ワーキングペーパー

Gemba Kaizen and Opportunity Loss[1)]
－Problem statement of our study－

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Gemba Kaizen is a specialty of Japanese manufacturers that has enabled them to survive global competition. Successful Gemba Kaizen by a manufacturing company results in lower product costs, and consequently, higher operating profits. There are many examples of Gemba Kaizen in which the Kaizen effect is confirmed by the Kaizen key performance indicators; however, few have measured the accounting effects and the reduction in product cost and the increase in operating profit cannot be confirmed. Consequently, heated arguments often arise between Kaizen's Gemba and management. From a management accounting perspective, this phenomenon is a lack of accounting communication resulting from the absence of "accounting for Gemba Kaizen."

Ⅰ　Gemba Kaizen in Japanese Manufacturing Companies

Since the 1950s, Gemba Kaizen, which aimed to dramatically improve the postwar "cheap or bad" Japanese products, was developed in Japanese manufacturing companies through approaches such as Quality Control (QC), Preventive Maintenance (PM), Zero Defects (ZD), Industrial Engineering (IE), and Value Analysis (VA). Furthermore, techniques including Total

1) 本稿は，上總康行・柊紫乃［2023］「現場改善会計論：改善効果の見える化」中央経済社の第１章（pp.1-22）の英訳版である。書籍は第１章から第６章で構成され，そのうち第１章は主として研究に至った問題意識が述べられている。海外の会計研究者との議論のため，当該章の英訳をワーキング・ペーパーとして公表する。
This paper is an English translation of Chapter 1 of "Gemba Kaizen Costing-Visualization of Kaizen Effect" by Kazusa Yasuyuki and Hiiragi Shino (Kazusa and Hiiragi 2023). The book consists of six chapters, of which Chapter 1 of the report mainly describes the problem that necessitates the study. The English translation of this chapter is published as a working paper for the purpose of discussion with overseas accounting researchers.

Quality Control (TQC), Total Productive Maintenance (TPM), Value Engineering (VE), and Just-In-Time (JIT), represented by "Kanban" and developed by Toyota Motor Corporation, which were refined in Gemba, are world-class "Japanese Gemba Kaizen techniques." Gemba Kaizen is developed in companies through "small group activities" that draw out the spontaneous ingenuity of all employees (Makido [1993], pp.54–58). In particular, the Deming Prize is awarded to companies that have practiced excellent quality control, and many companies have employed the TQC technique to win this prize (Shimokawa [1990], pp.111–114).

It is well known that the basic philosophy of the Toyota Production System (TPS) consists of two pillars. "The basis of the Toyota production system is the absolute elimination of waste [Muda]. The two pillars needed to support the system are: [1] just-in-time [2] autonomation, or automation with a human touch [Jido-ka]. Just-in-time means that, in a flow process, the right parts needed in assembly reach the assembly line at the time they are needed and only in the amount needed. A company establishing this flow throughout can approach zero inventory. [Omission (middle of text)] The other pillar of the Toyota production system is called autonomation – not to be confused with simple automation. It is also known as automation with a human touch" (Ohno [1988], pp.4–6, the text inserted in parentheses [ ] is by the author of the quotation). More importantly, "Kaizen activities by small groups" are positioned as the basis for these activities. Professor Yasuhiro Monden (University of Tsukuba[2)]) has identified the following in relation to these Kaizen activities:

"The Toyota Production System integrates and attains different goals (i.e., quantity control, quality assurance, and respect for humanity) while pursuing its ultimate goal of cost reduction. Improvement activities are a fundamental element of the Toyota Production System and they are what makes the Toyota Production System really tick. Each worker has the

2) Affiliations are, in principle, according to the time of publication of the cited document.

chance to make suggestions and propose improvements via a small group called a *Quality Control (QC)* circle (Monden [2012], p.17)."

Unquestionably, the TPS is based on the premise of "Kaizen activities by small groups," which are QC groups.

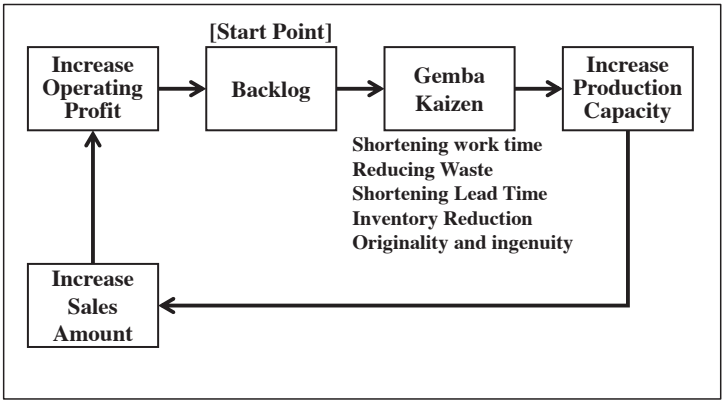
Ⅱ Gemba Kaizen Cycle and Opportunity Loss

While cost reduction is a highly anticipated outcome of Gemba Kaizen, it is not the only outcome; Gemba Kaizen increases the production system's productivity so that the same product can be produced with less management resource inputs (quantity and time). Cost reduction is a monetary measure of the decrease in input resources quantities, assuming that the unit costs of the input resources are constant. In contrast, if the same management resources as before Kaizen are invested in a production system with higher productivity, more products can be produced. This implies an increase in the production capacity and available products, which can lead to increases in realised sales and consequent profits. Although it has not received much attention, the increase in sales is another achievement of Gemba Kaizen. Conversely, if a product is not sold in the market, it cannot be produced, thereby creating Free (surplus) production capacity.

To allay the readers' doubts, we add that forcing products into production without the prospect of selling them in the market would result in a mountain of inventories. If the inventory is sold at a discount or discarded, the results of Gemba Kaizen will disappear in an instant.

Thus, as Kaizen progresses, the capacity of the production system increases. When there is additional demand that can absorb the increase in production capacity or when demand increases continuously, as in the case of Japanese firms during the period of rapid economic growth since the 1960s, excess production capacity does not arise. **Figure 1-1** illustrates Gemba Kaizen and the increase in production capacity during periods of economic growth.

Figure 1-1 Gemba Kaizen Cycle (economic growth period)

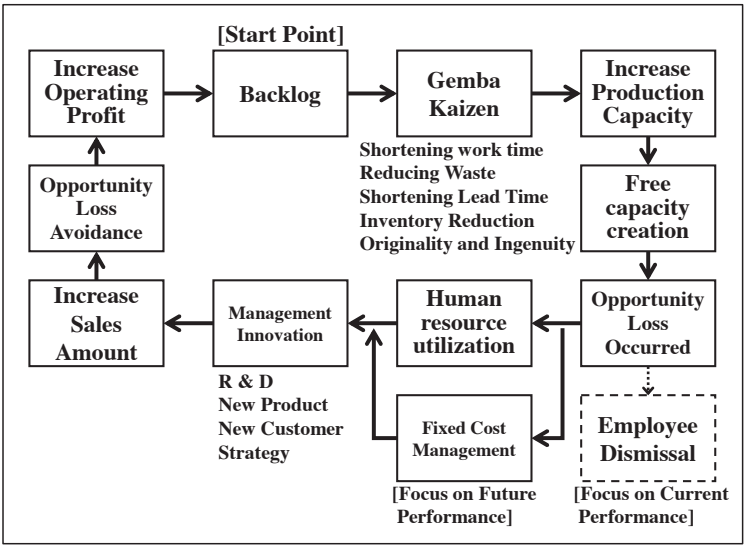


Source: Kazusa[2016] p.9

According to **Figure 1-1**, productivity is increased by Gemba Kaizen, which reduces work hours, eliminates Muda (waste), shortens lead times, and reduces inventories, resulting in increased production capacity. During periods of economic growth, demand absorbs the increase in production capacity resulting from Gemba Kaizen; therefore, production capacity is immediately utilized, and sales increase. Consequently, the Free production capacity does not increase. Thus, there is no opportunity loss regarding profit if Free production capacity remains is the same.

In Japan, however, the bursting of the bubble economy in 1992 marked the end of steady economic growth. During this period, the demand could not absorb the increase in production capacity resulting from Gemba Kaizen. This led many Japanese firms with long-term or lifetime employment systems to have idle facilities and excess personnel, resulting in Free production capacity and opportunity loss as illustrated in **Figure 1-2**.

Figure 1-2 Gemba Kaizen and Management Innovation Cycle



Source: Kazusa[2016] p.11

Figure 1-2 shows that in Japanese-style management based on long-term employment and lifetime employment, the order backlog is the starting point, and the cycle repeats in a clockwise direction: Gemba Kaizen → increase in production capacity → creation of Free (production) capacity → opportunity loss → utilization of human resources and fixed cost management →management innovation → increase in orders → avoidance of opportunity loss → increase in operating profit → order backlog. When opportunity losses occur, many global firms may adopt an employment policy of "employee layoffs." In contrast, Japanese firms have found a way to utilize human resources under a system of long-term and lifetime employment. Through management innovation, they have been able to attract increased orders, avoid opportunity losses, and, as a result, increase operating profits. Of course, even if a company aims to increase orders through human resource utilization and management innovation, opportunity losses may not be immediately avoided. For this reason, fixed cost management arising from Free production capacity

is also developed simultaneously (Kazusa [2016], pp.11–12).

For Japanese managers, one of the key issues is the strategic utilization of Free production capacity (opportunity loss) created by Gemba Kaizen under Japanese-style management or, more straightforwardly, innovation in order-oriented management to increase orders. One successful example is Komatsu Ltd. Under the strong leadership of President Masahiro Sakane, Komatsu responded to the crisis by laying off employees to eliminate its Free capacity and implementing strict fixed-cost management, including the liquidation of affiliated companies. From there, Komatsu secured R&D funds for growth and implemented management innovation to develop "Dantotsu (decisive) products" by leveraging its human resources. Komatsu achieved a remarkable V-shaped recovery after one year (Kazusa [2021], pp.146–150). This indicates that Komatsu's management had excellent innovation capabilities.

Thus, a major challenge for management accounting researchers is constructing an accounting theory that can explain the Free production capacity created by Gemba Kaizen and its accounting expression of opportunity loss. The basic purpose of this book is to present Gemba Kaizen Costing (GKC) as one such accounting theory.

Ⅲ Kaizen Effectiveness and Accounting Measurement of Kaizen Effectiveness

This book aims to develop an accounting method to measure and evaluate the economic effects of Gemba Kaizen as accurately as possible in monetary terms. To achieve this objective, we must, first, pursue cost accounting that can accurately calculate cost reductions resulting from Gemba Kaizen, and, second, construct an accounting theory that accounts for the Free production capacity created by Gemba Kaizen as an opportunistic loss.

Therefore, we focus on the increase in production capacity that occurs when Gemba Kaizen increases the productivity of the production system. We then focus on the Free production capacity created by Gemba Kaizen

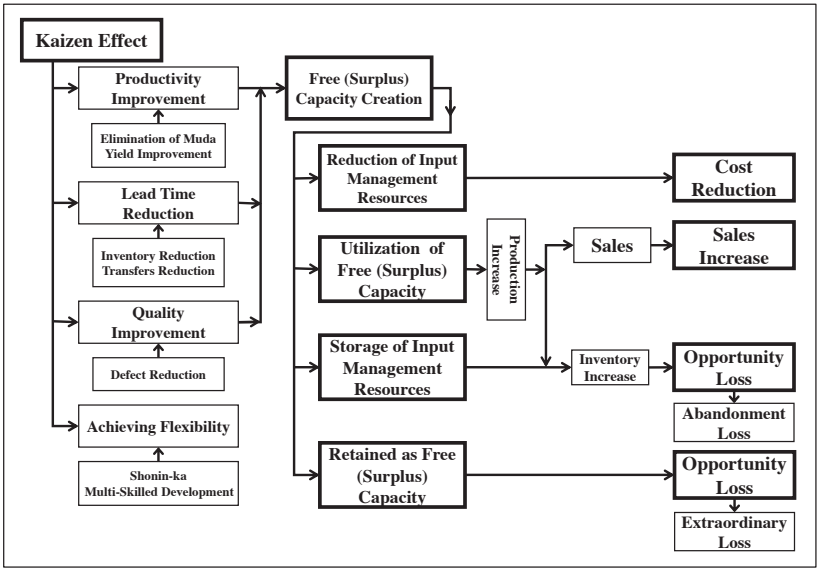
and recognize it as the creation of opportunity loss. This opportunity loss is eliminated immediately if the product becomes marketable. However, if the product cannot be sold, the opportunity loss is preserved.

Professor Takahiro Fujimoto (University of Tokyo) has advocated product competitiveness from the perspective of the workplace as follows:

> From the vantage of the workplace, product competitiveness is a composite of quality, cost, and delivery. Those three elements, widely known as QCD, are standard measures of factory performance. The author supplements QCD with a fourth measure, flexibility (F), to support comprehensive evaluations of competitiveness in manufacturing (Fujimoto [2007], p.5).

In this book, the framework of this competitive factor "QCDF" is used as the four elements of the "Kaizen Effect." **Figure 1-3** illustrates how the Kaizen effect relates to accounting.

Figure 1-3 Kaizen Effect and Accounting Numbers



Source: Author

According to **Figure 1-3**, the Kaizen effect is mainly recognized as productivity improvement, lead time reduction, quality improvement, and flexibility achievement.

(1) Productivity Improvement: Productivity is generally the ratio of a production system's inputs to the outputs produced. Various measures of productivity have been proposed, but when we simply refer to "productivity," we often mean "labor productivity" by implication (Fujimoto [2001], p.118). Labor productivity also appears to be diverse; therefore, in this book, we use labor productivity shown by the following equation (Kazusa [2000], p.100, partially revised):

$$\begin{aligned}\text{Labor productivity} &= \text{Output/Production hours} \\ &= (\text{Output/Input}) \times (\text{Input/Production hours}) \\ &= \text{Koritsu} \times \text{Noritsu}\end{aligned}$$

In this equation, input and output denote the quantities put into the production system and produced by the production system, respectively. Production time is the time taken to process raw materials fed into the production system (Kazusa [1997], pp.67–68).

Koritsu, the first term in the above equation, is the same as the well-known "yield ratio" and is often used as an indicator of physical productivity. However, because "modern companies compete for speed in production and development as a competitive strategy" (Kazusa [2000], p.100), it is undesirable for the productivity formula not consider time. Although Gemba Kaizen often actively works to reduce various types of time, such as working, processing, operating, and production lead times, this book focuses on working time and uses labor productivity, which includes the concept of time. In this book, productivity improvement refers to an increase in labor productivity.

The portion of input (raw materials, etc.) that does not contribute to the output is referred to as an offcut or loss. To improve Koritsu (yield rate),

it is necessary to minimize offcuts and defects as much as possible. The increase in yield and reduction in work time (elimination of Muda) greatly improves labor productivity.

(2) Lead Time Reduction: Delivery is an element of competitiveness. "In regard to competitiveness, delivery refers to how long customers need to wait for the products they have purchased" (Fujimoto [2007], p.6). Delivery time is also called "customer procurement lead time" from the ordering perspective. Conversely, from the supply perspective, it is "production lead time," meaning "the time from material preparation to finished product" (Hiiragi [2012], p.3). The two types of lead times are two sides of the same coin. Hiiragi [2012] identifies that production lead time is more prevalent in the 'Kaizen' targets on the shop floor, as exemplified by the TPS. For manufacturing firms, shortening the production lead time is a powerful way to secure competitive advantage. Therefore, at the production site, shortening the production lead-time, such as through inventory and transfer reductions, is practiced through Gemba Kaizen.

(3) Quality Improvement: Quality is a competitive factor. The concept of quality is diverse, but from the customer's perspective, it is defined as "overall product quality," that is, the degree of customer satisfaction that the product itself provides to the user (Fujimoto [2001], p.245). The overall (total) product quality includes both design and manufacturing qualities (quality of conformance). Design quality refers to the function, performance, and appearance of a product as intended at the product design stage, meaning "quality aimed at as the goal of product manufacturing" or product functions promised in advance to the customer. Conformity quality is a measure of the degree to which a product is created according to a blueprint. The quality determined by the manufacturing process is also called manufacturing quality, which is synonymous with conformity quality. Therefore, overall product quality generally consists of design and conformance (Fujimoto

[2001], pp.246–248). "Design quality and manufacturing quality (quality of conformance) are equally important in product competitiveness. The best designs in the world are meaningless if the workmanship of the products is shoddy. Likewise, building products faithfully to lousy designs is no way to earn customer satisfaction" (Fujimoto [2007], pp.5–6). Therefore, product quality control must be a company-wide effort involving development, manufacturing, purchasing, and sales (Fujimoto [2001], p.249). This is ensured by Japan's world-class TQC.

(4) Achieving Flexibility: "Flexibility – through of a different character from quality, cost, and delivery – therefore ranks with those three factors as a crucial determinant of competitiveness. It is an indicator of companies' ability to maintain their QCD-based competitiveness amid change in the operating environment" (Fujimoto [2007], p.7). Professor Fujimoto provides the following examples:

> For example, a system that is flexible regarding cost when the production volume or lot size decreases is one in which the ratio of fixed costs to variable costs is small or the cost of setup changes (switching of product types) is small. Cost flexibility for changes and diversity in product design can be achieved through a combination of parts commonization among models (the same parts for multiple products) and the generalization of man-hours (the same process for multiple varieties) (Fujimoto [2001], p.104).

"People have traditionally regarded high flexibility and high productivity as mutually incompatible in manufacturing. But Japanese manufacturers – most notably Toyota – have succeeded in achieving both, and that success has become the wellspring of their international competitiveness" (Fujimoto [2007], p.7). Only those companies that succeed in achieving this "compatibility" will be able to win the severe global competition. Flexible

manpower lines (Shonin-ka) and multi-skilled development (Tanoko-ka) are considered effective for achieving flexibility.

This book focuses on the four Kaizen effects resulting from Gemba Kaizen: productivity improvement, lead time reduction, quality improvement, and flexibility realization. The Kaizen effect, especially the productivity gains realized by eliminating Muda and increasing yields, results in the creation of Free production capacity. The created Free production capacity is used for (1) the reduction of input management resources and (2) the utilization of Free production capacity. The remainder is either (3) temporarily stored in material warehouses as storage of input management resources or (4) retained (or left) as surplus management resources temporarily in search of new ways to use them.

The Kaizen effect can be calculated and evaluated regarding cost reduction, sales increase, and opportunity loss. Traditionally, most studies have focused on cost reduction. Unfortunately, few studies have examined opportunity losses. In this book, focusing on the creation of Free production capacity, we propose a new accounting method, Gemba Kaizen Costing, which can calculate and evaluate cost reduction, sales increase, and opportunity loss as accounting figures that embody the Kaizen effect.

Ⅳ Production Gemba's Kaizen KPI focus VS management's profit focus

In Japanese companies, various Gemba Kaizen activities are conducted through small groups, and the Kaizen cycle (PDCA) was developed to make these activities systematic. Specifically, improvement goals were set, and the PDCA cycle of plan, do, check, and action was developed (Fujimoto [2001], p.104). Key Performance Indicators (KPI) were set as numerical targets for the Kaizen Plan, and Kaizen activities were developed to achieve these KPIs as numerical targets. If KPI considered as "Kaizen KPI," it has played an important role not only in Kaizen planning but also in evaluating the results

of Kaizen activities. **Table 1-1** lists the Kaizen KPIs used in Gemba Kaizen.

Table 1-1 Kaizen Key Performance Indicators (KPIs) used in Gemba Kaizen

Group	Classification	KPI	KPI definition formula	Data (P = planned/standard, A = actual, C : calculated in aggregate)
By item or production order unit	Cost variance	Input material quantity variance	By input material standard yield − Actual yield	P : Actual output quantity per order × Standard input quantity per standard output quantity A : Actual input quantity per order
		Yield variance	By product standard Yield − Actual Yield	P : Standard yield per output material A : Actual yield per order
		Input person hours variance	Standard processing time − Actual processing time Standard setup time − Actual setup time	P : Actual output quantity per order × Standard processing time per standard output quantity P : Actual output quantity per order × Standard setup time per standard output quantity A : Actual processing time per order Actual setup time per order
		Input machine hours variance	Standard machine hours − Actual machine hours	P : Actual output quantity per order × Standard machine hours per standard output quantity P : Standard down time A : Actual machine hours per order Actual down time per order
	Lead time	Production lead time	Target lead time − Actual lead time	P : Standard production lead time per ordered output quantity A : Completed time − Started time per order
	Achievement rate	Ordered quantity ratio	Planned ordered quantity vs. Actual produced quantity	P : Planned ordered output quantity at the beginning of each month A : Monthly total of actual output quantity from order
		Ordered person hours ratio	Monthly aggregated hours of Planned person hours vs. Actual target person hours (i.e. Actual output quantity per order × Standard person hours per standard output quantity)	P : Monthly aggregated hours of (Planned ordered output quantity per order) × (Standard processing hours per standard output quantity) P : Monthly aggregated hours of (Planned ordered output quantity per order) × (Standard setup hours per standard output quantity) A : Monthly aggregated hours of (Actual output quantity per order) × (Standard processing hours per standard output quantity) A : Monthly aggregated hours of (Actual output quantity per order) × (Standard setup hours per standard output quantity)
		Scheduled time ratio	Scheduled production date vs. Actual production date	P : Scheduled production start date and end date A : Actual production start date and end date

Group	Classification	KPI	KPI definition formula	Data (P = planned/standard, A = actual, C : calculated in aggregate)
By process, series or product unit	Achievement rate	Ordered output quantity variance	Planned ordered quantity vs. Actual output quantity	C : Aggregate data collected in "Ordered quantity ratio" (by daily, weekly, monthly)
		Variance in the number of production order	Monthly planned number of orders − Actual number of orders	C : Aggregate "Number of planned production order" (by daily, weekly, monthly) C : Aggregate "Number of actual production order" (by daily, weekly, monthly)
		Variance in person hours	Monthly aggregated hours of Planned person hours vs. Actual target person hours (i.e. Actual output quantity per order × Standard person hours per standard output quantity)	C : Aggregate data collected in "Ordered person hours ratio" (by daily, weekly, monthly)
	Labor productivity	Gross hourly productivity	Actuals target person hours (i.e. Actual output quantity per order × Standard person hours per Standard output quantity) and total working hours ratio	C : Aggregate actual data collected in "Ordered person hours ratio" (by daily, weekly, monthly) A : Actual working hours by day C : Calculate actual target person hours and actual working hours ratio on weekly or monthly basis.
		Input person hours productivity	Actuals target person hours (i.e. Actual output quantity per order × Standard person hours per standard output quantity) and actual person hours ratio	C : Aggregate actual data collected in "Ordered person hours ratio" (by daily, weekly, monthly) A : Aggregate actual data collected in "Input person hours variance" (by daily, weekly, monthly) (i.e. Actual processing time per order)
		Achievement rate of target rate	Comparison actual person hours and working hours ratio and target ratio	P : Target ratio (Actual person hours and working hours ratio) A : Aggregation using the data up to the above
	Equipment effectiveness	Equipment utilization rate	Actual equipment operating hours ÷ Available operating hours	A : Actual equipment operating hours = Hours per day of equipment operated A : Availability hours = Hours per day that the equipment is planned to operate
		Hourly operating rate	Actual equipment operating hours ÷ Capable operating hours	A : Actual equipment operating hours = Hours per day of equipment operated (same as above) A : Capable operating hours = Availability hours per day − Planned downtime per day

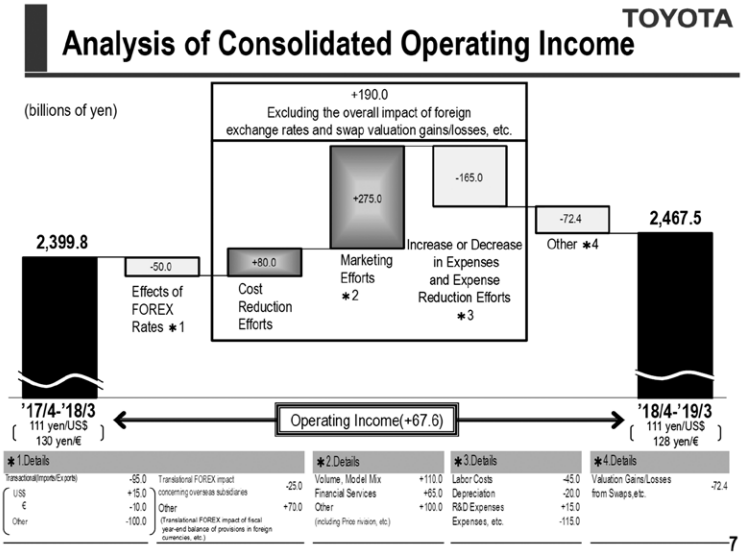
By process, series or product unit	Equipment effectiveness	Equipment performance	Target machine hours ÷ Actual equipment operating hours	A: Actual equipment operating hours = Hours per day of equipment operated (same as above) A: Target machine hours = Actual output quantity × Standard machine hours per standard output quantity
		Overall equipment effectiveness	Target machine hours ÷ Capable operating hours	A: Target machine hours = Actual output quantity × Standard machine hours per standard output quantity A: Capable operating hours = Availability hours per day − Planned downtime per day

Source: BENG[2020]

Table 1-1 shows that the Kaizen KPIs are all physical quantity figures or ratios, not accounting figures. In the "Classification" column, KPIs (raw material yield variance, yield variance, man-hour variance, and equipment utilization variance) for cost variance are shown; however, strictly speaking, none of them are accounting figures. Although it is not confirmed that accounting figures are not used as Kaizen KPIs in the Gemba of all companies, it is certain that non-accounting Kaizen KPIs that more directly reflect the results of Gemba Kaizen are more important than accounting figures for the operational managers who promote Gemba Kaizen.

However, it is fair to say that a corporation's management has the greatest interest in accounting profit, which is the result of corporate activities measured in monetary terms, as proof that corporate activities were managed in a congruent manner to achieve the corporate objective of profit-making. Except in special cases, corporation management is not particularly interested in the various Kaizen KPIs that indicate individual Kaizen effectiveness. Management evaluates the Kaizen effect as a contribution to their company's profit, rather than a variety of Kaizen KPIs. Typically, cost reductions are calculated as the contribution of the Kaizen effect, using cost accounting. **Figure 1-4** shows the factors behind the increase or decrease in Toyota Motor Corporation's consolidated operating profits.

Figure 1-4 Factors Contributing to the Increase/Decrease in Toyota Motor Corporation's Consolidated Operating Profit (FY3/2019)



Source: Toyota Motor Corporation [2019] p.7.

This figure shows that consolidated operating income increased by 67.6 billion yen in the fiscal year ending March 31, 2019, compared to the previous year. The increase in operating income was due to cost improvement efforts (+80.0 billion yen), sales efforts (+275.0 billion yen), and efforts to increase or decrease overhead costs (-165.0 billion yen). From the figure alone, without the cost improvement efforts, the FYE March 2019 would have resulted in a decrease in profit compared to the previous year. Cost improvement efforts include cost reduction through Gemba Kaizen and Target Coting (Genka-Kikaku) in the planning and design stages of new products. The management of Toyota Motor Corporation is expected to make great efforts to improve costs through Gemba Kaizen. Akio Toyoda, president of Toyota Motor Corporation (at the time), mentioned cost improvement (Genka-Kaizen) in his President's Speech when announcing the financial results:

For the fiscal year ended March 2015, our consolidated operating income reached 2 trillion 750.5 billion yen, primarily as a result of group-wide cost reduction efforts and depreciation of the yen. [0mission (middle of text)] I believe that our financial results are the outcome of continuous efforts made by individuals within our company, including those at production lines who are painstakingly seeking to make the most of every last second and every last yen, striving to improve productivity, and those at product development who are working tirelessly to translate their visions for ever-better cars from conceptual drawings to reality. They, also, have our sincere thanks. (Toyota Motor Corporation [2015])

This greeting is typical of the president of the Toyota Motor Corporation, who places emphasis on the worksite (Gemba) and actual items. Here, the costs of Kaizen through Gemba Kaizen and Genka-Kikaku by development members, respectively, are mentioned, which must reflect the attitude of the president who trusts in the Gemba.

In profit-and-loss accounting, the company's profit is calculated as "sales - expenses = profit." Therefore, along with an increase in sales, a reduction in expenses increases a company's profit. This is not easy, even for Toyota Motor Corporation, because an increase in sales is achieved by winning fierce market competition. Therefore, there is great hope to reduce the costs incurred by the company. Total cost reduction includes cost reduction resulting from Gemba Kaizen. Mr. Taiichi Ohno, regarded as the creator of the Toyota Production System, asserts the following regarding this connection:

Improving efficiency makes sense only when it is tied to cost reduction (Ohno [1988], p.18).

Manpower reduction at Toyota is a company-wide activity whose purpose is cost reduction. Therefore, all considerations and improvement ideas, when boiled down, must be tied to cost reduction (Ohno [1988], p.53).

The emphasis here is that "Gemba Kaizen must be tied to cost reduction." From the management perspective, the greatest concern is the extent to which Gemba Kaizen reduced the costs of the company's products. As the results of Gemba Kaizen were evaluated as cost reduction, cost accounting is used to measure the amount of cost reduction.

The cost accounting used today was originally developed to calculate product costs that contribute to a company's periodic profit-and-loss calculation and was not developed for calculating the results of Gemba Kaizen as cost reductions. In cost accounting, the calculation of product costs for periodic profit-and-loss calculations is given priority; therefore, the calculation structure may not properly reflect the results of Gemba Kaizen as a cost reduction amount. One purpose of this book is to present a costing system that can calculate, as accurately as possible, the cost reductions resulting from Gemba Kaizen.

V "Visualization" of the invisible Kaizen effect

When employing Gemba Kaizen, most operational managers are familiar with Gemba Kaizen itself and the non-accounting Kaizen KPIs, but few managers are familiar with the accounting figures. In contrast, corporate management is familiar with accounting figures; however, with the exception of production executives, they are not so familiar with Kaizen KPIs, which show the results of Gemba Kaizen.

As accounting figures are comprehensive information that aggregates and integrates various elements into monetary information, it is impossible to explain the results of Gemba Kaizen in detail. This role is fulfilled by a wide variety of KPIs. Unfortunately, accounting figures are not easy proxies for Kaizen KPIs (non-accounting figures) in Gemba Kaizen.

Nevertheless, manufacturing firms use accounting figures to calculate and evaluate the Kaizen effect. The results of Gemba Kaizen appear as changes in accounting figures in the balance sheet and income statements, albeit in a "frustrating manner" (Kazusa [2018] , p. 27) . The word "frustrating" refers

to the (1) slow response to cost reduction and profit increase, (2) small amount of those amounts, and (3) difficulty in understanding the meaning. This frustration is evident in the dissatisfaction of parties promoting Gemba Kaizen:

> "When I proposed inventory reduction, I was asked, 'How much profit will you make?' I was at a loss to explain that one."
>
> "Under the name of 'production innovation,' the factory has been Kaizen to an unbelievably high degree. However, the cost reductions were not commensurate with the expenses incurred."
>
> "Various Kaizen efforts being made and the individual figures are profitable, but for some reason cash flow remains tight and overall profits are not increasing." (Tanaka [2009], p.22)

Each person above expressed frustration in their own way. Mr. Masatomo Tanaka, based on his experience as the former General Manager of Toyota Motor Corporation's Operations Management Consulting Division, stated, "The essence of Gemba Kaizen of the Real Toyota Method is to pursue just-in-time (D) while thoroughly implementing Jido-ka (Q). Then profit (C) will follow" (Tanaka [2009], p.280). It seems that "patience" is necessary until the Kaizen effect becomes clear in the form of cost reduction and profit increase.

While this described frustration may be tolerable, the "challenge" of Free production capacity, or opportunity loss, created by Gemba Kaizen, is that the Kaizen effect does not appear in the financial statements at all. Free production capacity is generated by Kaizen activities, but when there is additional demand, it is absorbed and no Free production capacity remains. However, in the absence of additional demand, this manifests itself. Until now, this challenge has been largely ignored in cost accounting research, both in Japan and abroad.

Thus, as a result of several factors, it is difficult to discuss Gemba Kaizen and reach an understanding thereof between Kaizen KPI-oriented operational

managers and accounting number-oriented management. Professor Takahiro Fujimoto (University of Tokyo) has pointed out the following regarding this connection:

> In Japanese companies and Gemba, it is said that in many cases there exists a conflict between cost management based on total cost accounting by the accounting department and "Monozukuri Kaizen" (manufacturing Kaizen) by the production department. In particular, the Toyota Production System, which pursues "value-added flow" by reducing production lead time through limited-volume production with reduced product inventories and reduced work-in-process inventories, has been said to be incompatible with traditional Full Costing. It is that Taiichi Ohno, the founder of the Toyota Production System, stated: "I hate Full Costing," and that he often clashed with the directors in charge of accounting. (Fujimoto [2012], p.10)

Because corporate profit-and-loss and cost accounting systems are designed for external reporting, it is easy to imagine that Full Costing was intolerable for Mr. Taiichi Ohno, who placed more emphasis on internal reporting and factory management. For this reason, "Toyota Motor Corporation's Gemba management has traditionally taken the approach of segregating accounting from Gemba, not applying cost control in monetary terms to Gemba, and thoroughly implementing Kaizen regarding lead time, output level (Gentani), productivity, operational availability (Bekido-ritsu), and defect rate in physical quantity terms" (Fujimoto [2012], p.10). According to Professor Makoto Kawada (Meijo University), "Toyota Motor Corporation, where Mr. Taiichi Ohno had fostered the just-in-time production system while sharply rejecting the involvement of accounting led by the accounting department, has now achieved a clever segregation of financial accounting and production systems" (Kawada [1996], p.239).

The expression "clever segregation" is used here to describe the Kaizen

effect. At Toyota Motor Corporation, the conversation, or accounting communication, between management and operational managers using accounting information such as cost information may not have been so smooth.

Mr. Goro Ito, former head of the cost control office of Toyota Motor Corporation, made the following assertions regarding cost management at Toyota Motor Corporation:

> When the crisis hit, the sense of urgency among top management and all employees regarding Muda, which was absorbed by quantitative expansion and did not surface during the strong economic period, thereby becoming the lifeblood of the company, rose dramatically, and the expectations for cost management reached the highest level. In this sense, I believe that times of recessions and economic crises are opportunities to improve and rebuild cost-management systems (Ito [2009], p.34).

The Muda identified by Mr. Ito must have included the Free production capacity created by Kaizen. At that time, Toyota Motor Corporation saw the recession and economic crisis as a chance to improve and rebuild its cost management system. Through the process of system development and reestablishment, the "clever segregation" would have been improved.

However, as Professor Fujimoto identifies, if the TPS and traditional Full Costing are "incompatible" to begin with, the dissatisfaction of those involved in Kaizen will continue to smolder unless major changes are made to cost accounting, which is the "true cause."

We believe that if we can visualize the invisible Kaizen effect as the amount of opportunity loss and present it on the income statement along with the cost reduction amount, we can solve many of the longstanding problems. The new accounting theory that makes this possible is GKC.

Under this new accounting theory, not only the amount of cost reduction but also the amount of opportunity loss, which means Free production

capacity, is provided simultaneously; therefore, we can expect that the conversation between management and shop-floor managers regarding the Kaizen effect–in other words, accounting communication–will be greatly improved.

The framework of cost control in modern Japan consists of three elements, Genka-Kikaku (cost adjustment during product development), Genka-Iji (maintenance of defined costs after the start of mass production), and Genka-Kaizen (further reduction of costs in mass production). Of these, only Genka-Kaizen does not have an established accounting method relating to Gemba activities. In this book, we propose GKC as an effective costing theory to fill this void.

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