Product Valuation Approach
to Aid Manufacturing Business in the 21st Century

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Abstract

Cash flow accounting that flourished in 15th century Italy has been revived, this time being fortified with the concept of discounted cash-flow (DCF) or Economic Value Added (EVA™) This new version of cash flow accounting that is called Corporate Valuation Approach (CVA) may work effectively at the corporate or, possibly, at SBU (Strategic Business Unit) level, but not readily at the SPU (Strategic Product Unit) level for the difficulty in estimating the business risk involved in the product.

Product Valuation Approach (PVA) is an accounting framework focused on the economic value over its life cycle. PVA measures lifetime Free Cash Flow (FCF) generated by a product, forming an integral part of CVA. While CVA subsists on financial information, PVA works in production system, examining the lifelong product strategy. Without such substructure to support the finance-oriented valuation, CVA might be just a mirage.

Among alternatives of management accounting tools, *pure* standard accounting that fixes the product cost before starting production is required of PVA.

For the business system as a whole, management accounting system should help create knowledge at the planning and designing stage. At the operational stage as well, management accounting should give momentum for knowledge creating activities. Front-line operations are not the object of "control," but are a rich source of knowledge.

Product focused approach of PVA will help make strategic decisions on the product, supporting finance oriented valuation, and eventually will foster the leaning organization.

1. Introduction

"Even if return on investment (ROI) is greater than zero but less than its weighted average cost of capital (WACC), the company may be "profitable" but it will not provide an adequate return to the suppliers of capital, rather the company is destroying the value. [7]" This message from CVA offers at least three major advantages to be beneficial for the Japanese traditional management.

(1) *Cash Flow basis* is superior to accrual basis as performance measure for business.
(2) The notion of *Cost of Capital* to be subtracted from profit
(3) Measuring of *Value for the future* with the notion of perpetuity

Noteworthy is the resuscitation of cash flow as a dependable financial indicator of business performance. Statement of Cash Flows was issued in 1987 and made effective in 1988 as Statement of Financial Accounting Standard No.95 in the U.S. (It was 1999, eleven years later, when the similar rule was made effective in Japan.) Earlier than that, the theory underlying FCF was first set off in the 1961 by Professors Franco Modigliani and Merton Miller (M&M). The research of finance oriented valuation or the economic model as against the accounting model proceeded through the 1980s, even during the time of downfall of U.S. industrial performance, and cropped up in Japan after the bubble-burst with an appealing message of "shareholder value management" in the 1990s.

Since the 1990s, the focus of management accounting has been shifting from downstream, operational or middle manager's area to upstream, strategic or top management's area. Especially, CVA became an epitome of managerial accounting tools for top management.

On the other hand, some limitations are found in CVA, one of which is the difficulty in breaking down the valuation into SBU or SPU level. PVA presents a rational way to lower the valuation level to *product*. The other problem is that CVA is an independent, "stand-alone" system, not necessarily linked with business system as a whole. Whether CVA works effectively or not depends on the company's capability in integrating CVA into a system.

Technically, PVA may be just a way of capital investment analysis, several components of which are found in accounting textbook such as expected rate of return (ROI), the investment's expected life or discounted present value. What counts here, however, is not technique, but its implication. "PVA as a system integrator" achieves a functional integration, specifically between production and accounting system.

The conception of PVA embodies priority in business planning – *Do product planning first* –. CVA theory assumes that the order of valuation runs from corporate to business unit and finally to the product level. But, in actuality, even the first step down of estimating business unit level EVA is not an easy job especially for small or venture businesses.

Taking the reverse course, or climbing the ladder from the product up to the corporate level will give a solution. In this "reverse approach," how to deal with the notion of "risk adjusted discounted rate (RADR)" or "weighted average cost of capital (WACC)" would still be a challenge. Some simple, but logically valid solution must be found.

PVA also embraces a perception that the businesses will compete product against product rather than corporation against corporation in the 21st century. Accordingly, management should focus more on the Strategic Business Unit (SBU), or more correctly, the Strategic Product Unit (SPU).

A product's life cycle resembles a merchant's voyage in the 15th century Medieval Italy, when income and expenses were settled at the end of each voyage, not by fiscal period, and settled on cash flow basis, not on accrual basis. Product Lifetime Cash Flow (PLCF) planning that PVA offers will not only provide guidance for product strategy but will play the role of knowledge-driver for the organization.

2. PVA: Why and How?

In financially oriented CVA, "value drivers" govern the corporate value. In real world, however, what drive value is the attraction of product *per se*, and the corporate value is equal to the aggregation of such product's value. Then, when and how is the product's value created in real world? It is usually said that 90% of product cost is decided at the drawing stage. The fact is that not only the cost but also the price, profit and eventually, the final winners in the market will be virtually decided at the product planning. In the beginning, therefore, let's confirm the basics on items to be implemented at the product planning and designing stage.

2.1 Product planning

First, in product planning, specify the basic product concept and the message the product delivers to the customer. Analyze the overall value chain in the industry of which the product is a part, and identify what the customer will pay for, which is called the "value chain analysis and strategic positioning" by Shank and Govindarajan [1].

Among three generic strategies of "overall cost leadership", "differentiation" and "focus" presented by Michel Porter [2], preference from now would be for the "differentiation" and "focus" rather than for the "cost leadership." Do benchmarking and clarify how the product can do *epochally* better than the competitions. Fix the price the customer will pay for the product. Management accounting at this stage should emphasize, not costs, but price setting which will decides 99% of the product's destiny.

2.3 Process designing

In product designing, the "best practice" must be mapped out with regard to optimum processes for the product, encompassing marketing, engineering, manufacturing, and customer service. "Non-value-adding activities" or "capacity constraints" in the process must be removed or improved before the launch of the product so that such tools as Activity Based Costing (ABC) or Theory of Constraints (TOC) would not become necessary later.

To this end, "concurrent engineering" and "target costing" could be fully employed. Alternatives to optimize the investment for the product over its life cycle, such as whether to use man or machine, in-house production or outsourcing, logistics, and means to comply with eco-system and so forth are carefully chosen at this stage. The plan shall be expressed in Product Lifetime Cash Flow (PLCF). (See Exhibit 1) Still, at this stage, the scenario PLCF

presents may be full of volatility, but somehow, a strategic map must be drawn with cash flows values, otherwise the plan could not persuade anybody including the planner him- or herself.

2.5 *Pure* standard Accounting

Planning PLCF takes "*Pure* Standard Accounting", which implies here that it differs from the conventional standard costing in two points. One is that, in measuring cost, it relates to standard value alone, not to actual value. Cost variance between the standard and actual value that comes out later is charged to the entire cost of goods sold of the fiscal term, not redistributed to each product. (In bookkeeping, this method is called "single plan" as opposed to "partial plan.)

The other point is that *Pure* Standard Accounting commits to *price setting* as well, not to cost alone. Standard value alone is able to fix the product cost at the designing stage, where measuring actual value is impossible. The idea that standard value alone constitutes the product cost is not new. H. Emerson advocated in 1908 "expense caused by inefficiency does not constitute cost" and "product cost should be fixed before production by standard value" [3]. Emerson's idea may have been somewhat unrealistic for long due to the difficulty in maintaining standard value. But, IT technology has made it possible to update standard price and standard cost constantly by contrasting them with actual values measured in day-to-day transactions.

One unique advantage of *Pure* standard accounting is that it works as innovation-driver to promote *Kaizen*, which encourages people to update standard value through method change. The gap between the old and new standard value is gripped as "standard-standard variance." which represents the reservoir of "explicit knowledge" accumulated in the organization."

2.6 Why "lifetime calculation" ?

As to lifetime calculation, PVA takes the same stance with CVA. Historically, accounting theory originated as a product-focused schema in 15th century medieval Italy as mentioned earlier, measuring performance of "one voyage" with "cash flow." The notion of "fiscal year" superseded "one voyage" in 1600. Then, the schema of periodic calculation based on with the principle of "matching revenue with expense" persisted almost throughout the 20th century.

Noteworthy in this process, however, is that Schmalenbach indicated, "As seen in the short lifespan business, all the unresolved transactions would be settled or resolved within the same period. Such calculation would be called the *total calculation (Totalrechnung)*. [4] " Schmalenbach's *Law of Congruence* (*Das Gesetz der Kongruenz*) thus suggested the feasibility of measuring lifetime profit with *cash flow.*"

2.7 Why Cash Flow?

In the conventional accrual based income statement linked with the full absorption costing, the profit became deceptively high when a company built inventory and deceptively low when it reduced inventory. Even Activity Based Costing (ABC) that appeared in the 1990s could not level off this "financial" fluctuation. Cash flow is least affected by this fluctuation that is caused by the artificial notion of "fiscal term".

In addition, a big advantage of measuring by cash flow is *simplicity* and easiness. Without any accounting jargons, just calculating cash inflows and outflows in PVA enables PVA to help small or venture businesses follow business plan every day, or even in real time.

3. Specification of Product Lifetime Cash Flow (PLCF)

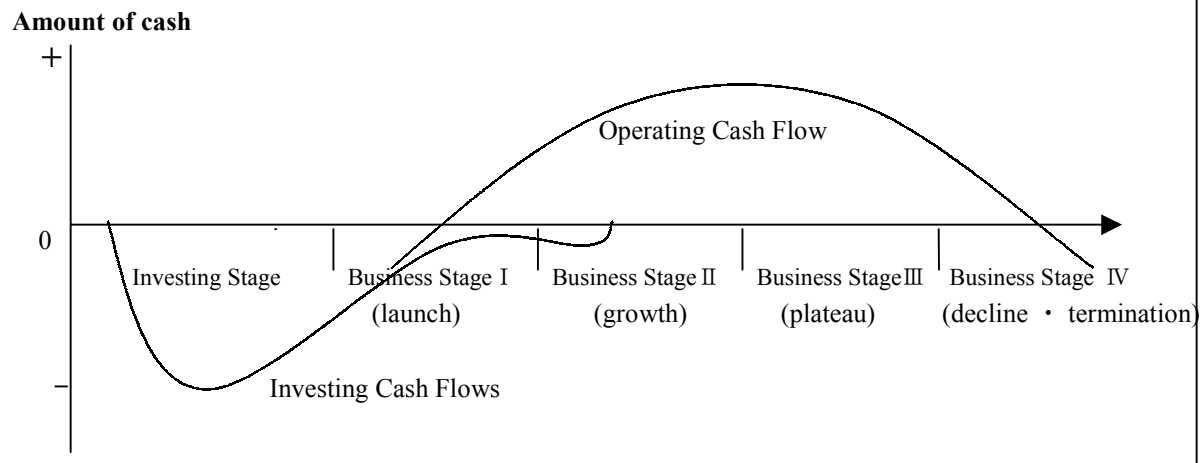
3.1 Product Life Cycle

Exhibit 1 draws the notion of PLCF, which represents FCF generated by the product over its life. Each individual product has its life expectancy, starting from the launch into the market to the withdrawal from it. Product Life Cycle starts with the highest volatility at the time of launch, then into less volatile growth stage as the customer's response or competitor's reaction gradually looms, next into the plateau where unpredictability lessens drastically, reaching finally turning-off stage where business risk subsides eventually to zero. Exhibit 1 depicts the relationship between product life cycle and cash flows.

The initial negative FCF of an SPU at the time of launch shall be offset by the expected future FCF. If not, stopping, selling or some other strategic decisions shall be made, or otherwise the plan itself shall be revised. The validity of top management decisions in this regard depends on the traceablity and the transparency of PLCF. For that purpose, the

results of cash flows should be grasped at least on daily basis as in Point of Sales (POS) System.

EHIBIT 1 Product Life Cycle & Cash Flows



Note: Financing Cash Flow is omitted as product-level measurement.

3.2 Specifications of PLCF

Followings are specifications of Exhibit 2 that explains the implications of PLCF. (Exhibit 2 is on the final Page of the paper.

(1) Degree of Precision of PLCF

In the original PLCF, it is not easy to evaluate the potential size of the market for the product. The volatility is quite high at the initial stage. Nobody could tell that epochal products like telephone, transistor, laser or microprocessor had so huge a potential at the time of launch. Somehow or other, however, the future prospect of the product must be given in the form of PLCF. As time wears on, from the launch to the growth stage, competitions appear and the market price gets gradually stabilized and the volatility dwindles.

The point is that, after the approval, PLCF is exposed to constant surveillance, which is the cardinal indicator of business performance as well as the driver for communications among all members committed to the product.

(2) Close Cash Flow Accounts Monthly for the Past Twelve Months (Rolling P/L)

Measuring cash flows everyday is the simplest way to measure business performance even for mom-and-pop stores. A problem, however, is monthly or seasonal fluctuations of the amount of cash inflows or outflows. To cope with this fluctuation, PLCF uses two columns for each month (see Exhibit 2). One is for the month's result, and the other is for the result of the aggregation of past twelve or six months. The curve of twelve or six month's moving aggregation then levels off bumpy monthly fluctuations or seasonal effects, just as the stock price chart does. (Six months may be more sensitive foe analysis unless seasonal effects are strong.)

What is more, just as Schmalenbach proved, this rolling aggregation of cash flows offers profit information as accurate as (or perhaps more dependable than) the accrual based income statement. Whatever the fiscal term may be, accounts are settled with cash flow every month for the past full-year like "June-May", "July-June", "August-July" and the like. By this PLCF, without any artificial adjustment in accrual based financial income statement, every month becomes "the month of reckoning" and "the month of fresh start." Management accounting may not need income statement [5]!

(3) Operating Cash Flow managed by Production System

Operating cash flow (No. 3.3 in the table of Exhibit 2) equals "cash inflows less cash outflows", being calculated by "unit standard price (or cost) times the number of units sold. The point here is that the operating cash flows are measured in production system. Accounts receivable and accounts payable, although they do not constitute cash flow, are also grasped in production system as associated with material flow.

(4) Activity Cost (indirect expense) – (No. 3.2.4)

A sure way to exploit ABC is to use it at the designing stage. ABC works effectively in estimating indirect costs that the product is expected to incur. More importantly, ABC enables to improve the efficiency of service activities for the product *in advance* by removing non-value-adding activities, and most importantly, the efforts of examining detailed folds of indirect activities in the process will add much more new knowledge to the designer than just applying the traditional single, volume-based overhead rate.

In applying ABC, standard accounting is employed, where the planned value of activity cost is calculated as "the *standard* cost-driver rate times the number of *standard* cost-driver", whereas the actual value is as "*standard* cost-driver rate times the number of *actual* cost-driver." The sum of activity costs is an integral part of indirect expenses of the Division the product belongs to.

(5) Headquarters Costs – (NO.5.3 & 5.4)

To run business, a product usually receives services like personnel, accounting, computer service etc. from the Division headquarters (DHQ), and services like corporate planning, finance, legal, public relations etc. from the general headquarters (GHQ). The principle is that both DHQ and GHQ costs be charged to product according to the amount of services each product receives.

The point here is that when a product manager thinks that the headquarters costs are a large drag on overall product's value, the product manager should be entitled to outsource those headquarter services. Otherwise, an *ad hoc* ABM project should be organized to cut down on the swelled headquarters costs.

(6) Depreciation – (No.5.1)

The overall invested cost (No.2) is depreciated over the product's lifetime, the purpose of which is to prepare for the investment required for the next product or for model change. Subtracting depreciation from operating cash flow (No.3.3) leads to the product's FCF (No.6).

(7) Taxes – (No.5.2)

"Taxes" represents the income taxes charged to operating cash flow (No. 3.3) of the product. In PVA, income taxes are stated on cash basis as in CVA.

(8) Product Value – (No.8)

In PVA, there is no such concept as "continuing " or "perpetual" value as in CVA. Every product has its life span, and the termination is the time of reckoning for the product. If the Product Value is positive, the business is a success. If negative, it is a failure.

3.3 Problems in Finance oriented FCF calculation

In the beginning, let's confirm the formula of FCF measured in CVA that is the basics of modern finance. Stewart [1991] explains the Value as the present value of all future FCF, or the cash flow generated by a company's operations that is free of the cash invested for growth [6].

FCF = NOPAT – increase in working capital – fixed capital expenditures
Economic Value Added (EVA™) = NOPAT– C*×capital

where NOPAT (Net Operating Profit After Tax) = Sales – Operating expenses – Taxes, and C* is Weighted Average Cost of Capital (WACC).

Whereas, Tom Copeland et al [1995] defines FCF as the total after-tax cash flow generated by the company and available to all providers of the company's capital [7].

FCF = NOPLAT – Net Investment
Economic Profit = Invested Capital ×(ROIC-WACC)

where NOPLAT is Net Operating Profit Less Adjusted Tax, and ROIC is Return On Invested Capital.

Basically, these two formulae imply the same thing, and entail the following two problems.

① Calculating FCF through NOPAT or NOPLAT takes comparative balance sheets and income statement. FASB call this way of using B/S, P/L data to calculate cash flow "Indirect Method" in that net operating profit is reconciled to net cash flow. For managerial accounting, however, "Indirect Method" is too late, and too aggregated. Cash flow information is required to be "hot," and to be shown in the form of gross cash receipts against cash payments.

FASB says, "Because most enterprises said that they cannot now obtain amounts of gross operating cash receipts and payments *directly* from their accounting systems, the Board considered means by which those amounts might be determined indirectly. [8]" They may not be able to obtain gross data *directly, and now*, but actually it would takes less than a month to make a stand-alone, PC-based "Direct Method" reporting system, if only they are familiar with how to handle the subsidiary ledger and spreadsheet.

② Breaking down the corporate-level capital cost, "business risk premium" or beta (β) value in Capital Assets Pricing Model (CAPM) into individual product level is another difficult task [9] [10]. Product should bear the capital cost, yes, but even competent product managers are often neither unfamiliar with the source of fund offered to them, nor can read the business risk of the product very accurately. Some switch of thought is required to measure product-level cost of capital including business risk in a persuasive way.

3.4 How to formulate product-level FCF

Following is a formulation of Product Capital Cost Rate (PCCR) for the use of PVA, a plausible solution to the above problem.

Formula

Operating Cash Flow (No.3.3) = Operating Revenue (No.3.1) – Operating Expenditure (No.3.2)

Product FCF (No.6) = Operating Cash Flow (No.3.3) – Attributable Charge (No.5)

Product Value (No.8) = Σ Product FCF (No.6) / *Product Capital Cost Rate (No.7)*

The point here is that this formula shows the "Direct Method. " The Direct Method employed in PVA enables companies to obtain FCF information on each product and its aggregation everyday or in real time. But to realize this system, the final remaining problem must be resolved, that is, to measure *Product Capital Cost Rate (No.7)* .

3.5 Product Capital Cost Rate (No.7) - Combine Company's WACC with the Product's Return On Assets (ROA)

At first, let's confirm the principle that each *product should bear the cost of capital*, though the current accounting theory denies this principle. Note, however, that, since long before, there have existed strong counterarguments against the accounting rule that excludes interest from the product cost. Obata [2000] introduces, for instance, Mellerowicz who insisted in the 1930s, "The cost of debt capital constitutes product cost. [11]" Modern production paradigm that cherishes the velocity of material flow perfectly agrees with Mellerowitcz's idea.

Secondly, Mellerowicz also recognized that debit side usage of capital affects credit side structure of capital, and turn over rate of capital affects the cost of capital [11].

Then comes up an idea of *using company wide WACC adjusted by the specific product's ROA (Return on Assets)*. The rationale for this is that while *every product in a company is subject to the financial control of the company*, what is expected of the product manager is to *effectively use the capital* offered.

Turnover Rate, a part of ROA is an indicator that is supported by the new production paradigm, and production people are able to *improve the credit side capital structure by reducing debit side assets*. Inventory costs, for one thing, quite often exceed 20% of the book value of current assets, that is much more than WACC rate because inventory costs include such invisible or less visible expenses as "space", "warehouse", "transportation", "material handling", "distribution" etc.

Formula

Turnover Rate (TR) at Corporate (or Division) level: TR = Sales / Total Assets

Turnover Rate at Product level (PTR):

Product ROA= Operating Cash Flow (No.3.3) / Operating Revenue (No.3.1)

× Operating Revenue(No.3.1) / Assets for the Product

Assets for the Product = Invested Fixed Capital (No.2) + Operating Working Capital

where Operating Working Capital is obtained as the sum of net working capital account of the product that is maintained in the database of production system. Some adjustment like subtracting deferred and intangible assets from the company's total asset account may be necessary, but detailed adjustment are omitted here. Note anyway that the sum of operating working Capital in each individual product must equal the total current assets of the Company (or Division.)

Following is the example to estimate product-level Cost of Capital based on the above formula.

Example

Suppose : Company's Turnover Rate (TR) =3.0, Weighted Average Cost of Capital (WACC) = 8.2
Product A's TR= 3.5.

Then : Cost of Capital for Product A = 8.2 ×3.0 / 3.5 = 7.0

As a similar case, Matsushita's "Capital Cost Management " measures CCM in the form of "Division's operating profit less Asset Cost Rate equals CCM" to measure Division's business performance based on the segmented B/S financial report. (CCM is similar to EVA, and its Asset Cost Rate is similar to WACC, respectively.) Japan's Hoya also uses asset's side of B/S instead of WACC to value its division's performance.

Finally, if the Product Value (No.8) is positive, the product is to continue business, and the one that has negative PLCF should stop, sell or take some other strategic decisions. That is the same with CVA. But, don't forget the *status control* to take the current status of each product into account. Even aggregated negative PLCF might be allowed when the status of each product concentrates on the "launch".

All in all, PVA would be a system integration of the "Point of Sales (POS) system in supermarket, valuation theory and the status control based on product strategy.

3.4 Byproducts - Management Accounting tools obtained through PLCF

Beside ABC that has already been incorporated in No.3.2.4 of Exhibit 2, PLCF is able to generate various management-accounting information. Because PLCF database has two conceptual data at its core, that is, "standard value" and "cash flow" with minimal *lot*-level.

(1) Throughput Accounting

Formula

A: Throughput Contribution = Cash receipts from customers (No.3.1) – {material expense (No.3.2.1) + outsourcing expense(No.3.2.2) + sales commission (No.3.2.5)}

B: Operating costs = payrolls (No.3.2.3) + activity expense (No.3.2.4) + selling & administrative expenses (No.3.2.6)

Throughput Operating Income = A – B

(2) Direct Standard Costing

Formula

A: Contribution Margin for the product = Sales (No.3.2.1) – Variable costs (No.3.2.1+No.3.2.2)

B: Product Margin = Contribution Margin – Fixed costs (No.3.2.4)

(3) Back Flush Costing

Back Flush Costing (BFC) is a modern version of standard costing that supports JIT environment by letting all the manufacturing costs of a period directly flow into cost of goods sold with standard value, skipping work-in-process account [12]. Further improvement may be possible for this method by shifting the trigger point of product costs from "sales" to the upstream "before order-release", that is, from "back-flush" to "fore-flush" costing. At least, however, BFC's emphasis on standard costing is appreciable, and BFC information also is readily be produced by PLCF database.

4. Management accounting and the knowledge Management

Of late, knowledge management tends to be much talked about "explicit knowledge", and in relation to "*e*-technologies" such as "client-server database", "knowledge-navigation" and so forth. Very soon, however, "tacit

knowledge" will come up as a crucial issue of knowledge management, because the reservoir of sound "tacit knowledge" is what virtually decide the corporate value [13]. Management accounting system from now must support, or at least, be compatible with *knowledge creating function* in the organization [14].

4.1 Management accounting as knowledge driver

In the 20th century, management accounting tended to make for the *command-control style* of management. Budget control, for instance, became just a "pressure device" to enforce the plan by any means. From now on, management accounting should incorporate the *momentum of knowledge-creation* into the system. For one thing, shifting focus of management accounting "upward" could gather that momentum. For the other, injecting that momentum into the frontline operational also add that momentum to the organization.

For management accounting, identifying "the number of order-slip processed" as the cost driver of procurement office and pondering over the alternatives in light of the strategic optimum may lead process designer toward a more creative knowledge. But, what happens if the "number of order-slip" is employed as an indicator to measure the buyer's cost performance remains to be seen. Unfortunately, the indicator might rather deprive the buyer's potential for creative knowledge. "Cost driver" is one thing, "knowledge driver" quite another.

This rule might apply to any software packages equipped with excellent *e*-technologies like enterprise wide system (EWS) or supply chain management (SCM). These packages might have to be carefully customized to positively foster the learning organization.

4.2 The Role of Operation in knowledge management

PVA emphasized the importance of the product-planning and designing stage as a rich source of creative knowledge for innovative products and technologies. This insight, however, does not lessen the importance of operation stage in knowledge creation. Note that the implication of operational dimension is rapidly changing. Operation is not the object of *control* any more. It is the *source of knowledge-creation for the company as a whole*. Managers at corporate headquarters may be generalists. Although planners and designers may be able to set "assumptions," these assumptions must be examined, vindicated and redressed by front-line operators who are directly linked with customers and the market. " In this respect, PVA is to be designed to help explore such *real* knowledge in the process of executing PLCF, challenging people to reexamine what they take for granted on the product and its customer.

4.3 *Product must outweigh Period*. – Toward knowledge-focused management accounting system

Shifting *from command-control to knowledge creation* is becoming a clue to management accounting system viable in the 21st century. Then, how? Focus more on product is an answer that relates to management accounting.

There have been two different dimensions of knowledge in management accounting. One is the *Product-oriented*, and the other is the *Period–oriented knowledge*. PVA taken up in this paper, strategic cost management and target costing are the examples of the *Product-focused* knowledge, whereas, CVA taken up in this paper, income statement, cost volume profit (CVP) and other financial analysis belongs to *the Period*–focused accounting knowledge. Both Product- and Period-focus are required for running business, but the point is that *Product must outweigh Period* in terms of fostering the knowledge-creating, leaning organization.

History shows that, since the 1980s, *period*-focused knowledge such as full absorption costing lost relevance in the face of new production paradigm [15]. What cornered the U.S Big-threes might have been the *period*-led accounting embraced by "bean counters," and what revived them in the 1990s was the *product*-first schema of "car-guys [16].

Specifically, as to operation control, there have been two conflicting thoughts. H.T. Johnson put forward "bottom-up empowerment by Total Quality Management (TQM)", rejecting "top-down control by accounting numbers." His stance is for *Product* school, being in line with Toyota's JIT and E. Deming's Quality Control [17].

Kyocera, Japan's top ceramic manufacturer and famous for its "Amoeba system", belongs to the *Period* school. "Amoeba" means units of small group at workshop level, where the indicator of "earned cash flow per man-hour" is constantly monitored and controlled, being linked with financial accounting. At least as to knowledge management, the viability of Kyocera's aggressively *period*-focused approach remains to be seen. Kyocera may succeed, too, if its system would follow the principle that *Produc*t must outweigh *Period*. Originally, Toyota and Honda are sharply product-oriented [18]. SONY or Ford, while they appreciate shareholder value and CVA, seems to know well that their strength depends on *product*, not on *period* [19].

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Exhibit. 2 Sample of PLCF in Product Valuation Approach

Name of Product [12″ Wafer Transferror] **Product Lifetime Cash Flow Plan**

No.			Aug. 2000			Sept. 2000 (Closing).				Oct. 2000				Mar. 2001	Apr. 2001	***Life Total***
			Plan	Actual		Plan		Actual		Plan		Actual		(closing)	～	
1	R&D Stage		accum.	6 mths	accum.	6 mths	accum.	6 mths	accum.	6 mths	accum.	6 mths	accum.	～	～	
	1.1	Payroll & Overhead for R&D	××	××	××	××	××	××	××	××	××	××	××	～	××	×××
	1.2	Prototype/ Mock-up	××	××	××	××	××	××	××	××	××	××	××	～	××	×××
	1.3	Marketing Research	××	××	××	××	××	××	××	××	××	××	××	～	××	×××
	1.4	Patent	××	××	××	××	××	××	××	××	××	××	××	～	××	×××
	1.5	Other R &D related expenses	××	××	××	××	××	××	××	××	××					×××
2	Investment Stage															
	2.1	Construciton (Plant, Layout etc.)														×××
	2.2	Equipment (Equipment, machines, tools, dies etc. including common utility)	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
	2.3	Payroll & Overhead for Marketing/Produciton Arrangement	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
	2.4	Supply Chain Networking (Procurement, Logistics, Network, After service, Recycle etc.)														×××
	2.5	Other expenses for Arrangement & Launch														×××
3	Business Stage															
	3.1	Operating Income (Cash Receipts from customers = Standard price × QTY)														×××
	3.2	Product Operating Expenses														
		3.2.1 Payout for material (= Standard price × QTY)	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
		3.2.2 Payout for Outsourcing (Standard price × QTY)	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
		3.2.3 Payroll for the Product (Number of Employees × Rate)														×××
		3.2.4 Activity Costs (Standard Cost Driver rate × Standard Cost Driver QTY)														×××
		・Mfg 1 (Machining)														×××
		・Mfg 2 (Heat & Surface Treatment)														×××
		・Mfg 3 (Assembly)	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
		・Quality Assurance	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
		・Sales														×××
		・Technical Service														×××
		3.2.5 Sales Commision (= Unit Margin × QTY)														×××
		3.2.6 selling and administrative exoenses attributable														×××
	3.3	Operating Cash Flow (= 3.1-3.2)	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
4	Termination Stage															
	4.1	Inventory Diposiiton	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
	4.2	Facilities Disposition														×××
	4.3	Other Termination-related Revenues and Expnses	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
5	Attributable Charge															
	5.1	Depreciation	～	～	～	～	～	～	～	～	～	～	～	～	～	×××
	5.2	Taxes (= Operating Cash Flow × Effective Tax Rate)													××	×××
	5.3	DHQ service (Personnel, Accounting, Computer service etc.)													××	×××
	5.4	GHQ service (Corporate Planning, Finance, Legal, Public Relatoin etc.)													××	×××
6	Product FCF (Operating Cash Flow (3.3) - Attributable Charge(5))		～	～	～	～	～	～	～	～	～	～	～	～	～	×××
7	Product Capital Cost rate (%)		～	～	～	××	××	～	～	××	××	～	～	～	～	×××
8	Product Value (= Product FCF/ Product Capital Cost Rate)		～	～	～	××	××	～	～	××	××	～	～	～	～	×××