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## RESEARCH ARTICLE

### TO STUDY REJUNEVATION OF RIVERS & STORM WATER MANAGEMENT

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#### ABSTRACT

The supplier performance has a significant effect on the competitiveness in implementation Just-In-Time and entire supply chain. In this paper, the supplier performance effected in Just-In-Time implementation was described, the supplier must be introduced and developed before being an approved Just-In-Time supplier. Considering, the importance of supplier performance as a part of Just-In-Time implementation, the Just-In-Time will not be successful if no good cooperation from supplier in term of quality and business point of view. This paper proposed the strategies in managing vendor called Vendor Management System (VMS), which shown in the management flow model for development the supplier performance to reach ready state before entering the Just-In-Time. The Vendor Management System (VMS) identifies five phases starting from qualification, measuring, analyzing, implementing and maintaining the supplier performance. The Vendor Management Team (VMT) will implement each VMS phase as proposed steps at a periodic timeframe. The suppliers who reach the ready state level as company goal and expectation will be selected to enter the Just-in-time program. An example of vendor management model in an electronics manufacturer in Thailand showed the effectiveness of the system through the yearly performance and incoming quality lot acceptance rate.

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#### INTRODUCTION

The vendor management system is for supporting the good quality of material, delivery on time, good service and cooperation, reasonable price, strong and close relationship to continuous improve, etc. As the growing popularity of just in time and supply chain management, the supplier seems to be more significant role for manufacturing to achieve their customer satisfaction in terms of quality, delivery and business point of view. The smooth running of production line could be interrupted by the poor quality of material. The schedule to delivery will be effected by both poor quality of material and poor delivery performance. Also the manufacturing will get less profit if they select the non-reasonable price of material, as of the material is the cost of manufacturers. In order to achieve the Quality Manufacturing Excellence (QME), the Vendor Management System (VMS) is the one most important factor of success. The vendor/supplier is the partnership that concerned to manufacturer not only the quality but also other business issues. As Vendor

Partnership Relation (VPR), it is necessary to work closely between manufacturer and supplier as a team working such as training a supplier's staff about quality techniques, including a design review meeting to gain ideas on how supplier parts can best be used, providing sale projections/forecasts with supplier to support their production scheduling, sharing information of accept/ reject criteria for manufacturer and supplier, etc. Such this VPR, it leads to establish the Vendor Management Team (VMT) at Manufacturer to assess, work, and coordinate with the vendor partnership at a first stage of production. The supplier development is a vehicle that can be the important factor to increase the competitiveness of the entire supply chains (2). The supplier development had been studied since the supplier selection phase, the quality of materials; good delivery performance and cost are some of major criteria in selection suppliers (1, 3, 4, 5). Other than these 3 criteria, AHP was developed to set priorities involving subjective judgments in supplier selection (5,6) and also AHP was to solve the supplier selection problem in supplier management process (7). The excellence methodology to select the supplier is important phase for VMS, but it is not enough to guarantee whether the supplier will send the excellence quality of product as manufacturer's requirement all along and every shipment.

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As of the supplier is the "Vendor Partnership Relation" to manufacturer, the fully cycle to development suppliers must be performed to know and involve the between this Manufacturer-Supplier Relationship (MSR). The supplier developments among several researches now are more emphasized on the supplier selection and evaluation (8). In this paper we have proposed the fully system of Vendor Management System (VMS) program and its model to support the Just In Time and Supply Chain Management that this Vendor Management System (VMS) will cover the supplier development from selection, measure, improve until the supplier achieve the excellent quality. The Vendor Management System (VMS) will also provide the recommendation the Ready Status (RS) of supplier before they enter to the Just In Time (JIT) and Supply Chain Management (SCM).

### STATEMENT OF PROBLEM

Current vendor management practices in the construction industry are performed on fragmented basis with unstructured communication and no clearly established responsibilities between the parties involved. The highly fragmentation is a result of the separation of design and construction, lack of coordination and integration between various functional disciplines, poor communication, etc. Furthermore, dependency of the general contractors on other parties such as suppliers and subcontractors reinforces the construction industry fragmentation. All of these are the important factors causing performance-related problems such as delay in material ordering and receiving, low productivity, cost and time overrun, conflict and disputes.

### RESEARCH AIM

The aim of this research is to develop a framework for the best practice and an effective vendor management system of material supply chain process through the project phases that suits the local construction industry in order to help contractors to have the right materials in the right quantities (at the right place) at the right moment at minimal cost so they can improve their productivity, minimize losses and increase competitiveness.

### RESEARCH OBJECTIVES

The objective of this research work is to get an insight into the procurement systems adopted by the project promoters and the contractors in awarding subcontracts or procuring goods and services. The work aims in understanding the actual procurement systems of road and highway projects and its contractors and then examining its appropriateness with respect to the best practices evolved through the literature survey. An attempt is made to explore the finding of the importance of procurement of material and services to project promoters engaged in road and highway projects which initiates them to adopt the most efficient methods in order to ensure the smooth flow of the execution of the Project, thereby avoiding delay and cost overrun of projects. It also includes the study of vendor development practices. Some of the other objectives of study are

- J To suggest improving construction procurement practices to achieve better value for money and ensure that customer are more satisfied.

- J To ensure the effectiveness in selection of vendors and their evaluation for firms sustainability.

### SCOPE AND LIMITATIONS

**The proposed research will be limited to the following assumptions:**

The scope of the present work includes the understanding of the best practices in the existing procurement systems suggest necessary improvement. Two cases have been referred to understand the procurement function of the contractors working in road and highway projects.

### SIGNIFICANCE OF THE STUDY

The framework is significant in several ways. First, the framework identifies and describes all phases of the VMP starting from bidding, sourcing, procurement, construction, post-construction and ending with evaluation. Second, the framework presents solutions to the uncertainties and risk inherent in the VMP. Third, the framework documents the problems encountering the contractors through the VMP and providing possible solutions to the most occurred ones. Finally, the framework identifies the factors that contribute in integrate the VMP.

### LITERATURE REVIEW

The most distinct part of India's physical infrastructure development in recent years is the development of road network across the country per sq. km. of surface area in India is now endowed with one km of roadways. India has one of the largest road networks in the world, aggregating to 3.34 million km. The country's road network consists of Expressways, National Highways, State Highways, Major District Roads, Other District Roads and Village Roads. The road network, as on December 2007, comprises 66,590 km of National Highways, 128,000 km of State Highways, 470,000 km of Major District Roads and about 2.65 million km of other District and Rural Roads. National Highways comprise only about 2 percent of the total length of roads and carry about 40 percent of the total traffic across the length and breadth of the country. Out of the total length of National Highways, 32 percent is single lane/intermediate lane, 56 percent is 2-lane standard and the balance of 12 percent is 4-lane standard or more. The National Highways Development Project (NHDP), the largest highway project ever undertaken by the country, is being implemented by the National Highway Authority of India. NHDP Phase I & II envisage 4/6 laning of about 14,279 km of National Highways, at a total estimated cost of Rs.650 million (at 2004 prices). These two phases 109 comprise of Golden Quadrilateral (GQ), North-South and East-West Corridors, Port Connectivity and other projects.

The Golden Quadrilateral (GQ-5,846 km) connects the four major cities of Delhi, Mumbai, Chennai and Kolkata. The North-South and East-West Corridors (NS-EW-7,300 km) connect Srinagar in the North to Kanyakumari in the South, including spur from Salem to Kochi and Silchar in the East to Porbandar in the West. By November 30, 2006, 6,776 km of national highways pertaining to NHDP had been completed, the bulk of which (5,475 km) lie on the GQ.

Constraints faced in the timely completion of NHDP include delays in land acquisition, removal of structures and shifting of utilities, law and order problem in some States, and poor performance of some contractors. Nearly 93 percent works on GQ have been completed by November 2006, and the NS and EW corridors are expected to be completed by December 2009. With the completion of about 93 percent of the GQ, a substantial impact upon the economy is already visible. At this stage there is a need to focus attention on corridor management and road safety, and ROAD AND HIGHWAY PROJECTS has already put in place a corridor management policy.

**Construction Procurement:** During the construction of the roads, materials account for a big part of products and project costs. The total cost of installed materials (or Value of Materials) may account for 50% or more, even though the manufacturing cost may be a minor part of the total, probably 20-30%. Material ordering and delivery are very important for the successful execution and completion of any project since unavailability of materials can stop the construction work. The person in charge of procuring materials needs to ensure that the correct materials in the correct quantities are ordered. They also need to verify the release dates at which the material is needed and clearly specify those delivery dates as well as the location of delivery to the supplier. It is important for a contracting firm to consider that even for standard materials, there may be significant difference in the date that the material was requested or date when the purchase order was made, and the time in which the material will be delivered. Unavailability of materials when needed can affect productivity, cause delays and possible suspension of activities until the required material is available. These delays can occur if the quantities needed are large and the supplier is not able to produce those materials at that time or by any other factors beyond the control of the company. Therefore, material procurement is a critical aspect to consider for the successful completion of a construction project. To obtain the best service and performance from the suppliers, the Client must be closely involved with each step of the procurement process. Successful construction procurement should results on time delivery, cost and optimise desired quality required by the Client.

### BENEFITS OF THE MATERIALS MANAGEMENT

An effective material management system can bring many benefits for a company. Previous studies by the Construction Industry Institute (CII) concluded that labor productivity could be improved by six percent and can produce 4-6% additional savings (Bernold and Treseler, 1991). Among these benefits are:

- ) Reducing the overall costs of materials
- ) Better handling of materials
- ) Materials will be on site when needed and in quantities required
- ) Improvement in labor productivity
- ) Improvement in project schedule
- ) Better relation with suppliers
- ) Reduce of surplus materials
- ) Reduce storage of materials on site
- ) Labor savings
- ) Stock reduction

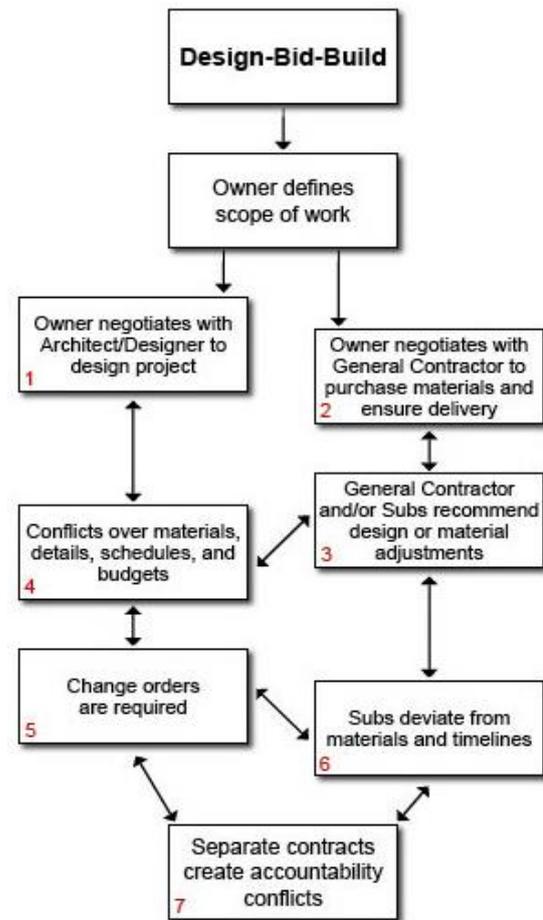


Figure No 1- Design Bid Build

### SELECTION OF PROCUREMENT PROCESS

There is no particular procedure to follow, in deciding the type of procurement system to use. Each project will be different and must be treated on its merits and be matched to an appropriate procurement system which exposes the contracting firm to an acceptable level of risk in the attainment of the project objectives. In implementing the procurement strategy, the contracting firm must firstly identify those constraints which surround the specific project. In doing so the contracting firm may need to seek external expert assistance. These constraints may include financial, physical, geographical, time, functional or design. From these the contracting firm must decide how such constraints impact on the risks associated with delivery and contract systems and make a selection of systems which exposes the project to the least critical risks. Some risks, while they may be high for a particular system, nevertheless could be discounted as they may not be critical to the project and therefore might be best carried by the contracting firm. Factors which affect the system selection can be identified under broad headings as contracting firm constraints and physical constraints.

#### Source selection

**Two of the important responsibilities for the purchasing Executive are:-**

- ) To select the right source of supply.
- ) To develop new suppliers.

In other words, supplier selection and new source development are major contributions of the purchasing function and so should have properly planned approach. A good supplier actively participates and helps the purchase to meet his customer's requirements. Suppliers also contribute their specialized knowledge and help build quality into the purchasing company's products. For the selection, it is easy for purchaser to work out a preference pattern based on price, quality, delivery and service and his geographical location, his technical ability and knowledge. The suppliers may be large, medium or small, who supplies raw materials, component, equipment, etc. The factors which were considered to evaluate the functional aspects of vendor's selection are –

- Delivery Reliability
- Quality / price ratio
- General reputation
- Geographical location
- Technical ability and knowledge
- Technical inventiveness
- Supply of information and market surveys
- Extent of previous contact with the buyers
- Importance as a client
- Extent of personal benefits to the buyer.

The vendor / suppliers may be large, medium or small firms and further they can broadly classified as suitable for –

- ) Raw Material
- ) Maintenance Repair and operating supplier
- ) Components – Standard and Special
- ) Capital equipment
- ) Subcontracting
- ) Services

#### Sources of supply information:

##### The sources of supply information are:

- Catalogue
- Trade Journals
- Trade Directories
- Newspaper Advertisements
- Telephone directory
- Government Publications
- Publications of Institutions and Manufacturers Association
- Industrial Advertising including Direct Mail
- Salesman's visits
- Trade Exhibits and Technical Exhibitions
- Industrial Product Finder

Sources of supply covering equipment, materials, price information and other details may be extracted from the above. All these, if indexed, properly filed and periodically updated, serve as a good reference not only to the purchasers but to others in the organization. The indexing should be based on product information and according to the names of suppliers and geographical purchasers should be fully aware the information of new product, new processes contained in these.

## METHODOLOGY

The research methodology will explain how the objectives of this study can be achieved. This study was carried out based on literature review and questionnaire survey. Subsequently,

data collection from the questionnaire survey is analyzed using the statistical methods, and their results are tabulated. It follows by discussions, conclusions and recommendation. In achieving the objectives of this study, the information regarding different types of procurement processes used in different circumstances were obtained from various sources i.e., international journal, international conference, and published books.

These circumstances and methods were used to develop the questionnaire survey in order to collect data from the targeted respondent

## RESEARCH DESIGN

**Data collection:** Data collection is the most critical part of the study since the accuracy of the data will determine the success or failure of the research. Data obtained through these questionnaires will be analyzed accordingly using appropriate analysis techniques.

Responses from questionnaires will then be compiled and analyzed. Data collected from different questions will be gathered to answer different objectives. Analysis is done based on various categories by using the statistical methods.

**Questionnaire Design:** The questionnaire was designed based on different types of procurement processes used under different circumstances. A questionnaire survey was developed to assess the perceptions of contractors and consultants of the relative importance of types of procurement processes.

The questionnaire was designed into three sections: section A; section B; and section C;

**Company and Respondent Profile:** This section is to obtain the information about the respondents. The questionnaire includes the following:

#### The company in which the person respondent represents (serve);

- The position of the respondent in the company;
- The experience of the respondent in construction project;
- The experience of the company in construction industry; and
- The range of project cost involved.

**Different types of procurement processes under various circumstances:** This section is to obtain the information regarding the applicability of different types of procurement processes under various circumstances. The questionnaire is mainly based on Linkert's scale of five ordinal measures from one (1) to five (5) according to level of applicability. Each scale represents the following rating:

#### Scale of Applicability:

- Not Applicable: (1)**
- Low: (2)**
- Medium: (3)**
- High: (4)**
- Always: (5)**

This section is to obtain the information regarding procurement processes and vendor development practices adopted by the contracting firms.

**Questionnaire Distribution:** The developed survey questionnaire was distributed in eight sets to the targeted respondents. About five sets were distributed to the contractors selected, and three sets to the consultants selected.

**Data Analysis used for testing of Hypothesis:** The procedure used in analyzing of data was aimed at establishing the relative importance of the various procurement processes. There are three steps used in analyzing the data: calculating the relative importance index; ranking of procurement processes in each circumstance based on relative importance index, and to determine degree of correlation on ranking of procurement processes among the two groups.

**Relative Importance Index:** Odeh and Battaineh (2002), to determine the ranking of different procurement processes from the viewpoint of contractors and consultants, the Relative Importance Index (I) was computed as:

$$I = \frac{\sum_{i=1}^5 W}{\sum_{i=1}^5 X}$$

Where :

$i$  = response category index = 1,2,3,4, and 5 for:

Not Applicable: (1), Low: (2), Medium: (3), High:( 4), Always:( 5)

$W_i$  = the weight assigned to  $i$ th response = 1, 2, 3, 4, 5, respectively.

$X_i$  = frequency of the  $i$ th response given as percentage of the total responses for each factors.

**The Spearman's Rank Correlation Coefficient Test:** The Spearman's Rank correlation coefficient is a measure of association, in this case between two groups of respondents and the variables were measures in ordinal scale. In order to determine there is significant correlation of the ranking of different procurement processes between contractors and consultants perspective, the Spearman's Rank correlation coefficient (Sheskin, 2004) was computed as:

$$r_s = 1 - \frac{(6 \sum d^2)}{N(N^2 - 1)}$$

where:

$r_s$  =Spearman's rank correlation coefficient;  
 $d$ =the difference in ranking between the contractors and consultants; and

$N$  = the number of variables, respectively.

This calculated value of  $r_s$  is compared with critical value of  $r_s$  from the standard table.

In order to know whether there is disagreement or agreement between the two groups on ranking factors, a test of hypothesis is needed.

**Null hypothesis: Ho:** Agreement in rankings among the contractor and consultant.

**Alternative hypothesis: H1:** No significant agreement in the rankings among the two groups. Compare the  $r_s$  value against the critical value for  $n$  samples. Reject the null hypothesis, if  $r_s$  is greater than the critical value

## DATA ANALYSIS AND DISCUSSION

In this chapter, the results of the questionnaires are presented and discussed. The chapter illustrates and discusses the characteristics of the study population, current construction materials supply chain management, the important factors that form the VMP that are appropriate for the India construction industry, contractor-supplier relationship, the impact of the Israeli closure on the MSCP, some concepts that mitigate the uncertainties and risks in the construction industry, the most occurred problems facing contractors through the VMP and the factors that may contribute to integrate the phases of the VMP. The objective of conducting the analysis is to know the best procurement process adopted by the various contracting firms used under different circumstances and the ranking was given according to their applicability in given circumstance.

## CONTRACTOR / SUPPLIER RELATIONSHIP

The relationship of a contractor with his suppliers is critical for the successful of any construction project. This section aims at studying the contractor / supplier relationships. It is divided into two subsections. The first subsection shows the criteria that the contractors adopt to select the suppliers. The second subsection shows the likely or preferred course of action that contractors use when the supplier deliver materials late or deliver materials do not meet the required

## RESULT AND FINDINGS

### Conclusion and Recommendations

The main aim of work done is to understand the procurement processes and vendor development practices adopted by the contractors engaged in road and highway projects projects and this is done by interviewing the contractors. Here different issues regarding the procurement processes in different level of industries are analysed. Cases were obtained from the main contractors and the findings were compared with findings from literature and journals.

**Findings:** We found that most of the firms do not like to adopt the strategies. Many of the middle profile level firms still want to procure the materials from the suppliers who provide them materials at the lowest price. They don't believe in finding the new suppliers, they just want procure the materials from the existing vendor's. They feel that carrying out the efficient materials procurement processes is waste of time and money. The work is traditionally awarded to lowest bid and the idea of modified bid and renegotiating is still to be updated. Some firms of huge turn over believe in adopting the efficient procurement processes and continuously evaluate the existing vendors and also search for the new vendors. They believe in improving the processes in order to be competitive in the present world.

	CONSULTANTS		CONTRACTORS		Spearman's Rank Coeff. Rho rs
	Index	Rank	Index	Rank	
Types of procurement process:					rs calculated=0.7
Request for Proposal	3.1	2	3.0	2	rs critical = 1.0
Request for Tender	4.2	1	4.1	1	Thus Ho is accepted.
Request for Quotation	1.9	5	2.0	3	
informal procurement	2.1	4	2.0	3	
Non competitive procurement	2.9	3	3.0	2	

Table No -2 -procurement of high value materials

	CONSULTANTS		CONTRACTORS		Spearman's Rank Coeff. Rhors
	Index	Rank	Index	Rank	
Types of procurement process:					rs calculated=0.35
Request for Proposal	1.9	4	2.1	5	rs critical = 1.0
Request for Tender	4.9	3	5.2	1	Thus Ho is accepted
Request for Quotation	5.1	1	5.0	3	
Informal procurement	5.0	2	4.9	4	
Non competitive procurement	5.0	2	5.1	2	

	CONSULTANTS		CONTRACTORS		Spearman's Rank Coeff. Rhors
	Index	Rank	Index	Rank	
Types of procurement process:					
Request for Proposal	2.9	3	3.1	4	
Request for Tender	5.0	1	5.1	1	rs calculated=0.30
Request for Quotation	5.0	1	4.9	3	
informal procurement	4.9	2	5.0	2	rs critical = 1.0
Non competitive procurement	1.0	4	1.0	5	Thus Ho is accepted

Table 3. In evaluating bids/proposals from qualified bidders, price is the primary factor and is not negotiated

circumstances	RFP	RFT	RFQ	INFORMAL PROCUREMENT	Non competitive procurement
Procurement of high value materials	Medium Value	High Value	Low Value	Low Value	Medium value
Purchaser has a clear or single solution in mind and precisely defines technical requirements for evaluating bids or proposals	Low Likelihood	Always	Always	Always	Always
In evaluating bids/proposals from qualified bidders, price is the primary factor and is not negotiated	Medium	Always	Always	Always	Not Applicable

They give much importance to cost, quality, timely procurement, material procurement processes and vendor development practices.

**Conclusion**

This research work helped us to know the present material procurement processes and vendor development practices adopted by the contractors engaged in road and highway projects. It completely depends upon the quantity of material to be procured, different levels of firms, availability of suppliers and supplier capabilities.

**Firms with less turn over:** Since they execute less work, their quantity of material requirement is less, hence they give much importance to those vendors who provide the materials with

- ) Lowest price
- ) Long credit periods
- ) Long service periods

They preferably go for direct negotiations with the dealers rather than suppliers since suppliers costs are high compared to dealers. They don't give much importance to vendor development processes. Firms with the large turnover want to follow certain strategies, they give much importance to efficient procurement processes and vendor development practices. Some procurement approaches which are followed by them are

**Pre-Qualification and Negotiation:** In prequalification, the vendors are called for prequalification based on their technical, financial and capacity to supply criteria. The prequalified vendors are then asked to quote the prices of the materials based on which the negotiation is carried out.

**Invitation to Negotiate (ITN)**

This process involves the following steps

- Step 1) Contractors develops and releases an ITN.
- Step 2) Interested vendors respond to the ITN.

Step 3) Interested vendor responses are reviewed and either ranked or included in a next iteration of the ITN scope. The next iteration of the ITN scope will be only distributed to a "short-list" of best-qualified vendors based on the responses to the initial ITN.

**Performance-Based Contracting:** Here the performance of the existing contractors is evaluated continuously comparing them with the other new vendors in the market and based on their performance the materials are procured from them.

### Design-Bid-Build procurement

#### Procurement processes adopted by the firms are

- ) Request for proposals
- ) Request for tenders
- ) Request for quotation
- ) Informal procurement
- ) Non competitive procurement
- ) Two envelope procurement process
- ) In-house bids

In vendor development practices the different process of supplier selection, best practices of vendor development, collaboration between supplier and contractor and vendor evaluation is adopted.

### Recommendations

Development of guidelines for the procurement of materials and vendor development is required. The contractors should get into the partnership with the vendors in order to improve the efficiency of the business which increases the profit and reduces the delays due to procurement. Best procurement process should be followed based on the type of work executed and best practices for the development of vendors should be followed. Their rating and evaluation should be done efficiently. The selection of the vendors is to be done with the help of AHP process since AHP model is

- Multi-criterion, Multi-person.
- Can handle qualitative input.

Decision making in presence of environmental, social and other influences

### REFERENCES

- Lenders Micheil R and Anna e Flynn-value driven purchasing professional publishing burr ridge 1995
- Zenz, Purchasing and the Management of Materials. John and Wiley & Sons, USA, 1987
- A report of marlene J. suarez bello University of puerto rico mayagüez campus "Government policy initiatives." Online: National Highway Authority of India <http://www.road and highway projects.org>
- Wei, Jinlong and Zhicheng, "A Supplier-selecting System using a Neurl Network", IEEE International Conference on Intelligent Processing Systems, 1997.
- Types of Suppliers 2000.Purchasing and Materials Management, 1991
- Thompson, "Scaling Evaluative Criteria and Supplier Performance Estimates in Weighted Point Prepurchase Decision Models", International Journal of
- AASHTO. Guide Specifications for Highway Construction. 8th edition. AASHTO, Washington, DC, 1998.
- Federal Highway Administration. Design-Build: FHWA's Role in the Design-Build Program Under Special Experimental Projects No. 14, 1996.
- Guidelines for investment in road and highway projects project govt of india ministry of road shiping and highway [www.elsevier.com/locate/ijproman](http://www.elsevier.com/locate/ijproman), International Journal of Project Management 20 (2002) 627–632

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