LEAN MANUFACTURING AND KAIZEN COSTING: BRIDGING THE COST MANAGEMENT GAP

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Introduction

In the last decade, many US manufacturers have experienced fierce global competition and have adopted lean manufacturing practices in order to compete in the international market. Many US firms, however, still rely on traditional costing systems to control costs at the manufacturing phase. These cost management systems are not supporting lean manufacturing objectives and are often in conflict with strategic goals of the firm [1,2]. Kaizen costing has increasingly been adopted as a new cost management tool and philosophy to support lean manufacturing in Japan.. The focus of kaizen costing is on continuous cost reduction. The purpose of this article is to describe and prescribe financial measurement metrics essential to the successful implementation of lean manufacturing. The financial metrics described in the paper were developed and actually implemented in the Boeing Company IRC.

According to Berliner [1] current cost accounting and cost management systems utilize performance measures that are often in conflict with strategic manufacturing objectives, and they can not adequately evaluate the importance of non-financial measures such as quality, throughput, and flexibility. For example, lean manufacturing is about simplifying processes and removing waste. Therefore, appropriate measurement metrics need to be developed that clearly reflect the goal of lean manufacturing which is to identify what is and is not waste [10]. Standard costing systems, however, focus on meeting a cost standard and avoiding unfavorable variances. What is needed is a costing method that stresses continuous cost reductions [11]. Target costing is a process for ensuring that a product meets or exceeds customer requirements for quality, functionality, and price. That is, target costing is key to attaining and sustaining product competitiveness [4]. The emphasis of Kaizen costing is on gradual ongoing cost reductions.

Target and Kaizen Costing

Increased pressures within supply chains, coupled with new pressures from capital markets are forcing firms to adopt Japanese cost management systems [5]. Japanese manufacturers have known that financial measures are still vital in running a lean production system and have tailored their cost management systems to support this purpose [6]. They have, however, separated cost *management* from cost *accounting*. In Japan, cost management is proactive in planning, managing, and reducing costs, as opposed to the historical backward looking focus of cost accounting [1]. As Robin Cooper states in his study of Japanese manufacturing, “only by sharing the relevant

cost…information could management expect the workers to be able to most effectively achieve cost reduction by setting and committing to sensible targets" [2]. In other words, employees must have access to related cost data to meet set targets.

Japanese firms consider cost reduction as the single most critical measure in lean manufacturing. They believe the consumer will only buy the product if the price is less than the perceived value of the product. As such, there are only two ways to make this happen, increase the perceived value of the product or lower the price of the product by lowering the costs required to produce it [9]. Target costing and kaizen costing are both used to lower price.

The key to target costing is the principle that the *market* sets the price, not on what it actually cost to produce the product. The firm then sets the desired profit margin and the remainder is the cost that must be attained. The target cost is established by the difference between target profit margin and selling price. The target cost is used to control design and manufacturing costs [3]. It is estimated that 80% of product cost is locked during design, therefore making it difficult to achieve major cost reductions after this phase [11]. Design for manufacturability affects design costs, but will not be discussed in this paper. The remaining 20% of product cost is due to manufacturing costs. For example, as illustrated in Figure 1, if the perceived value of a product to the customer is $1.00 and the price to the customer is $0.80, then with a 20% profit margin the target cost is $0.64 ($0.80 - $0.16 = $0.64). The design cost [2] which is determined by target costing would then be $0.51 ($0.64 * 80%) and the remaining manufacturing cost is $0.13 ($0.64 * 20%).

During the manufacturing process kaizen focuses on continuous small incremental improvement as opposed to big process reorganizations. Kaizen operates at the production level, not at the design and development phase. This implies that we should never be satisfied with the current level of efficiency. Rather, we should always ask what can be done better. In contrast with target costing, kaizen costing stresses continual incremental cost reduction in the manufacturing stage.

In kaizen costing, management will set the overall division cost reduction targets for the product during a six month time interval. Then workcell group targets are established based on negotiation and agreement between management and the workcell. Once targets are finalized, the workcell has complete freedom in coming up with ways to achieve these targets. Generally, the only product costs considered are those directly controllable by the shop floor. After three months the results are measured to evaluate if the workcell has achieved its' target. If the workcell fails to meet set targets, the reasons are investigated. It could be that the target was set unreasonably high to begin with, or external factors beyond their control such as supplier constraints contributed to the failure. In this case, the previous cost per product should be used as a starting baseline for kaizen cost reductions. The cost must be reduced in each successive period in order to meet target profit [9].

The key factors in successful implementation of kaizen costing are two fold. First, after the cost reduction target is established, then the workcell should be held accountable to the cost targets. Second, the kaizen process needs to be consistent and repeatable. It must become part of the culture for the workcell to always strive to meet their target and be able to recognize the progress made over the course of the year. The use of value-added analysis is recommended on the shop floor to facilitate workcells in reaching their kaizen

targets. A detailed discussion of value-added analysis, per se, has been provided elsewhere in the literature [e.g., 8], and hence will not be elaborated upon in this paper.
Boeing Commercial Airplane has several on-going lean manufacturing initiatives and they were searching for ways to measure costs more appropriate to the goals of lean manufacturing. The next section describes kaizen costing and value-added analysis, as applied to one shop floor in the Interiors Responsibility Center of the Boeing Commercial Airplane.

Interiors Responsibility Center

The Interiors Responsibility Center (IRC) in Everett, Washington has design and production responsibility of aircraft interiors for the Boeing Commercial Airplane Company. The IRC produces interiors for the 737, 747, 757, 767, and 777 models, both production and spares. Products include overhead stowage bins, ceiling panels, sidewall panels, class divider partitions, closets, flight attendants workstations, and crew rests.
The majority of products manufactured are composite crush core parts made of Kevlar, graphite, carbon fiber, and fiberglass materials. The fabrication process consists of laminating the composites in a crush-core press that numerically controls (NC) routing of parts to trim. Thereafter components from other Boeing divisions and outside suppliers are assembled onto the fabricated piece for the finished end item to the customer. The production area was organized into commodity groups broken out by stowbins, closets and partitions, ceilings and sidewalls. Each commodity was led by a senior manager who had supply chain responsibility for all products within the commodity. Engineering was a separate function.
As a result of lean efforts in IRC over the past few years, the commodities are now further broken down into separate cells delivering a specific product. Each workcell is a self-directed work team with one supervisor having responsibility over the cell. Previously, the production was taking place in three buildings. Currently, it is consolidated into a single building in Everett. Support functions such as manufacturing engineering, industrial engineering, and purchasing have been moved to the workcells they are assigned to support. As the result, the lead times and unit costs have been drastically reduced. However, the financial measurements posted in the shop floor are very similar to those used in the past, even though the rest of the shop is drastically different. While some of the techniques for gathering data have changed, the overall financial measurement metrics have not changed to support the new process. There are two metrics used to measure the workcells in terms of financial performance. These are Hours Per Part (HPP) and Budget vs. Actuals. The hours per part are a basic algorithm of total direct labor hours expended for a given period, usually a month, divided by total part completions out of the workcell for that same period. Obviously, this is a measure of productivity and the lower the HPP the better. But the challenge is to determine how low HPP can go, what is the finite limit, and what the targets should be.

References are available upon request.