FOSTERING SUSTAINABILITY OF THE SUPPLY CHAIN THROUGH ADOPTION OF THE STATE EXPLICIT PROCUREMENT STRATEGY - A MATHEMATICAL APPROACH USING ANALYTICAL HIERARCHY PROCESS

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ABSTRACT

Despite the impressive success of JIT programmes, many companies still use the traditional approach to determine their purchase orders. This is particularly true for small manufacturing firms who cannot effectively implement JIT purchasing. Manufacturing companies that use economic order quantity (EOQ) purchasing, either classical EOQ model or a variation thereof, increasingly are faced with the decision of whether or not to switch to the just-in-time (JIT) purchasing policy. This is a complex decision, requiring careful examination of each system and its possible impact on a variety of factors, such as cost, quality, and flexibility of the operations. Though JIT purchasing should be the goal of all the organizations for all the items, it is not feasible /economical to implement JIT under all the circumstances. In this paper a model is developed to identify the suitability of an outsourced item for JIT purchasing. The study is basically qualitative and exploratory in nature. The Methodology developed will be useful for industries to select a proper purchase policy for an outsourced item. The proposed approach is very well explained with the help of live case study.

Keywords: JIT (Just in Time) Procurement Policy, Situation Specific Policy, Analytical Hierarchy Process (AHP), EOQ (Economic Order Quantity) Model, JIC (Just in Case) Procurement Policy, MADM (Multi Attribute Decision Making), State Explicit Policy

1. INTRODUCTION

To withstand fierce challenge of global competition industries must develop more efficient value added processes. Nowadays supply chain management is a popular practice in manufacturing systems, and just-in-time (JIT) production plays a crucial role in supply chain environments. JIT philosophy improves the value added capabilities. Companies are using JIT production to gain and maintain a competitive advantage. The characteristics of JIT systems are consistent high quality, small lot sizes, frequent delivery, short lead time, and close supplier ties. Schonberger [01] identified JIT purchasing as a major component of a complete JIT value added system. Thus Just-in-time is one of the most celebrated modern manufacturing techniques and its use has helped many firms in becoming more productive and competitive. JIT is designed to virtually eliminate the need to hold items in inventory. It is defined as: "to produce and deliver finished goods just in time to be sold, sub-assemblies just in time to be assembled into goods, and purchased materials just in time to be transformed into fabricated parts", Schonberger, [01]. However, the benefits associated with JIT generally surpass the mere savings in inventory holding costs. A well implemented JIT system will also result in improved quality, lower manufacturing costs, lower ordering costs, elimination of waste, streamlining of the production process, and the elimination of production process bottlenecks, Rao and Scheraga, [02]. Most JIT companies view JIT purchasing as a significant

component of their JIT implementation and a major factor in their success, Billesbach et al. [03]. Characteristics of JIT purchasing as revealed by Birsen Karpak [04], are frequent deliveries of small order quantities directly to the area of production floor where they are used. The prerequisite for the successful JIT implementation is a close buyer supplier relationship, Nassimbeni [05] strengthened by appropriate buyer action, supplier action and buyer supplier action, Yan Dong et. al. [06] . Ansari [07] stated that in JIT purchase, purchase is carried out in small lots with frequent deliveries in small standard containers to hold the exact quantities of required specifications from a nearby local supplier with a long term contract. Further advantages of JIT purchase are Sylvain Landry et. al. [08]

1. Reduced lead time
2. Reduced inventories
3. Improved quality
4. Improved lead time variability
5. Reduced material cost
6. Improved flexibility

Despite the impressive success of JIT programmes, many companies still use the traditional approach to determine their purchase orders. This is particularly true for small manufacturing firms who cannot effectively implement JIT purchasing, Wu Min, Low Sui Pheng [09]. The traditional inventory management practices centre around the economic order quantity model which focuses on minimizing the inventory costs rather than on minimizing the inventory. Manufacturing companies that use economic order quantity (EOQ) purchasing, either classical EOQ model or a variation thereof, increasingly are faced with the decision of whether or not to switch to the just-in-time (JIT) purchasing policy. This is a complex decision, requiring careful examination of each system and its possible impact on a variety of factors, such as cost, quality, and flexibility of the operations. This creates a need for a comparative analysis of these two popular inventory management practices, and an examination of the many factors that enter in such a decision. There is a large number of studies comparing EOQ and JIT systems (Chyr et al., 1990; Hong et al., 1992; Johnson and Stice, 1993; Jones, 1991; Lee and Ansari, 1985; Ramasesh, 1990; Sauers, 1986). Most of these studies advocate the use of JIT over EOQ. However, in a comparison of JIT and EOQ, Farzaneh Fazel [10] conclude that "traditional inventory management techniques may underemphasize the costs of maintaining large inventories. JIT may under-emphasize the costs of not maintaining inventories, particularly since such costs are often difficult to identify and measure". In another study, Marc J. Schniederjans, Qing Cao, [11] state that most manufacturers ignore some relevant and important costs associated with carrying inventory, and thus do not calculate EOQ lot sizes correctly. A fundamental difference between traditional and just-in-time (JIT) strategies lies in the approach taken in the intermediate stages of production. The traditional approach adopts a functional organization designed to minimize manufacturing costs for the particular component. A JIT system organizes the intermediate processes to respond directly to demands from later stages of production. This distinction can be referred to as the difference between 'cost-push' and 'demand-pull'.

In this project a simple conceptual model is proposed to enhance the decision making capabilities of supply chain managers to determine an optimum purchase policy for any outsourced item. The JIT strategy is generally preferred unless the manufacturing economies associated with the traditional approach are significant and/or the cost to change systems is large. A specific application of the model is also presented. The approach presented in this paper will help industry to identify on a selective basis, the items which have low degree of turbulence and are therefore suitable for JIT purchasing. The study identifies major considerations along with their attributes and their relative importance to decide the suitability of JIT purchasing or Conventional purchasing for a given item. JIT purchasing differs from traditional purchasing in terms of the number of suppliers, the selection and evaluation of suppliers, and the negotiating and bidding process. Thus, suppliers have a considerable effect on the implementation of successful JIT purchasing Jaideep Motwani, Manu Madan, James Jiang, Luis Otero, [12]. Though JIT purchasing should be the goal of all the organizations for all the items, it is not feasible /economical to implement JIT under all the circumstances. So the research aims at selecting an optimum procurement policy for an item under [explicit circumstances.

For ideal JIT implementation, vendor should have only one client who has a fairly stable production schedule. C. Muralidharan, N. Anantharaman, S.G. Deshmukh, [13] stated that a supplier with low distance, High quality, and shipping high value items is the only one suitable for the JIT supplies. It

is therefore proposed to identify the factors responsible for the success or failure of JIT purchasing for choosing a suitable system. The proposed model in this research, tests the suitability of an item for JIT purchasing. The Methodology developed will be a boon for industries to select a proper purchase policy for an outsourced item R., Bindu, B.B. Ahuja [14]. The items having low degree of turbulence are generally suitable for JIT purchasing. Items having high degree of turbulence should be purchased by conventional purchase method. Intermediate purchase policy should be adopted for in between items. The study is basically qualitative and exploratory in nature. Major areas needing considerations for choosing purchase policy are identified and attributes of the major areas are listed.

2. PROPOSED APPROACH

A) Attributes for Framing the Procurement Strategy

Purchase policy is State Explicit. State can be described with the help of No. of Attributes. These attributes refer to internal and external factors, controllable, uncontrollable. Attributes construct a structural framework for selecting a proper procurement strategy Stamm C.L. and Golhar [15]. A model is proposed here to assist the companies in their decision making process to switch from the economic order quantity (EOQ) to the just-in-time (JIT) purchase policy. There is an upper limit for the JIT purchase price of an item below which the manufacturer will be better off using JIT purchasing. Also the annual demand level of the item dictates the policy to be adopted for it's purchase. For demand levels above the indifference point, EOQ is the less costly method while JIT is preferable for demand levels below this point. The model also predicts that JIT will be preferred for inventory items with higher purchase price, holding costs, or ordering cost.

By reviewing the literature on JIT purchasing and Operations Management and after conducting brain storming sessions with number of top executives of the Manufacturing Industry these attributes are decided. Total Thirty two numbers of attributes are listed.

Each attribute has a number of characteristics. Some are suitable for JIT purchasing and result in economic and operational advantages while others are suitable for conventional purchasing. These characteristics are represented by symbols (■) and (▲) for JIT and conventional purchasing respectively in the questionnaire framed.

B) Priorities among the Attributes

JIT purchasing can not be implemented in all circumstances. There are certain situations which are not suitable for JIT but conventional purchasing is more economical and operationally advantageous in these cases. The attributes decided in above section have different degrees of importance in the successful implementation of purchasing systems. These attributes are to be prioritized among themselves. There are many multi attribute decisions making methods which can be used to determine the relative importance of these factors. Aim of all MADM is to convert the subjectivity into objectivity.

Analytical Hierarchy Process (AHP) is one such method which gives an overall view of the relationship inherent in the environmental attributes and helps the attributes in the same level have same order of magnitude so that these can be compared accurately. The most important input to the AHP is the opinion of the decision makers or a group of decision makers. Therefore to get good results brainstorming sessions are organized with the executives from production, purchase, marketing, design, quality assurance departments which helped to obtain a consensus opinion. The questionnaire is designed and used to acquire the necessary information on the attributes. Six major considerations play an important role in deciding the purchase policy:

1. Market consideration
2. Product consideration
3. Purchaser consideration
4. Item consideration
5. Supplier consideration
6. Logistics consideration

Market consideration is concerned with the demand pattern of the manufactured items. The product consideration is concerned with the attributes of the product. The purchaser consideration is concerned with the operational attributes of the buyer. The item consideration is concerned with the attributes of the item for which the purchase policy is being made. The supplier consideration is concerned with the location, ability and motivation of the supplier for JIT purchasing. Logistics consideration is concerned with the impact of infrastructure on the purchase policy. Next, the attributes are considered

for judging how will these considerations are addressed. The market and product consideration have five attributes each. Purchaser consideration has four attributes. Item and supplier consideration have seven attributes each and logistics consideration has four attributes. Each attributes has five characteristics. The six major areas to which information is related for the item under study are

1. Market Consideration : Attributes nos. 01 to 05 in the Table 10
2. Product Consideration: Attributes nos. 06 to10 in the Table 10
3. Purchaser Consideration: Attribute nos. 11 to 14 in the Table 10
4. Item Consideration : Attribute nos. 15 to 21 in the Table 10
5. Supplier Consideration: Attribute nos. 22 to 28 in the Table 10
6. Logistics Consideration: Attribute nos. 29 to 32 in the Table 10

Though JIT purchasing offers numerous benefits and should be the goal of all the organizations for the procurement of all the items required, the successful implementation of JIT purchasing needs certain situational specifications expressed as attributes and characteristics. A model is developed to identify the suitability of JIT purchasing Vs conventional purchasing for different items. The model also provides an objective assessment of attributes required to be improved upon to bring the items under JIT purchasing.

3. ILLUSTRATION OF THE PROPOSED METHOD WITH THE HELP OF A LIVE CASE STUDY

The Giant Automobile company under study, presently purchases 35000 different items/components from various suppliers. There are total 600 suppliers. 300 vendors are in close vicinity. 8750 items are procured by using JIT policy. Items are classified as A class, B class, C class. A class items are purchased by JIT policy. Around 21000 items have single source of supply while 14000 items have multiple sources of supply. Diesel tank of heavy commercial vehicle model is having capacity of 300 liters. This steel Diesel tank is voluminous and heavy for storage in the plant. Inventory carrying cost is also high for the Diesel tank. So company proposes to switch over to JIT purchase policy for this item, but is not sure about the results of implementation of new purchase policy. So it is decided to test the model developed for assessing the suitability of JIT purchasing policy for the procurement of Diesel tank. The Diesel tank has double source of supply. Both the suppliers are located in nearby region. There are three basic reasons why the company is thinking to adopt JIT purchase policy for the tank:

1. There is no space in the plant to store this bulky and heavy item.
2. There is a problem in transporting this inventory to the assembly line as heavy transportation cost is incurred.
3. Company does not require any capital investment on the storage of such bulky items

Keeping this in view, it is decided to operate the model developed to test the suitability of JIT purchasing for the Diesel tank. A questionnaire is prepared and it is filled up after conducting the brainstorming sessions with the experts in the following department

- Marketing
- Design
- Purchase
- Quality Assurance
- Logistics

There are total 32 attributes listed related to six major considerations which affect the selection of purchase policy whether JIT or conventional. Each attribute has a no. of characteristics; some are suitable for JIT purchasing (■) and result in economic and operational advantages, while others are suitable for conventional purchasing (▲). By referring the table below the correct characteristics for the item under study are marked. The departments related to six major areas are consulted for the Realistic and specific, precise information. A brain storming session is organized with respective department people before filling up this questionnaire.

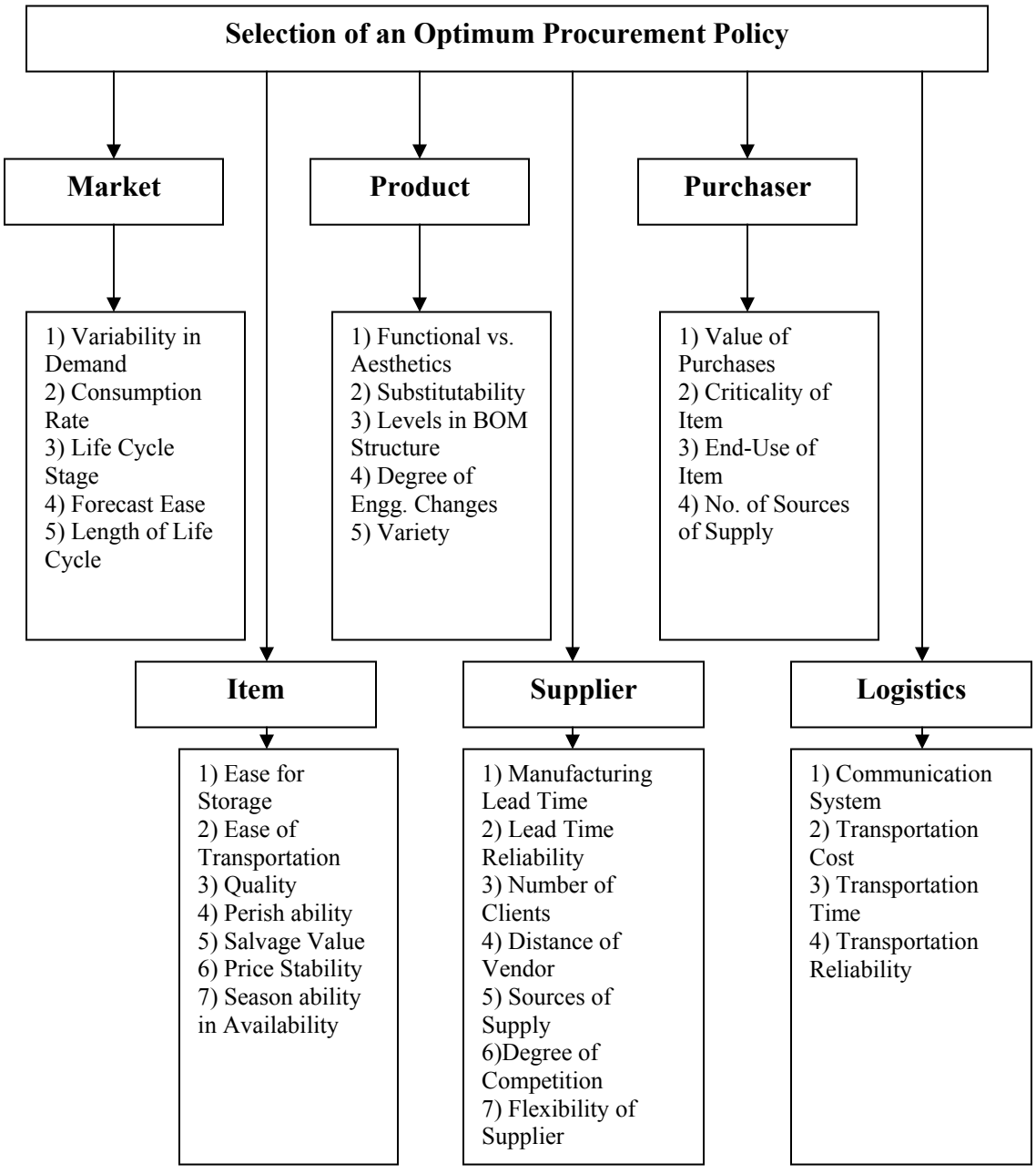

Figure 1: Overall Analytical Hierarchy Structure for Purchase Policy Selection

A) STEP1: Questionnarie Template

Table1: Designed Questionnarie Template

SR NO	MAJOR AREA/DEPT T RELATED	ATB R NO.	ATTRIBUTE	CHARACTERISTICS				
				1 (1)	2 (0.75)	3 (0.5)	4 (0.25)	5 (0)
01	Marketing	01	Variability in Demand	v.High	High	Medium	Low	v.Low
				▲	▲	■ √	■	■
		02	Consumption Rate	v. High	High	Medium	Low √	v. Low
				■	■	■	▲	▲
		03	Life Cycle Stage	Introductory	Growth	Steady	Maturity	Declining
				▲	■	■ √	■	▲
		04	Forecast Ease	v.Easy	Easy	Moderate	Difficult	v. Difficult
				■	■	■	▲	▲ √
		05	Length of Life Cycle	v. Large	Large	Medium	Short	v. Short
				■	■	■ √	▲	▲
02	Product (Design)	06	Functional vs. Aesthetics	Highly Functional	Functional	Moderately Functional	Aesthetic	Highly Aesthetic
				■ √	■	■	▲	▲
		07	Substitutability	v. High	High	Medium	Low	v.Low
				▲	▲	■ √	■	■
		08	Levels in BOM Structure	Too Many	Many	Moderate	Few	Flat
				▲	▲	■ √	■	■
		09	Degree of Engineering Changes	Never	Occasionally	Often Frequently	Frequent	Very Frequent
				■	■ √	▲	▲	▲
		10	Product Variety	Single	Double	Some	Many	Too Many
				■	■ √	■	▲	▲
03	Purchase	11	Value of Purchase of Item	A-Class	AB-Class	B-Class	BC-Class	C-Class
				■ √	■	■	■	▲
		12	Criticality of Item	Highly Vital	Vital	Essential	Desirable	Hardly Desirable
				▲	▲√	■	■	■
		13	End-use of Item	In Packing	In Assembly	In Manf.	Consumable	Spare
				■	■ √	■	■	▲
		14	Number of Sources of Supply	Single	Double	Some	Many	Too Many
				■	■	▲	▲ √	▲
		15	Ease for Storage	v.Easy	Easy √	Average	Difficult	v.Difficult
				▲	▲	■	■	■
04	Item (Quality Assurance	16	Ease of Transportation	v.Easy	Easy	Average	Difficult	v.Difficult
				■	■	■	▲ √	▲
		17	Quality(No.of Rejections)	v.Low	Low	Medium	High	v.High
				■	■ √	▲	▲	▲

04	Item (Quality Assurance)	18	Perishability (Shelf Life)	v.Short	Short	Medium	Long	v.Long
				■	■	■√	▲	▲
		19	Disposal/ Salvage Value	v.Good	Good	Medium	Less	v.Less
				▲√	▲	▲	■	■
		20	Price Stability	v.Stable	Stable	Moderate	Volatile	v.Volatile
				■	■	■	▲	▲
		21	Seasonality in Availability	Nil	Very Less	Less	High	v.High
				■	■	■	▲	▲
		22	Manufacturing Lead Time	v.Short	Short	Moderate	Long	v.Long
				■	■	■	▲	▲
05	Supplier (Quality Assurance)	23	Lead Time Reliability	v.Good	Good	Average	Poor	v.Poor
				■	■	▲	▲	▲
		24	Number of Clients	Single	Double	Few	Many	Too Many
				■	■	■	▲	▲
		25	Distance of Vendor	Nearest	Nearer	Moderate	Far	Farthest
				■	■	■	▲	▲
		26	Sources of Supply	Indigenous	Freely Available	Partially Controlled	Imported	Govt.Controlled
				■	■	■	▲	▲
		27	Degree of Competition	v.Low	Low	Moderate	High	v.High
				▲	▲	■	■	■
06	Logistics	28	Design Flexibility of Supplier	v.Flexible	Flexible	Moderate	Rigid	v.Rigid
				■	■	■	▲	▲
		29	Communicatio n System	v.Effective	Effective	Average	Poor	v.Poor
				■	■	▲	▲	▲
		30	Transportation Cost	v.High	High	Average	Low	v.Low
				▲	▲	■	■	■
		31	Transportation Time	v.High	High	Average	Less	v.Less
				▲	▲	■	■	■
		32	Transportation Reliability	v.Good	Good	Average	Poor	v.Poor
				■	■	▲	▲	▲

B) STEP2: Prioritization among the Six Major Considerations:

The relative importance of above six major considerations in context with the item under study (Diesel tank) is assessed subjectively consulting with the experts from the related department viz. marketing, design, purchase, quality assurance, logistics. Outcome is that the product, supplier and logistics considerations are very important from the point of view of purchase and storage of the diesel tank while Market, purchaser and item consideration are secondary as compared to them. Diesel tank cost Rs. 5000 per item and A class item. Why product supplier and logistics considerations are important explain in context with Diesel tank. The relative importance of these six major considerations are obtained by applying AHP.

Table 2: Relative Importance of the Six Major Considerations using Saaty's Scale

	Mar	Pro	Pur	Item	Sup	Log
Mar	1	1/2	1	1	1/2	1/2
Pro	2	1	2	2	1	1
Pur	1	1/2	1	1	1/2	1/2
Item	1	1/2	1	1	1/2	1/2
Sup	2	1	2	2	1	1
Log	2	1	2	2	1	1

Consistency Index = 0
For n=6,
R.I.= 1.24
Consistency Ratio = 0 < 0.1
Priorities of these major considerations are

Table 3:Priorities obtained of the Six Major Considerations.

Major Consideration	Priority
Market	0.1111
Product	0.2222
Purchaser	0.1111
Item	0.1111
Supplier	0.2222
Logistics	0.2222

Product, Supplier and Logistics considerations are the most important considerations having total weight age of 67% in deciding the suitability of the purchase policy. The weightage of Market, Purchaser and Item considerations together is 33%.

C) STEP 3: Prioritization among the Sub-Attributes of Each Major Consideration:

The Attributes under each major consideration are prioritized w.r.t. the relevant consideration and the priorities obtained are as shown in Tables 4 to Table 9.

Table 4: Priorities obtained among r Sub-Attributes of The Market Consideration.

Attribute	Priority
Variability in Demand	0.4786
Consumption Rate	0.0890
Life Cycle Stage	0.0890
Forecast Ease	0.1716
Length of Life Cycle	0.1716

Table 5: Priorities obtained among the Sub-Attributes of The Product Consideration.

Attribute	Priority
Functional Vs. Aesthetics	0.5228
Substitutability	0.1088
Levels in BOM Structure	0.1088
Degree of Engg.Changes	0.0619
Product Variety	0.1975

Table 6: Priorities obtained among the Sub-Attributes of The Purchaser Consideration.

Attribute	Priority
Value of Purchase of Items	0.4327
Criticality of Item	0.2391
End Use of Item	0.2391
No. of Sources of Supply	0.0889

Table 7: Priorities obtained among the Sub-Attributes of The Item Consideration.

Attribute	Priority
Ease of Storage	0.2895
Ease of Transportation	0.2895
Quality	0.1187
Perish-ability	0.0698
Salvage Value	0.0698
Price Stability	0.1187
Season-ability in availability	0.0438

Table 8: Priorities obtained among the Sub-Attributes of The Supplier Consideration

Attribute	Priority
Manufacturing Lead Time	0.1778
Lead Time Reliability	0.1778
Number of clients	0.0561
Distance of Vendor	0.2979
Sources of Supply	0.0967
Degree of Competition	0.0967
Design Flexibility of Supplier	0.0967

Table 9: Priorities obtained among the Sub-Attributes of The Logistics Consideration

Attribute	Priority
Communication System	0.1667
Transportation Cost	0.3333
Transportation Time	0.3333
Transportation Reliability	0.1667

D) STEP 4: Calculating the Local and Global Priorities and JIT Index:

Comparing the purchase systems w. r .t. the attributes of *Table 1,* the local priorities are derived. These local priorities are summarized in *Table10.*

Table10: Local and global priorities for JIT purchase of Diesel tank of HCV

Sr. No	Attributes	Priority	Local	Global
A)	Market Considerations	0.1111		
	1) Validity and demand	0.0531700	0.75	0.03988
	2) communication Rate	0.0098936	0.50	0.00495
	3) Life cycle stage	0.0098936	0.50	0.00495
	4) Forecast Ease	0.0190600	0.25	0.00477
	5) Length of life cycle	0.0190600	0.50	0.00953
				0.06408
B)	Product Considerations	0.2222		
	6) Functional vs Aesthetic	0.1161750	1.00	0.11618
	7) Substitute ability	0.0224175	0.50	0.01209
	8) Level in BOM structure	0.0241750	0.50	0.01209
	9) Degree of engg. changes	0.0137690	0.75	0.01033
	10) Product variety	0.0439044	0.75	0.03293
				0.18362
C)	Purchaser Considerations	0.1111		
	11) Value of purchase of items	0.0480828	1.00	0.04808
	12) criticality of items	0.0265664	0.75	0.01992
	13) End use of item	0.0264664	0.75	0.01992
	14) Number of sources of supply	0.0988423	0.75	0.00741
				0.09534
D)	Item Considerations	0.1111		
	15) Ease of storage	0.0321672	0.25	0.00804
	16) ease of transportation	0.0321672	0.25	0.00804
	17) Quality (No. of Rejections)	0.0131895	0.75	0.00989
	18) Perish ability (shelf life)	0.0077583	0.00	0.00000
	19) Disposal / Salvage value	0.0077583	0.75	0.00581
	20) Price Stability	0.0131895	0.50	0.00659
	21) Seasonality in availability	0.0048697	0.50	0.00243
				0.040824
E)	Supplier Considerations	0.2222		
	22) Manufacturing lead time	0.0395071	0.50	0.01975
	23) Lead time reliability	0.0395071	0.50	0.01975
	24) Number of clients	0.0124714	0.25	0.00312
	25) Distance of vendor	0.0662107	0.50	0.03311
	26) Sources of supply	0.0215011	0.75	0.01613
	27) Degree of competition	0.0215011	0.25	0.00538
	28) Design flexibility	0.0215011	0.75	0.01613
				0.11337
F)	Logistics Considerations	0.2222		
	29) Communication system	0.037033	0.75	0.02777
	30) Transportation cost	0.074066	0.50	0.03703
	31) Transportation time	0.074066	0.50	0.03703
	32) Transportation reliability	0.037033	0.50	0.01852
				0.12035
			JIT INDEX	0.61755

Table11: Selection of Proper Purchase Policy based on the value of Derived JIT Index

JIT Index	Purchase and Inventory Policy
0.9 and above	• JIT Purchase policy • Frequent delivery (2-4 Times / shift) • Small shipment size • Single source of supply • Long term contract • Less paper work • Elimination of in coming inspection • Stock to dock delivery • Exact quantity • Fair price
0.6 to 0.9	• JIT like policy • Delivery once in a day or once in two days • Single / two sources of supply • Long term contract • Some safety stock • Fair price
0.3 to 0.6	• Hybrid policy • Delivery once in a week • Safety stock • Conventional storage and issue
Less than 0.3	• Conventional purchase policy • Economic order quantity • Competitive price • Large safety stock • More storage area

4. RESULTS AND DISCUSSION

The value of JIT index as derived by considering global attributes is 0.61755 as shown in *Table 10* above. By referring to *Table 11* above, the purchase policy most appropriate for the purchase of Diesel tank of HCV will be JIT Like policy and not the JIT Policy. The characteristics of JIT Like Policy as enumerated in *Table11* are,

- Delivery once in a day or once in two days
- Single / two sources of supply
- Long term contract
- Some safety stock
- Fair price

While the characteristics of the existing Purchase Policy for Diesel Tank of HCV are enlisted below.

1) One delivery is received in a shift as the line capacity for temporary storage of this item is less.
2) There are two/three sources of supply.
3) Suppliers are located within 2-3 km. radius from the location of the plant.
4) Batch Quantity is average 60 tanks received in a shift.
5) Unloading of the tanks from the transport vehicle is directly on the line.
6) Dedicated logistics arrangements for easy unloading are provided.
7) Long term contract with the two suppliers exists.
8) 20-25 % safety stock is always maintained on the Line.

The characteristics of the existing purchase and procurement system resemble the JIT like Purchase Policy. This shows that the choice of purchase policy is situation specific and within the same company, different purchase practices are required for different items.

5. CONCLUSION

This paper demonstrated a generic approach that could be applied to evaluate suitability of implementing JIT in item procurement. Different types of existing procurement strategies are reviewed and a method is proposed for calculating JIT index to compare alternative procurement policies with a view to enter in a most favorable purchase relationship with appropriate supplier in a given situation, thus promoting a responsive and sustainable supply chain. The method helps to obtain a state explicit objective index, helpful as a decision support tool for today's executives for adopting the best suited procurement strategy for an outsourced item. The approach is well illustrated with the help of case study of a real Industrial problem from an Automobile Sector. The methodology involves framing of the Hierarchial structure with main and sub attributes and application of the analytic hierarchy process to relatively rank the attributes for calculating Local and Global priorities for an item in a given situation.

6. SCOPE FOR FUTURE WORK

Presently Industries plan to practice JIT purchasing for almost all the items to be baught. But JIT can not be always an appropriate policy to be exercised for all the procurements / outsourcing decisions as policies need to be situation specific. The model discussed with a particular case study includes maximum number of situation specific attributes which have a control on the purchase policy to be adopted but there can be a few more number of remote controlling factors over and above those explored in this model and the model also needs to be customized for particular industry and for particular type of items. Future work can also include validation of this methodology using other examples from industry.

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