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Research Article

Lean Cost Management Analysis on Food Processing Enterprise

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Abstract: The aim of this study is to introduce Lean Cost Management (LCM) that tries to create creating value for customers and performs whole cost management in enterprise's entire life cycle under structure of target cost, cost sustaining and cost improvement guided by reverse thinking into food processing enterprise to construct LCM system from aspects of external value chain analysis as well as internal cost management. Dynamic pricing game model was used to provide cost improvement on food enterprise value chain so as to minimize whole cost. The target cost was divided into each part in design phase supported by cost programming, cost reduction and cost improving. Case study shows that such cost suppressing method can reduce cost of food processing enterprises and improve long-term competitiveness.

Keywords: Cost improvement, food processing enterprises, lean cost management, value chain optimization

INTRODUCTION

Competition of food industry in the international market is increasingly rough. Although production of China's grain, vegetables, fruit and meat rank first in the world, the processing degree is shallow. There are more semi-finished products, while less finished goods. On the contrary, 90% vegetables in Europe, Japan and other countries have been processed before circulation. While in China, such ratio is less than 30%. The processed apple in German accounts for 70% in total production, while ratio of which in China is less than 10%. In the international market, main competitors of food processing enterprises are developed countries, while domestic market also faced with competition from multinational companies in same industry. Therefore, it is urgent for food processing enterprises to consider about reasonably improve success rate, optimize flow and eliminate waste so as to reduce production costs and increase profits. Currently, food processing industry is faced with many problems, which can be divided into two aspects as external problems and internal problems. Outside the food processing enterprises, main problems include improper requirements management; value chain lack forward insight; inventory problem and slow response problem. Inside the companies, production of foods in the processing enterprises has feature of small quantities and many spices, which are all customized according to orders from customers, resulting in poor applicability. Different product has different working flow, process requirements and production parameters of which are also different. Such enterprises have typical problems as follows: slow production efficiency caused by discrete production layout; slow production line utilization ratio in different workshops; reduced production efficiency resulted from non-standardized working.

The door into food industry is low and tech is not high, but it has long-lasting vitality to attract a large number of enterprises entering into market competition. Cost management plays vital role if we want to stick a heel in rising raw material market and further to find appropriate development path. The core of LCM is cost management. As same as lean production process management, LCM also guided by reverse thinking and based on unique cost management idea that change addition to subtraction. The traditional cost management formula is cost + profit = price, while LCM change it into price-profit = cost. We can acknowledge that subtraction of predefined enterprise profit from acceptable price by customers is target cost. LCM adapts to food processing enterprises with multiple batches and less bulks to meet market requirements and enterprise development needs. As advanced management mode, LCM strengthens connection of parts along value chain from outside and promotes cost improvement of partners, so as to eliminate waste and optimize flow from inside, which improves cost with reverse thinking (Wu and Wee, 2009; Rachna and Peter, 2007; Cachon *et al*., 2005).

The study tries to establish LCM system of food processing enterprises from two aspects of external LCM and internal LCM. Dynamic valuing fame model was used to provide cost improvement along food industry value chain, so as to achieve lowest in the whole cost. Using cost planning, cost reduction and cost improvement to divide target cost in the design phase to each part.

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PRINCIPLE AND METHODS

External value chain optimization: According to value chain theory, external value chain of food processing enterprises refer to whole process from raw materials in the very beginning to final production. We regard value activities of core enterprises, suppliers, vendors and customers as a link. These value activities constitute a chain relationship after been connected. Industry value chain analysis centered on food processing enterprises means identify role and position of it in value chain from aspect of industry. It regards relationships among competitors in same industry, suppliers, vendors and customers from strategic level and seeks for overall cooperation for cost reducing methods (Chen and Xu, 2011; Zhang, 2010). The content of food processing enterprises value chain analysis is as following: after industry location and actual circumstance analysis on enterprises, optimize and integrate external value chain so as to further reduce cost and achieve cost advantage. Thus, we need to analyze vendors, suppliers and customers respectively to select appropriate partner with reasonable cost and establish collaborate alliance to reduce cost as well as expand profit margin, thus achieving a win-win business of each enterprise along value chain.

Cost analysis and optimization of supplier value chain: Suppliers are located in upstream of value chain, which is responsible for providing raw materials for enterprises. The product quality, delivery speed, price, technological development level, price as well as after service have improve impact on cost of core enterprises. Best suppliers can not only meet product quality, reduce procurement cost and stable supply, but also add value to enterprises products, so as to play positive role on reduce enterprise procurement cost as well as improve competition advantages. Therefore, it is necessary for food processing enterprises to perform classified management on suppliers. They can select appropriate suppliers based on own needs to optimize cost target as well as establish long-term strategic partnership with suppliers.

Enterprise upstream suppliers undertake important task for supplying production materials. The quality, price and delivery speed will impact on enterprise production cost. An stable, long-term supplier with core competition is an important factor for reducing procurement cost and improve market competition (Hallam, 2010). Cost optimization analysis aiming at value chain of suppliers is of very important role on avoiding unnecessary cost. Suppliers and enterprises have coexist and mutually reinforcing relationship.

Enterprise can help supplier improve raw material by acknowledging whole production process of suppliers, so as to provide better products. Effective communication to coordinate batch arrival and time as well as transportation way can avoid loss caused by needed raw materials, labor cost caused by backlog, capital cost and time costs.

We use working cost method to select supplier model as following:

$$S_i = P_i \times Q + \sum_{i=1}^{n} C_{ij} D_{ijj} + \sum_{i=1}^{n} C_{je} D_{ije} + \sum_{i=1}^{n} C_{jw} D_{ijw} \quad (1)$$

where,

S_i = Total cost caused by the i^{th} supplier
P_i = The unit price of product provided by the i^{th} supplier
Q = Purchase number of enterprise to the i^{th} supplier
C_{ij} = Cost drive rate of the j^{th} indirect cost caused by purchase from the i^{th} supplier
D_{iji} = Cost drive number of the j^{th} indirect cost caused by purchase from the i^{th} supplier
C_{je} = Cost drive number of the j^{th} additional work cuased by i^{th} supplier
D_{ijw} = Cost drive number of relationship maintenance cost of the i^{th} supplier

In (1), $P_i \times Q$ is total direct cost of purchase; $\sum_{i=1}^{n} C_{ij} D_{ijj}$ is indirect cost; $\sum_{i=1}^{n} C_{je} D_{ije}$ shows relationship maintenance cost with supplier. Obviously, under premise of similar conditions, when S is the minimum, namely the procurement cost is at the lowest, the selected supplier is most favorable for enterprise development. Therefore, working cost method aims at determine supplier by purely compute cost of enterprises in the procurement process.

Cost optimization model on industry value chain: Vendors are at downstream of value chain. They always interact with final customers in the value chain and own large amount of market demand information, which is also key point to achieve product value. Therefore, selection on vendors also has significant role on maintain core competitiveness of enterprises. Vendors with larger market share and stronger sales can provide more useful information to core enterprises, such as product feedback information and sales information. Core enterprises can improve products or develop new ones according to customer demands to enhance competitive advantages of enterprises.

As to core enterprises, it is important for classified management on vendors to achieve LCM on them. Different types of vendors have different impact on enterprise cost and profitability. Cost enterprises needs to reduce cost with aims and improves enterprises value improvement space. Secondly, improve relationship with vendors. Vendors are direct customers of core enterprises. Win the customers means win the market. Keeping long-term and stable partnership with customers can maximize common profit as well as

achieve customer value and core enterprise value. The paper focuses on dynamic value gaming based on multiple partners.

Now, we analyze cost optimization model of industry value chain based on dynamic pricing system model from upstream and downstream introducing aspects from suppliers, vendors, sellers and customers.

Assumption conditions: Assume upstream enterprise supplier A, core enterprise B, vendor C and downstream customers consisting an industry value chain. A provides intermediate products to B. The products of B are sold by vendors, which is the final product of whole value chain. It is directly faced with customers. Enterprises are rational. Joining into industry value chains aims at purchasing profit maximization in long-term. A, B and C are independent enterprises and strategic alliances. Production outputs of upstream and downstream enterprises along industry value chain are matched. The upstream enterprise A is production side based on price. The downstream B and C are production recipient sides according to core of JIT and assuming recipient of B and C are consistent. The product is finally provided to C for final customers after sold and produced from enterprise B, which has a value-added space. Now we give description of intermediate product dynamic price adjustment participated by multiple sides.

Dynamic model description: Traditional dynamic value gaming is always confined between two partners, namely production recipient and price recipient. Based on assumption that optimal production is linear, seek for maximum convergence point of both overall profits. With the rapid development of economy, there are more and more value chain participants. It has not been able to meet current rapid economic development momentum only confined to overall maximum benefit of two sides. Therefore, the problem should be paid more attention is to analyze on dynamic price in case of multiple sides in the value chain to achieve maximization of profit of whole value chain. Industry development just oriented to market demands. When the market demand amount is large, the vendors engaged in sales of such product are bound to increase. The processing enterprises are impacted by sales production demands. The vendor product is bound to increase and supply exceeds demand. The shipping price from suppliers will inevitably increase. With such increasing, it will also affect price of vendors. The demand number from customers under high price may be affected. Such relationship from three sides form the dynamic price gaming.

The formulation of enterprise strategy is based on market demands. The demand amount reflected by market in same period is certain and then price from vendor is also fixed. If the demand maintains a high level, multiple participants in the industry value chain will select and been selected in cost and profit control strategy. They choose to maintain status quo or change procurement amount, or change price of intermediate. Compared profit under three circumstance, the decision can been made. While market demands keeps a low level, participants of value chain will select different types of suppliers to obtain higher profit. Therefore, multiple sides participated dynamic price gaming needs to reasonably control price and purchase amount and comprehensively make decision. Under the premise of assuring customer satisfactory, select right suppliers to seek for equilibrium point of profit maximization among sides, so as to maintaining industry leading in the more intense competition.

Internal cost management: The LCM within food processing enterprises can be divided into following steps. Firstly, determine target cost for continuous improvement of enterprise in the product design phase and then divide it to make feasible target in each phase. Reasonably optimize and configure enterprise resources to perform guiding plans and arrangements on enterprises cost. Subsequently, cost reduction method should be used to protect successfully implement of lean cost management in the production phase. Finally, aiming at existing problems in the production, the flow can be optimized to eliminate various wastes to improve cost.

Cost planning: Cost planning is divided into two levels, namely market-driven cost planning and product-level cost planning. The market-driven cost plan should be accomplished before target cost planning to determine production level, determining permitted cost by market. The application of LCM in cost management just change compute formula that price = cost + profit into cost = price-profit. According to cost planning theory in the design phase, the permitted cost = target sales price-target margin profit (Jiang *et al*., 2011; Azevedo *et al*., 2012). However, the permitted cost obtained from above computation method is based on premise of neglecting components supplier and product designer decreasing cost. It cannot ensure target cost and permitted cost in product level is consistent with permitted cost.

In the cost planning process of product level, designer should develop product meet demands of customers in the permitted cost scope. The target cost in product level = current cost - cost reduction target to be achieved. Based on such way, establish target cost firstly. Secondly, divide target cost into smaller unit according to product nature so as to achieve pressure partial of target cost. Finally, regard whole process of product formation as process analysis on cost generation, such as minimum of cost in the procurement, design and production phases. Main manners to achieve such process are Value Engineering (VE) analysis. The VE method just achieve target of necessary functions

using minimum cost in whole life cycle. It is not simply to reduce costs or improve the functions of emphasis on product, rather to seek for best combination of cost and functionality point, thus enhancing value of product.

Cost reduction: Cost reduction in food processing enterprises acts as an effective way to deal with reasonably control budget and planning on processing enterprises. It seeks for potential from internal enterprise, improving production ability and working efficiency. The effective expenditure is replaced by ineffective spending to avoid waste, reducing enterprise production cost and improving production efficiency of enterprise. The direct objects of reduction role in food processing enterprises are entities as components, semi-finished and finished products. The LCM in production and processing phase just based on the long-term cost reduction target, optimize the allocation of resources, policy integration for the food processing enterprises to provide a long-term cost-cutting approach.

The cost reduction to be executed in food processing enterprise has following methods. One is to improve technique and reduce cost. Another is to implement lean cost management and reduce cost. The third one is using working cost management to reduce cost.

Cost improvement: The cost improvement in food processing enterprises means eliminating various waste in the food processing completely to achieve target of cost reduction. After analysis on cost waste of food processing enterprises, we can divide content of cost improvement in food processing enterprises into following types.

Excess production factors waste, such as excessive labor, material inventory and machinery, resulting in higher wages, depreciation and interest expense.

Much production or too much waste in advance: The products of food processing enterprises have features as not long production cycle, short shelf life, species diversity and low production. It requires enterprise carry out pulling production guided by the target to increase value of customers. Excessive or manufactured goods in advance will both cause resource waster and give heavy burden on inventory costs.

Waste caused by too much products in progress. The accumulation of products in progress in plants of food processing enterprises not only leads to low space utilization, but also affects working efficiency of production line, thus bringing immeasurable loss to enterprise cost.

Waste caused by unnecessary handling and warehouse management as well as too high quality requirements.

EXAMPLE AND RESULT ANALYSIS

Enterprise profile: The problems and development transformation opportunities existing in food processing enterprises also adapt to HA group. HA group is one of China's catering industry leaders that mainly operate pot. There are 60 stores in China now. With continuous growing of HA group, the internal business of group gradually evolved into two major sections, namely store operation and logistical supply chain. Special company is responsible for store business now. In order to ensure food quality and food safety as well as reduce store kitchen and increase profit, the group provides unified raw materials for finishing dishes and distribution services. Furthermore, they seek to provide similar service for other restaurants to establish a restaurant industry supply chain service provider. Thus, an independent food supply chain service company established as company A.

As supply chain section in two major sections of HA group, company A undertakes responsibilities that HA dishes raw material purchasing, processing, warehousing, distribution and sales. Learned from the current situation, cost accounting is based on two different objects, namely internal sales within HA group and external sales. As to internal sales, company A is not operating as stand-alone profitable company. Company A and the internal stores did not carry the cost of internal transfer pricing for profitability analysis. Company A is undertaking a store logistics functions, i.e., company A is currently based on a breakeven point as a prerequisite, after the cost proportion of the cost of various statistics and quarterly rolling as the next stage cost control, assessment basis. Therefore, at this stage of history is a reflection of cost accounting and is a summary of all the dishes reflect, not a single dish cost structure accounted for and display, but cannot provide pricing for a single dish most direct input. External sales: foreign sales, the current proportion of sales accounted for less while costing and statistics used in the same way with the internal sales, so the lack of a reliable basis in the offer.

Lean cost analysis and improvement of external value chain: According to industry value chain analysis on HA group and its subsidiary company A, it contains four components, namely raw material supplying from suppliers, purchasing and processing in company A, storage and distribution, sales and customer service in HA group.

Food industry requires a lot of raw materials as vegetables and meat. Thus, in order to ensure the production, departments in company A must share with nearby vegetable producers to form a marketing alliance. The two sides signed a supply contract. The purchasing department in company A acquisition from vegetable producers with given amount in time. The

price should also be determined under bilateral cooperation. In the study we also found that changes of purchasing amount has important role on selection of company A to select long-term or short-term supplier. Long-term supplier product integrity is high, supporting good service, standard price is low, but needs maintenance cost, short-term vendor products good rates relatively low, but the product price is also low, no maintenance costs. According to the demand of different procurement, A company of supplier selection strategy is not the same, optimized A company's supplier cost management.

According to dynamic price analysis, under the premise of market demand as main orientation, find out the optimal solution to meet the parties on the basis of combined costing again, we can choose the most suitable value chain upstream enterprise. As to cost optimization between company A and vendors, based on the A and HA group companies (vendors) supply relationships, the overall profit maximization is what group wanted. The introduction of customer pricing element enables formulation of enterprise strategy more in line with actual situation to reduce cost

Dynamic price analysis in company A, combined with suppliers, buyers, vendors, customers quartet needs through information distribution network, for each product to make timely and accurate market positioning. If the vendor prices of certain products to customers demand change impact is not significant, then we do not have to supply customers prices into account, but if the sales prices of certain products supplier to customers demand change impacts large, you will need to carry out effective enterprise data analysis, so as to effectively save costs, reduce inventory and achieve win-win situation.

Case study of internal lean cost management: Company A achieves minimum of S product cost in the design phase with cost planning, which has accumulated practical experience for LCM in this company. In the implementation process, we have to note that the cost of setting goals is not just the cost of the planning stage, but a program of products and processes of continuous improvement process. Therefore, it needs product at all stages of the members, such as production, sales, manufacturing, etc. excellent staff work together to market the product design stage to achieve accurate positioning. In a word, successful implementation of cost planning needs to be lean production methods based on cultural background as well as give full play to human creativity and the role of the idea of continuous improvement.

The direct activate object of cost reduction in company A is various elements in the production processing phase. Aiming at long-term cost reduction, optimize resource configuration to execute guiding control internal resource consumption as well as cost, thus keeping potential in low cost to increase positive results with positive attitudes and actions efforts. We mainly take measures from following aspects to gain cost reduction in the production phase. First, improve handling method. Secondly, lay out U-shape production line. Thirdly, develop multi-functional employees. Fourthly, maintain equipment better. Fifthly, carry out 5S activities. At last, conduct lean quality management activities.

Cost improvement in company A means thoroughly eliminate various waste in the production and processing phase to reduce cost. As to actual production in company A, there is a lot of waste in three areas as production workshop layout, process flow and pipeline scheduling, which should be main content for cost improvement. In the cost improvement, we mainly performed layout optimization, process optimization and labor cost improvement.

CONCLUSION

Using manner of lean cost management theories and enterprise actual situation, the deficiencies in traditional cost management mode was analyzed and status in food processing enterprises was concluded. The idea and tool of LCM was introduced into food processing enterprises to construct general food processing enterprises lean cost management system. It lays emphasis on two aspects of reducing cooperation cost of external value chain and improve cost management mode within enterprise. Thus, the enterprise can reduce cost from aspect of external environment thoroughly, but also improve core competition from enterprises to achieve long-term development. In the next research, we will focus on constantly test theoretical effect in the practical process of executing lean cost management to improve problems and constantly improve LCM modes of enterprises.

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