Concepts on demand and supply chain-an analysis

Economics

Concepts on demand and supply chain-an analysis of innovative, conventional means of operations management with regard to the automobile industry

INTRODUCTION

Operations management is the methodology used to control the planning, organizing and controlling of resources at hand to produce the desired output as per the demand of the finished product in the market. The operational motive of the whole process is to meet the demands of both the customers and an economic institution such as a car manufacturing unit’s own demands.

Various resources have to be managed to ensure that timely delivery of the finished product in accordance with the demands of the market. The resources that need to be managed by planning, organizing and controlling are:

1. Physical resources such as customized automobile parts

2. Materials such as metal sheets required for casting of an automobile’s body

3. Human resources such as the labor force, designers and engineers

4. Time: this is the most essential element that needs to be managed effectively

5. Money

6. Information: this is another essential component of demand and supply chain management. Proper information is needed regarding a customer’s needs and demands, both current and subsequent in the future, inventory control, quality of supplies, condition of machinery and upgrades necessary, future competition in the market and human resource management, demands and control.

All the above components need to be adequately managed to ensure that quality products are manufactured adequately to ensure proper flow of goods into the market in just the right quantity to effectively meet the demands of the market and avoid wastages and over or under production. Due to the scope of the essay, the article would try to analyze the most important component, inventory control.

INVENTORY CONTROL

This is a very essential component in the demand and supply chain management process. The following diagram would outline the whole inventory control model based on basic verifiable components.

VARIABLE/CONSTANT INPUTS

OPTIMUM TOTAL COST FOR PURCHASING OR MANUFACTURING, INVENTORY HOLDING AND SHORTAGES

FEEDBACK MEASURES

GOAL INPUTS

INVENTORY MODEL

OUTPUTS

Before 1960, most of companies used to use a manual manufacturing system called the ROP or re order point systems which used to function on the principle that when component inventory used to fall below the pre set re order level, fresh components were to be purchased. This resulted in a pile up of component stocks because invariably stocks were ordered when not actually required. Similarly, a lot of money capital was being wasted due to such a pile up. An increased competition in the market and the increase in demands of the customers added with higher interest rates saw manufacturing companies rethinking the whole logic behind using such a technique for inventory control. With the subsequent development of informationtechnologycompanies started relying on computer-based systems for inventory control. Some of the later systems for inventory control are:

MATERIAL REQUIREMENTS PLANNING SYSTEMS: this was the most commonly used computer based system used by batch and mass production units. The various types of such a system are MATERIAL REQUIREMENTS PLANNING SYSTEM, CLOSED LOOP MATERIAL REQUIREMENT PLANNING and MANUFACTURING RESOURCE PLANNING.

JUST-IN-TIME Inventory system: one of the main reasons for Japan’s high productivity in manufacturing units is attributed to the success of cost reduction methods initiated by the introduction of this process. In this system, the supplier delivers the required components just in time for assembly. This system is also known as zero inventory or stockless production system. For JIT to work though, many requirements are to be fulfilled. The quality of the parts must be sufficiently high as a defective part can damage the finishing of the product and delay the whole assembly line,

a dependable and efficient working relationship has to exist between the company and its suppliers, and the supplying units should be situated as close to the manufacturing units as possible so as to reduce transportation costs and time taken for transportation.

COMBINATION OF MRP AND JIT: It may seem as if MRP and JIT are not compatible with each other but a closeobservationwould show that in practice both are well connected. The MRP is mainly based on the supply while the JIT is based on the demand. Therefore, a combination of both the processes would be complementary in nature.

OPTIMISED PRODUCTION TECHNOLOGY and THEORY OF CONSTRAINTS (OPT/TOC): similar to JIT in principle but based on complexmathematicsand computer-based systems.

PROJECT CONTROL: this system is used for manufacturing units, which produce limited products. Not used for batch production or mass production.

All the above systems are used to effectively plan, control and organize various aspects, especially inventory, to achieve optimal productivity in line with a customer’s demands. It has to be borne in mind that the manufacturing units can rely on any individual process or most commonly a combination of these processes at various stages of production in order to achieve its goal.

FORECASTING

Due to the scope of the essay, it would be necessary to understand the importance of forecasting in management processes. Forecasting is the process of predicting future market demands based on experiences of the

market. However, people tend to believe that forecasts can be like a weather report, accurate sometimes but not entirely accurate always because markets as in weather are subject to varying interests and in effect unpredictable. Even though inaccuracies may, creep up it is always recommended to forecast to ensure and enable the senior managers of the company and help them draft a plan based on past and current market trends. It enables managers to be both proactive and reactive.

Herein one would notice that sales forecasting is inherently connected to supply chain management.

Due to the scope of the essay, the essay would therefore be concentrating on only one aspect of production as relevant in contemporary times with acase studyof supply management techniques used by Malaysia's automobile giant, Proton Berhad. The essay would concentrate on supply chain management and inventory control processes only and thereby ascertain through scrutiny what an able inventory control process should be. The various aspects of inventory control as discussed before would therefore be seen to be valid and it can be ascertained whether it would be better to use any one of the systems or a combination of the above processes. The objective of the essay would therefore be to assimilate conventional management techniques employed by production industries in the automobile sector in both supply chain management and sales forecasting.

PROTON BERHAD- A CASE STUDY

HISTORY OF THE COMPANY

Proton is Malaysia’s national car manufacturing company. The company was founded in 1983 by the then prime minister of Malaysia, Dr. Mahathir Mohamad. Proton Holdings Berhad is the holding company of the automobile giant. Proton is an acronym for PeRusahaan OTOmobil Nasional. It produces cars in various segments and has a good overseas market. The flagship model of the company was the SAGA and initially the company used parts manufactured by Mitsubishi but later as skills were transferred the company started producing indigenous cars made entirely in Malaysia. The flagship car had rolled out of its first manufacturing unit at Shah Alam, Selangor.

FORECASTING TECHNIQUES

In trying to cope with the demands of an ever-changing market, the company has enlisted the use of various systems based on information technology, namely the logistics and IT solutions provided by the company SoFTAPP Group. The company provides IT software solutions to warehouse management and inventory control. The company also uses the JIT and MRP systems as well as the TOC/OPT system at various levels of production management. However, they would be dealt with later in the essay. Under this paragraph, the sales forecasting techniques would be dealt with.

The software solution provided by the aforementioned company is similar in principle to the TOC/OPT systems in that they provide software to deal with inventory control. The software is similar to the Sales Force Management System, which is also used by a number of leading companies. The system is based on a complex algorithm which takes into account current and past market trends in each car segment to enable sales forecasting.

Information system such as sales force management systems are used in the field of management and marketing which help to mechanize the sales and the functions of sales force management. They are often referred as CRM or customer relationship management system when sales force management system combines with MIS. The sales force automation system records the different stages involved in the process of sales. The SFA is characteristically a part of the customer relationship management system of the company.

The whole idea behind using such a system was to ensure faster study of data. Conventionally a manger would have had to study various sales reports in the past and then based on his judgments' would assimilate the data and reach a conclusion. By using this system the computer and the software does that work for him thereby reducing the chances of human errors in judgment, repetition of data, loss of data and helps to study the market more closely and the demands of the customers. Thereby it effectively reduces the time taken for such a forecast and therefore helps in achieving a more efficient and effective system.

The sales force automation helps the sales managers to save time needed to assimilate all the call sheets, and represents data in front him in easily understandable graphs, charts and tables. The organization would be able to achieve a more hands on approach while dealing with activity reports information booklets etc and therefore enable him to achieve a better understanding and control of inventory. Mangers would be able to detect psychographic, demographic and behavioral trends of the customers and would get better idea of product acceptance in the market and be able to understand the product related problems in the market. The most monetarily

beneficial and problematic areas of the customer base can also be studied. In addition, all these data are provided in a very user-friendly manner. Additionally, the managers would also be informed about market competition in the various segments and would thus help in the pricing policy of the products.

Therefore, by using such a system the company has been able to study the requirements of the market very closely and thereby has been able to adjust its productivity in line with its approach towards JIT management of inventory. This software has also been able to provide guidelines on the marketing strategy of the company. Therefore, one can conclude that this system has been able to provide solutions in enhancing and optimizing productivity of the company. However, this has been only one aspect. The other major reason for its optimal productivity has been its approach towards supply chain management and inventory control. This would be dealt with in the following sections.

EFFICIENT RESOURCE MANAGEMENT

(Source: http://scholar. lib. vt. edu/theses/available/etd-09142004-235255/unrestricted/NM_Thesis_Final. pdf; page 4)

In these uncertain times, it is also necessary to be prepared against uncertainties and therefore an effective resource management plan is necessary. The diagram provided at the start of the topic outlines the necessary steps that would be required. It is mandatory to predict a set of uncertainties that may plague production in the future and effective planning

tools need to be used to formulate the safeguards against such eventualities. Therefore, this may also help in determining the volume of goods to be provided and the inventory to be maintained. It is necessary to closely study all the possible scenarios and be adequately prepared to meet the consequences of such eventualities. Solutions that are to be provided are to be flexible because excess caution can also lead to overproduction and pile up of goods.

SUPPLY CHAIN MANGEMENT

(Source: http://www. econ. upm. edu. my/ijem/vol2no1/bab02. pdf; page 34)

The above two diagrams illustrates the various customized automobile parts that the company purchases from its vendors. Initially the company used to use parts manufactured by Mitsubishi but as the company and country developed the parts that were procured were more from local vendors. This is case of local outsourcing.

PROCUREMENT OF PARTS

Currently the company has been facing many issues regarding the mature, scope and prospect of procurements of parts. Of these, the company has identified local outsourcing as a major issue. Does procurement of parts not only locally ensure cost effective procurement but also affects the pricing policy of the car. Additionally the cars manufactured are predominantly meant for the local market and therefore use of locally manufactured and procured parts seems more logical. The company however imports many parts especially those related to the engine, transmission and fasteners. This

is because these parts are procured through joint ventures of the company in Japan or these parts are already patented by Mitsubishi.

The company has a guideline made for its suppliers based on both quality of service and time and obviously cost. The company has long-standing relationships with its suppliers and has therefore a good working rapport. Additionally a continuous monitoring system of suppliers is in place.

(Source: http://www. econ. upm. edu. my/ijem/vol2no1/bab02. pdf; page 49)

On close observation of the processes it can be noticed that inventory control is based on JIT and its variant TOC/OPT. TOC/OPT relies heavily on software systems but are similar in principle to JIT. The main mathematical formula that is used is

Where, Qe = economic order quantity

D= demand per year

S= setup costs

H= inventory holding (carrying) cost per item, per year

(For the source material of this above formula kindly, refer to “ literature references 2”)

This is just one of the formulae that are used. The software calculates based on various other complex algorithms, which study the trends in the market. Therefore hence again the importance of sales forecasting can be ascertained.

The idea is to have a close understanding of the demands of the market and thereby procure spares and other parts based on the predictions and thereby

avoid wastages and pile up of inventory. This makes the overall production system more cost efficient thereby affecting the pricing policy of the company.

The company has also been toying with the idea of incorporating the CATER or Computerized Automotive Technology Reconfiguration systems for mass customization of cars. This system was introduced to the managers of Proton in 2007. The system is another software-based system that would help car manufacturers in mass customization of the car and its parts to suit the demands of consumers over the years. Over the years the choices and preferences of consumers have been varying and there has been noticed a significant change in the type and class of cars that are in need today. People tend to buy cars, which suit their physical and emotional needs. The software acts as a database, which would help manufacturers in their modular customization and personalization of their products, based on both the demands of the customers and suppliers.

Techniques of forecast

A substantial number ofacademicliteratures can be found that justify the degree to which the growth from diversification of equity portfolios result from divergences observed in industrial structure in various aspects. However, when it comes to the subject of using the comparative significance of the factors such as forecast and actual value category in order to elucidate the cross-sectional distinction of proceeds to detailed company securities indices, it is seen that the area is much under researched. This lack of documentation comes as a surprise as it may be argued that company forecast security diversification may perhaps be more effectual

than stock diversification. It has been found that securities present broader diversification across continents as compared to international common stocks. Further, researches also reveal that correlations amid indices are considerably lower when evaluated against the correlations found among stock and bond indices.

The fact that correlation among the company securities markets is found to be exhibiting appreciably lower values can be observed in various research documents in the relevant field. Yet, little or practically no efforts have been made to give an explanation for why indices show signs of such incongruent behavior. On the other hand, it has been observed that quite a number of researches have been carried out in the financial economics domain in an effort to explicate the low correlation found among equity markets. Studies divulge that one explanation for the same is that country-oriented features are significant in the elucidation of return variation and should be considered with much appreciation. Another important factor to be considered in order to explain the return alteration is the significance of industrial composition. Industries are improperly correlated. Consequently, realms with diverse industrial configuration exhibit inappropriately correlated equity markets.

The disparity in the return of a given automobile forecast and actual figure can be accredited to one of numerous aspects, embracing the following as well: 1) a general feature return applicable to every single turnover, 2) general deviation in the financial year in which the forecast is based, and 3) the model type grouping in which the forecast fits in. The remaining deviation can be ascribed to other causes uncorrelated with actual, yearly or projected type impacts and can be categorized as forecast-specific deviation.

The subsequent representation for the return on the forecast and actual data that fits into the property type group j and nation k is put forward as follows:

Rit = ? t +? jt + ? kt + eit .. (1)

Here ? t is the general global factor return applicable to forecast during the time period t. ? jt is the property type influence, ? kt is the actual impact, and eit is the security-specific interruption. Formulation (1) permits different impacts of property type and model influences, but discards any relations among these factors. It is supposed that that the security-specific interruptions have a zero average and restricted variance in relation to returns in each forecast and model type groups, and are uncorrelated among automobile. Data for automobile indices situated across forecast data spread over four projection type groups is considered. A projection dummy Pij is formulated which is equivalent to one if security i fits into property type group j or else and is considered to be zero. A forecast dummy Cik is taken into account which is equivalent to one if actual turnover i fits in to nation k or else is considered zero. For every period t we can redraft formulation (1) as:

Ri = ? + ? 1Pi1 + ? 2Pi2 + ...+ ? 4Pi4 + ? 1Ci1 + ? 2Ci2 + ...+ ? 17Ci17 + ei ..(2)

Cross-sectional projection for Equation (2) across the four forecast type groups, P, in all of the actual results, C, put through the following restrictions:

Here wj and vk indicate the value weights of forecast type category j and actual k in the world market portfolio of automobile market. The least

squares estimate of the intercept in equation (2) represents the return on the value-weighted world market portfolio of automobile forecast. Given that the estimated interruption are statistically unrelated to each property type as well as forecast dummies by structure, the mean residual is negligible in all property type groupings and in every forecast. Further, because the market index is merely the value-weighted mean across every model type and actual result, the mean interruption for the value-weighted automobile market index is also negligible. The least-squares approximation of ? can therefore indicate the value-weighted automobile market.

The cross-sectional regressions per month capitulates the model and forecast type coefficients. These coefficients ?’ and ?’ are deduced as the approximated pure forecast type influence and approximated pure actual impact. The pure actual type return is the least-squares approximation of the return on a model diversified portfolio of companies in the jth model type group. With relation to this context, a internationally diversified portfolio possesses an identical model configuration as compared to the automibile securities market and is consequently liberated of company constraints. Likewise, ?’ + ? k’ is an approximation of the pure return on the company portfolio, k.

This approximation method permits a decomposition of , the authentic value-weighted index of nation k, into a factor that is applicable to every forecast, ?’, the value-weighted mean of the model type influence found on the exclusive composition of the elements that comprise of its index, and a forecast-specific factor, ? k’, as follows:

Here Xkj stands for the fraction of the entire market capitalization of model forecast k belonging to moel type group j. Formulation (4) asserts that the return on a forecast index can be at variance with the return on the automobile market portfolio and can be accredited to the following rationales: 1) the model type configuration of the nation varies from the forecast portfolio and 2) the returns on the model vary from the returns on forecast within the same model type groups in different forecasts.

Correspondingly, all value-weighted index return, , can be broken up into a constituent that is applicable to every type grouping, ?', the value-weighted mean of various model and forecast factors, and an actual model type-oriented factor, Bj, as follows:

Here ? kj denotes the fraction of the capitalization of the overall model index comprised of model's j's forecast. It should also be noted that there are no interruption factors are considered in formulation (4) and (5) for the reason that for all models and forecast type, the residuals are considered negligible by construction.

CONCLUSION

Even though newer technologies are being incorporated in manufacturing of cars and in effect, any other product based on customer and market needs, the process of supply chain management and in effect, that of the operational management still stays at the basic principles of JIT and MRP. What the newer systems are doing is build on these principles and present data in a more effective, user friendly way. It also reducing the amount of time that would be required to process the data and therefore provide ease

in calculating and predicting market trends. It would be prudent to note that markets are always volatile and people’s choices and preference keep on varying. The cash flow in the market is also not entirely predictable. Therefore, even though the systems are highly subjective and exhaustive the results obtained might not entirely be accurate owing to this aforementioned reason. The sales of automobiles manufactured by Proton have seen a significant drop in sales recently and the company predicts that even though they might have a joint venture coming up it would take them eight whole quarters to revert the losses sustained in the last three quarters as mentioned on February 2007. In spite of such setbacks that might occur it is imperative that effective procedures for operational management of the demand and supply chains be maintained. It is necessary to evaluate and be prepared against any possible fluctuation in demands in the market or changing trends. Therefore, it is mandatory that sales forecasting include within itself the uncertainties of the market. It is through such a harmonious and efficient system that a balance between the demand and supply chains can be accomplished.

References:

LITERATURE REFERENCES:

Koontz, Harold ; Heinz Weihrich; 2006; Essentials of Management –An International Perspective; 6th edition; Tata-McGraw Hill Publishing; page 388

Koontz, Harold ; Heinz Weihrich; 2006; Essentials of Management –An International Perspective; 6th edition; Tata-McGraw Hill Publishing; page 387

REFERENCES from the net:

http://www. econ. upm. edu. my/ijem/vol2no1/bab02. pdf

http://www. iomnet. org. uk/uploaded/documents/D4extract. pdf

http://scholar. lib. vt. edu/theses/available/etd-09142004-235255/unrestricted/NM_Thesis_Final. pdf

http://www. cater-ist. org/docs/D972-Dissemination_plans. pdf

http://www. bloomberg. com/apps/news? pid= 20601080; sid= axpaLGfllBA; refer= asia

http://sfapp. com/clients. htm

http://en. wikipedia. org/wiki/Proton_(carmaker)

http://announcements. bursamalaysia. com/EDMS/subweb. nsf/7f04516f8098680348256c6f0017a6bf/b6742b0a4af8d26d4825749d002ebe35/$FILE/PROTON-Cover%20to%20Page%2080%20(3MB). pdf

APPENDIX:

Pattern of sales in the last five years

(Source: http://announcements. bursamalaysia. com/EDMS/subweb. nsf/7f04516f8098680348256c6f0017a6bf/b6742b0a4af8d26d4825749d002ebe35/$FILE/PROTON-Cover%20to%20Page%2080%20(3MB). pdf; page 42)

Revenue earned in the last five years

(Source: http://announcements. bursamalaysia. com/EDMS/subweb. nsf/7f04516f8098680348256c6f0017a6bf/b6742b0a4af8d26d4825749d002ebe35/$FILE/PROTON-Cover%20to%20Page%2080%20(3MB). pdf; page 43

Increase in percentage in sales volume

(Source: http://announcements. bursamalaysia. com/EDMS/subweb. nsf/7f04516f8098680348256c6f0017a6bf/b6742b0a4af8d26d4825749d002e be35/$FILE/PROTON-Cover%20to%20Page%2080%20(3MB). pdf; page 48)

;