility of cross-border strategic alliances among construction firms from developing countries, which will enable them to collaborate in modern construction business and technology development. The subject of culture has rightly come to the fore in construction research.

Effort is required to reflect the cultural attributes and values of individual developing countries in their construction practices and procedures. The existing ones are not only currently obsolete, but they are also inappropriate.

Construction companies and practitioners should be encouraged to continuously search for inputs and ways of working which will minimize the negative impact of construction activity and improve the performance.

## **2.0 Road Construction Industry**

Road Development is an important component of the economic development in Sri Lanka. Although respective Governments have recognized the importance of improving the road network in the country, expenditure in areas such as defense, multipurpose development projects and decentralized administration has taken priority, resulting in only scanty investment in road development, especially in northern, Eastern and rural areas. Today, the present Government is planning to improve, rehabilitate and develop existing road network by giving equal weightage to both urban and rural areas within a reasonable period of time aiming to facilitate the rapid economic growth which is the top priority of the Government. Accordingly, number of road improvements projects has been planned and some of them are in progress. However, it is learned that the majority of these road projects do not perform as expected especially within time, cost and quality standards due to various factors. Aim of this paper is to study the current performance of the Road Construction Industry in Sri Lanka and make recommendations to improve the performance.

## **3.0 Data Collection & Analysis**

The study is aimed at identifying the factors affecting the performance of the Road Construction Projects in progress and to suggest practical and appropriate solutions to overcome the prevailing

deficiencies in order to improve their performance. Engineers working in the Road Construction Industry have been selected to represent the Employer, the Engineer and the Contractor organizations for the study. Individual discussions and focus group discussion have also been conducted to gather more information. In addition, a well-designed questionnaire has been administered to collect primary data. 130 factors influencing the performance of the Road Construction Industry have been identified & included in the questionnaire and distributed among the selected engineers. Thirty engineers have responded and returned their copy of the questionnaire with their comments. The participants were requested to allocate marks from 1-5 (1-very poor influence; 2-poor influence; 3-average influence; 4-high influence; 5-very high influence) to each factor according to their knowledge.

For the analysis purpose the factors received average mark of 4.00 and above were selected as significant and they are listed in Table 3.1. Also the participants have suggested 80 new factors influence (as they think) the performance of the Road Construction Industry. These factors have not been considered in the analysis.

It is observed in Table 1.0 there are 35 factors obtained average score of 4.00 & above and they are categorized under three main stakeholders of Construction Contracts. Namely: The Client (Employer) - 2; The Consultant (Engineer for the contract)-10, the Contractor-21 and all three parties -2.

The Client: Early settlement of the contractor's Interim Payment Certificates (Bills) and providing resources like land (possession of Site) and funds without any delay have been identified as factors on the client's part to improve performance.

The Consultant: Early certification of the contractor's Interim Payment Certificates ( IPCs ) , timely issue of Instructions to the contractor, leadership qualities, authority to take day to day decisions, sound contract administration knowledge & experience, technical ability, conducting regular progress meetings & site inspections, encourage Consultant to take timely & appropriate decisions by the client and the Client to approve such decisions, analyze the contractor's claims fair & reasonable manner and the qualifications of the Engineer's staff have been identified as , important factors on the consultants part to improve the performance.

The Contractor: People management skills of the Construction Manager, preparation of accurate & complete Contractor's Interim Payment Certificates and timely submissions of the same, availability of skilled labour gangs, availability of required amount of reliable plant & machinery, technical & construction knowledge of the construction team, effective progress monitoring & feedback by the Construction Manager, previous similar experience of the construction team, appointing of an experience Construction Manager at the beginning of the project, Head Office support to the site, appropriate & timely decision making by the site staff, timely response by the Contractor staff to the Consultant's & Clients requests/ instructions, effective planning of operations, resources & funds, commitment to complete the project within the time period, availability of construction material, understanding of the responsibilities of the construction team, effective utilization of plant & equipment, knowledge & skill of the supervisors, knowledge on the construction method and effective cash-flow management have been identified as important factors on the contractor's part to improve the performance.

Number After Ranking	Original No. Allocated	Description of the Factor	Total Marks	Average Mark
1	28	Making the payment for IPCs within a reasonable time (2 weeks)	137	4.57
2	12	Certification of the IPCs by the Engineer within a reasonable time (2 weeks)	133	4.43
3	38	Timely issue of instructions by the Engineer	130	4.33
4	80	Good working relationship with the Employer, Engineer & the Contractor	130	4.33
5	49	Construction Manager's ability to manage people at work	129	4.30
6	85	Timely submission of IPCs by the contractor	129	4.30
7	45	Contractor's ability to prepare timely, accurate and complete IPC	128	4.27
8	117	Availability of skill construction labour	127	4.23
9	2	Employer's ability to provide agreed / required resources (funds, land, etc.) throughout the project duration	126	4.20
10	113	Availability of the required number of plant & equipment	126	4.20
11	116	Technical ability & construction knowledge of contractor's staff	126	4.20
12	11	Discuss with the Employer, the Engineer & the Contractor on construction Issues and constraints at a regular intervals	125	4.17
13	112	Condition/reliability of the construction plant & equipment	125	4.17
14	14	Leadership qualities of the Engineer	124	4.13
15	15	Authority to take day-to-day decisions by the Engineer or his assistants	124	4.13
16	22	Effective monitoring and feedback by the Construction Manager	124	4.13
17	51	Having very good contract administration knowledge and experience by the Engineer	124	4.13
18	72	Previous experience of the construction team working on similar project	124	4.13
19	17	Engineer's technical ability	123.5	4.12
20	5	Selection of a Construction Manager with proven track record at the start of the construction work	123	4.10
21	37	Conducting Progress Review Meetings and site Inspections at appropriate intervals	123	4.10
22	128	Head Office support to site staff during construction	123	4.10
23	6	Providing effective assistance to the construction team to take decisions as required on time	122	4.07
24	9	Allowing the Engineer to take decisions and supporting such decisions by the Employer	122	4.07
25	50	Engineer's ability to analyze Contractor's claims fair and reasonable manner	122	4.07
26	105	Quick response by the contractor to Employer's / Engineer's requests / instructions	122	4.07
27	63	Adequacy and accuracy in contractor's planning on operations, resources & funds	121	4.03
28	109	Contractor's commitment to complete the project within the original or agreed time period	121	4.03
29	110	Availability of specified construction materials	121	4.03
30	21	Understanding of the responsibilities by various members of the construction team	120	4.00
31	25	Academic and professional qualifications of the Engineer	120	4.00
32	77	Effective monitoring of plant & equipment utilization	120	4.00
33	119	Knowledge & skill of the Construction Supervisors	120	4.00
34	126	Contractor's knowledge on Construction Methods	120	4.00
35	129	Construction Manager's knowledge on cash-flow management	120	4.00

**Table-3.1- Factors scored marks 4.0 & above**

Also it was recorded that all three parties (the Client, the Consultant & the Contractor) need to have a good working relationship and required to discuss construction issues & related constraints frequently to improve performance.

#### **4.0 Conclusions:**

1. Two factors out of 35 have been identified as the Client needs to pay attention to improve performance. They are: Early settlement of IPCs and timely handing over of possession of site.
2. Ten factors out of 35 have been identified as the Consultant needs to pay attention to improve performance. Timely action on issuing Interim Payment certificates, appropriate decisions & instructions, technical ability, qualifications, sound contract administration knowledge & experience, acting as fair & reasonable manner in all matters including evaluation of

contractor's claims and leadership qualities of the Consultant have been identified as important factors to improve performance.

3. Twenty one factors out of 35 have been identified as the Contractor needs to pay attention to improve performance. All these factors are Construction Management related and Contractor & Contractor Organization need to take actions to resolve during construction. These factors include: people management skills of the Construction Manager; preparation of accurate & complete Contractor's Interim Payment Certificates and timely submissions of the same; availability of skilled labour team; availability of required amount of reliable plant & machinery; technical & construction knowledge of the construction team; effective progress monitoring & feedback by the Construction Manager; previous similar experience of the construction team; appointing of an experience Construction Manager at the beginning of the project; Head Office support to the site; appropriate & timely decision making by the site staff; timely response by the Contractor staff to the Consultant's & Clients requests/instructions; effective planning of operations, resources & funds, commitment to complete the project within the time period; availability of specified construction material; understanding of the responsibilities of the Construction Team; effective utilization of plant & equipment; knowledge & skill of the supervisors; knowledge on the construction method and effective cash-flow management have been identified as important factors on the contractor's part to improve the performance.
4. It was also highlighted that very good working relationship and joint decision making to resolve all issues & constraints with the Client, Engineer & the Contractor staff at site is utmost important for performance improvement.

## **5.0 Recommendations:**

1. Reasonable time period should be provided in the Conditions of Contracts for certification and payment of Contractor's IPCs. It is appropriate to divide this period and specify the time allocated to the Consultant & Client separately
2. Client should take all possible steps to make sure that the land (possession of site) is handed over to the contractor as specified in the contract and maintain his cash-flow to settle all payment of the contractor without any delays throughout the project duration.
3. Suitable Selection Criterion should be prepared by the Client for the recruitment & selection of the Consultant staff considering the qualification, experience, skills & other requirements highlighted in the conclusion No.2 and it should be strictly followed at the selection process.
4. A workshop to educate Top Management of the Construction Organizations involved in the Road Construction Industry on the factors highlighted should be conducted.
5. A suitable procedure should be included in the Condition of Contracts on recruitment & selection of the Contractor's staff considering the qualification, experience, skills & other requirements highlighted in the conclusion No.3 and it should be strictly followed at the appointing stage.
6. Training Programmes should be conducted to cover all aspects highlighted in the Conclusion No.2 &3 for the Contractor's and Consultant's staff. This should include seminars on highlighted topic and short term, medium term & long term Training Programmes on Construction Management and Contract Administration areas.
7. Similar study should be conducted to cover other sectors of the construction industry. e.g. Water Sector, Building Sector etc.

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