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WORKING PAPER

Disclosure of improvement activities related to tangible assets

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DISCLOSURE OF IMPROVEMENT ACTIVITIES RELATED TO TANGIBLE ASSETS

Abstract - In times of globalization, harmonization, and increasing competition, striking the proper balance between, at one extreme, flexibility or a true and fair view, and, at the other, comparability or rigidity, is a delicate one. In this article, we argue that maintenance measures may be split into one of the two categories: Value Preserving Maintenance (VPM), or Value Increasing Maintenance (VIM). Given the significance of maintenance expenditures, and that continuous improvement is a key requirement of success in this new environment, then VIM-measurement is a readily understood and valid indicator of management and firm performance. In addition, VIM-measures give a more true and fair view of the change in wealth of the enterprise than accumulated maintenance expenses that conventionally are treated as income adjustment entries.

Key words: Accounting; assets; disclosure; maintenance.

1. INTRODUCTION

The subject of this paper is how financial accounting deals with maintenance expenses and whether the current way of accounting for maintenance is still optimal. Maintenance is an issue that can be analyzed from different perspectives. From a broader societal, ecological view our present toil and moil attitude should be changed towards one that emphasizes a sustainable development, or in the words of the Brundtland Report (De la Court, 1990, p. 136) "Development must be compatible with and restore diversity and rely on sustainable forms of resource use". At the national level, maintenance costs amount to a considerable figure, for example, in Sweden around 10-14% of GNP. Canadian data show that over the period 1961-1993, repairs

and maintenance were approximately six percent of gross domestic product, and averaged 50 percent of spending on new equipment (McGrattan & Schmitz, 1999). From a narrower microeconomic, or company view, maintenance is a value creating activity of significant importance (Porter, 1985), and the significance of this value creating activity increases with the leanness of production. For public sector agencies, the condition of the infrastructure they manage is often a key indicator of operational performance (Walker et al., 2000). However, there is little research on reporting on maintenance. Maintenance expenses are accounted for in different ways, which increases the difficulty of comparing financial statements prepared under different accounting frameworks. But even when financial statements deal with maintenance in the same way, and despite the fact that maintenance measures have a profound impact on the firm's efficiency and effectiveness, maintenance items are not openly disclosed in the financial statements. This may cause a problem to the users of the financial statements, for example financial analysts, who may make an incorrect valuation of fixed assets, which, in turn, may have a negative impact on the efficiency of the capital market. This is in line with recent empirical studies that suggest that the quality (usefulness) of accounting information is decreasing and that the users of financial statements need more forward-looking financial and non-financial information (Stolowy and Jeny-Cazavan, 2001). It must be stated that in today's global market, how maintenance is conceived and dealt with has not only management control implications that relate to the notion of economies of scope and what determinants are to be balanced (cf. Balanced Scorecard), but also to the financial accounting notion of a "true and fair view" and linked disclosure requirements. In this essay, we are discussing the maintenance value creating perspective by splitting maintenance measures on the grounds of intended purpose into two categories: Value Preserving Maintenance (VPM) and Value Increasing Maintenance (VIM). Acute maintenance is a special case of VPM in that it is not aiming at preventing machine failure. VPM includes, acute maintenance, preventive and predictive maintenance, while VIM corresponds to modifying maintenance. We are focusing on maintenance measures that fall within the category

VIM, that is, actions that take advantage of and apply cross-functional knowledge and skills to improving the functionality, capacity, maintainability, and/or the economic life of the tangible asset. In our discussion, we will distinguish two major aspects of accounting, measurement and disclosure. In the following pages, measurement relates to how maintenance expenses are registered in the accounting system, i.e. being capitalized or charged to the profit and loss account. Disclosure relates to how the accumulated effects of continuous improvement of tangible assets are shown in the financial statements. First, however, we will discuss the nature of different maintenance measures.

2. THE NATURE OF MAINTENANCE: VPM VS VIM

In a global economy the maintenance technicians have to participate in improvement work of many kinds, for example (upstream) product design and (downstream) re-engineering of equipment. Traditionally, maintenance aims at preserving or restoring the function of the equipment and thus, their availability. Machine availability is a key factor for success in a JIT or lean production environment, as it always has been in a continuous process production, where the entire process is automated, for example in chemical plants, oil refining, and liquor production. Further, in a global economy, the competitiveness of a firm depends on its global performance, which requires that machines are run flawlessly and are available when required. Advances in manufacturing technology, the wide-scale dissemination of new communications and information technologies, and accelerated international transactions, rapidly growing new markets, an increased ability to foster and mobilize a range of skills simultaneously (including maintenance skills) have all affected the development of maintenance practice. Today, we usually talk about four types of maintenance (cf. Willmott, 1990): (A) Modifying (or improvement) maintenance, aimed at improving the capabilities (including maintainability) of machinery and/or prolonging its economic life; (B) Predictive maintenance, based on monitoring the condition of the equipment in order to

repair before it fails; (C) Preventive maintenance, which is characterized as planned and scheduled inspection checks and routine overhauls at regular, fixed intervals; and, (D) Acute (or unscheduled) maintenance, usually characterized as requiring an immediate remedial response and, as such, often referred to as breakdown maintenance which is usually disruptive to production.

In cases where (D) acute maintenance predominates, the equipment is run until it breaks down or is worn out – "If it ain't broke, don't fix it." Only when the machine is broken is it repaired. The acute maintenance attitude agrees with the Fordism production philosophy (c.f. Coriat and Dosi, 1999), where extensive buffer inventories made continued production possible and costs of stoppages in individual machines affordable. Another typical situation is when, for example, light bulbs and printed circuit cards are broken are just exchanged for new ones. The rationale for acute maintenance in this case is that it is practically impossible to predict exactly when the components will break down, and thus the incurred cost of the stoppages is low due to the ease of exchanging components. In a JIT or lean production environment (Ohnism production philosophy), where reduced production lot sizes requires that machine downtime be minimized, the production flow be uniform through out the plant, and the quality requirements be set very high, there is no allowance for acute maintenance. That is, modern manufacturing techniques advocate (C) preventive, or planned, maintenance to ensure that machines are working effectively at all times. Research indicates that preventive maintenance substantially contributes to the operating performance of lean plants (Shah & Ward, 2003). Naturally, this type of maintenance methodology applies to process industries as well, especially in situation where there is a risk of environmental pollution, health and safety problems. (B) Predictive maintenance uses a number of testing techniques, such as oil analysis, ferro-graphic analysis, infra-red testing, sound measurement or vibration analysis, to determine the condition of a machine. The point is that if the machine has a problem, it can be repaired before it fails which allows the facility to keep running. Needless to say, testing alone can not make a machine perform. Predictive maintenance is crucial in cases where risks of

environmental pollution, health and safety problems are high. Airplanes, nuclear plants (and weapons!), and oil refineries, all are heavily dependent on well carried out predictive maintenance. (A) Modifying maintenance has arisen in response to today's dynamic environment, where insistence on continuous improvements and learning is increasing. By taking advantage of the expertise of maintenance technicians, together with expertise from other functional areas, and applying this knowledge (and skills) to improving the functionality, capacity, maintainability, and/or the economic life of the production equipment, the company will gain a competitive advantage over its competitors not lacking this ability (cf. Wernerfelt, 1984; Barney, 1997). For example, improved maintainability will lead to use of machines that are faster and easier to maintain. Redesigned machinery which allows higher cycle times and faster set-ups, enhances the flexibility that is crucial in today's competitive market. And, accordingly, this maintenance competence increases the value of the firm. Value Preserving Maintenance embraces acute, preventive and predictive maintenance (B+C+D), while Value Increasing Maintenance corresponds to modifying maintenance (A).

3. THE IMPORTANCE OF MAINTENANCE IN THE CURRENT COMPETITIVE ENVIRONMENT

In attributing manufacturing success to Japanese forms of management, researchers have focused on particular "new" manufacturing methods, such as JIT,* MRP, TQM, TPM, SPC, and QC (Jones, Currie and Dugdale, 1993). The success of these methods has been ascribed to Japanese management development and training as well as to processes of "team" and "strategic" management. Managers are seen as creating a work force which is "multi-skilled", "team-based" and with strong company "loyalty" and high "motivation" (Kumazawa and Yamada, 1989; Wood, 1991; Story, 1991). Importantly, much of the attention on Japanese manufacturing methods attributes economic advantage to the successful adoption of Advanced Manufacturing Technology (AMT) (Jones, Currie and Dugdale, 1993). The lowest common

* JIT (Just in Time), MRP (Materials Requirement Planning), TQM (Total Quality Management), TPM (Total Preventive Maintenance), SPC (Statistical Process Control), and QC (Quality Circles).

denominator of all these manufacturing methods is their distinctive direction at continuous improvement, or process innovation, of which VIM measures form an important part. Together with competitive culture, process innovation and organizational learning are the key factors influencing long-term success in global markets (Pucik, 1992). From a valuation point of view, process innovation measures related to tangible assets will sooner or later (this relationship may be non-linear) affect their value. The conclusive point is whether such measures will enhance the capacity/function of the asset and/or prolong its economic life.

The general meaning of economic value has to do with an asset's scarcity and utility, not its exchangeability (Kam, 1990, p. 475). The utility of an asset to the business increases with the leanness of that business. Hence, in a global economy, the notion of future services (utility) or benefits is gaining momentum, and so will the notion of Value Increasing Maintenance. An availability rate of around 50% for critical machine equipment is not unusual in the Swedish engineering industry (Halldin & Schiller, 1992). On the other hand, in the processing industry it is common to have over a 90% availability rate. Today, with the extensive capitalization rate, the stoppage costs are, in many cases, almost as high in the engineering industry as in the processing industry. Comparing (D) acute versus (A+B+C) non-acute maintenance, the "normal" rate in the engineering industry is 80 to 20 per cent, whereas it is 90 to 10 per cent in the processing industry. The effects of unplanned machine stoppages in some industries can be seen from Table 1 below.

Table 1. Losses in terms of contribution margin per hour due to a machine breakdown in four different industries

Industry-trade	*Losses due to stoppages*	
Petrochemical	500 - 1,000 Thousand USD.	*(3-4 days to restart)*
Steelworks	10 Thousand USD.	
Pulp and Paper mills	5 - 10 Thousand USD.	
Metal-works	5 Thousand USD.	

Thus, the consequences of unexpected stoppages in the production process are quite substantial and increase over time. Obviously, recurring machine break-downs will have a significant impact on a company's competitiveness in the global market. Table 2 displays the ratio between maintenance expenses and total turnover in different industries in Sweden.

Table 2. The ratio between the maintenance costs and the total sales/revenue (Source: adopted from Malmholt et al., 1993)

Industry-trade	*Ratio*
Machine and transport equipment	11.6%
Steel- and Metalworks	8.5%
Electromechanical	0.3%
Agricultural	2.0%
Pulp- and Paper mill	10.6%
Chemical	3.3%
Misc., e.g. graphical, wood, energy	3.9%
In average	6.0%

It can be seen, from Table 2 that the level of maintenance expenses vary across industry-trade, which indicates that the claim put forward in this paper is more relevant to certain major industries, such as the Machine and transport equipment industry, Steel and Metal-works, and Pulp- and Paper mill, than to, for example, the Electromechanical industry.

In a real-life context, there is much confusion as to whether to capitalize the cost of a maintenance measure or charge it to expense (Halldin and Schiller, 1992). As the maintenance costs amount to 10-14% of GNP (as in Sweden), this confusion may, at worst, distort the presentation of the financial position, performance and changes in the financial position of a firm, or, at least, make this presentation unnecessarily vague. From a disclosure (true and fair) point of view, it is obvious that maintenance transactions may be used for income smoothing in the financial statements. This provides support to our opinion that maintenance entries should be openly disclosed in the financial statements.

In brief, the argument put forward is that given the importance of maintenance expenses we need clear rules on how to expense or capitalize maintenance costs, in that distorted financial presentation may come out from a balance sheet, where VIM maintenance is not capitalized. Given the ever growing importance of process innovation, and thus VIM, leads to the claim that we need to make a distinction between the two categories of maintenance costs (VPM and VIM) and that we need to disclose VIM maintenance in the notes. This claim will be discussed in depth in the sections to follow.

4. ACCOUNTING FOR MAINTENANCE EXPENSES

A distinction should be made between measurement and disclosure. Measurement here relates to how maintenance is registered in the accounting system. International Accounting Standard 16 includes some regulations on how to account for maintenance (IASB, 2001). Its § 23 states that capitalization of expenditure on an item of property, plant and equipment [subsequent to its acquisition] is required when it is probable that this expenditure will result in additional future benefits, in excess of the originally assessed standard of performance of the existing asset, and the expenditure can be measured reliably. All other subsequent expenditure should be recognized as an expense in the period in which it is incurred. §§24 to 27 give further guidance on how to understand this general principle. Expenditures that must be capitalized include those that result in an extension of the useful life of the asset, including an increase in production capacity, in a substantial improvement in the quality of output or enabling a substantial reduction in previously assessed operating costs. This corresponds with the category of Value Increasing Maintenance above. On the other hand, repair or maintenance costs, made to restore or maintain, rather than increase, the future economic benefits that an enterprise can expect from the originally assessed standard of performance of an asset, are expensed when incurred. Costs of regularly recurring major overhauls of a tangible fixed asset should also be expensed, unless the asset to which they relate is an identifiable component that has already been depreciated, the overhaul will result in future economic benefits and costs can be measured reliably.

The following table summarizes accounting for repair and maintenance expenses in selected countries (Orsini et al., 2001).

Country	Revenue expenditures	Capital expenditures
Australia	Ordinary repairs and maintenance; Extraordinary repairs	Extraordinary repairs can be capitalized, but are commonly treated as revenue expenditures
Belgium	Ordinary repairs and maintenance	Extraordinary repairs; depreciation over remaining life of asset
Canada	Ordinary repairs and maintenance	Betterments or costs incurred to enhance the service potential of a capital asset, through an increase in the previously assessed physical output or service capacity, a decrease of associated operating costs, an extension of useful life or an improvement of quality of output
France	Ordinary repairs and maintenance	Extraordinary repairs
Germany	Ordinary repairs and maintenance	Extraordinary repairs
Ireland	Ordinary repairs and maintenance; extraordinary repairs	Extraordinary repairs are usually capitalized, but might also be expensed, depending on particular circumstances
Italy	Ordinary repairs and maintenance	Extraordinary repairs
Japan	Ordinary repairs and maintenance	Extraordinary repairs; depreciation over remaining useful life
The Netherlands	Ordinary repairs and maintenance	Extraordinary repairs; depreciation over remaining useful life
Spain	Ordinary repairs and maintenance	Extraordinary repairs; depreciation over remaining useful life
Sweden	Ordinary repairs and maintenance	Repair costs may be capitalized if they clearly enhance the value of the asset; depreciation over remaining useful life
Switzerland	Ordinary repairs and maintenance; Extraordinary repairs	Extraordinary repairs may be treated as capital or revenue expenses, usually they are expensed
United Kingdom	Ordinary repairs and maintenance; extraordinary repairs	Extraordinary repairs are usually capitalized, but might also be expensed, depending on particular circumstances
U.S.A.	Ordinary repairs and maintenance	Extraordinary repairs and betterments

*Ordinary repairs and maintenance: recurring, small amounts, do not appreciably prolong life of the asset, improve efficiency or enhance service potential; Extraordinary repairs: nonrecurring, relatively large, increase efficiency or service life beyond original expectations

From this table it can be concluded that accounting for repair and maintenance in most countries corresponds generally with IAS 16. The major exceptions are the UK, Ireland and Sweden, where VIM is generally capitalized but can be charged to the income statement immediately, and Australia and Switzerland, where VIM generally will be expensed.

The other relevant aspect is disclosure. Here, there seems to be a consensus across accounting frameworks as maintenance costs are not disclosed as a separate category of assets (VIM) or expenses (VPM). This lack of disclosure relates both to the balance sheet and income statement, and to the notes. Consequently, relying only on published financial statements would not inform its users on the relative importance and nature of maintenance. If VIM is to be capitalized and openly disclosed in the financial statements, then an important qualification that has to be considered is the materiality principle. The Securities and Exchange Commission (SEC, Regulation S-X 1-02) maintains that if the specific cost or expense exceeds 1% of the total sales/revenue it should be disclosed openly. Further, if an item exceeds 10% of the amount of a line item in the balance sheet or 5% of the sum of the total assets then the item should also be disclosed. FASB (in Concepts No. 2, Glossary) defines materiality as "The magnitude of an omission or misstatement of accounting information that, in the light of surrounding circumstances, makes it probable that the judgment of a reasonable person relying on the information would have been changed or influenced by the omission or misstatement". In the following section VPM measures and different depreciation methods are discussed.

5. VALUE PRESERVING MAINTENANCE

VPM (B+C+D) encompasses the adjustment of a machine or its working parts, the labor necessary to restore a damaged part to its original condition as well as the replacement of one or more parts with new parts. As described above, traditional financial accounting treats VPM as an expense that is currently charged against income. Maintenance expenses may increase over the life of an asset because of the increasing need for adjustment and care as equipment ages. Thus, the expected life of an asset is directly related to the extent of the anticipated maintenance. Furthermore, the efficiency of an asset frequently declines as an asset ages, and the rate of this decline is directly associated with amount of maintenance measures. If the value of the asset's output remains the same throughout its life, while maintenance expenses increase, the net

contribution of the asset is decreasing. This decline may also occur as a result of frequent maintenance interruptions as the asset ages. The recurred maintenance decreases the time available for production and thus diminishes the output of the machine. This calls for a declining depreciation charge, in order to better match expenses and revenue. On the other hand, there are assets where testing or training is important in the early years of their introduction and/or where software changes are important in the beginning of the asset's life (e.g. for debugging). For these assets, one could argue in favor of increasing depreciation charges, since their is a lot of idle time in the first years, resulting in reducing their potential output and consequently limiting their revenu generating capacities in the beginning. AMT may serve as an example of where increasing depreciation charges may more accurately reflect the adjustments (VPM) made to machines in the beginning of their useful life.

6. VALUE INCREASING MAINTENANCE

As mentioned previously, VIM (A) implies that the capacity, functionality, maintainability, and/or the economic life of an asset will increase by equipment design improvement. Hence, the net contribution of the asset will increase. As indicated above, this modification equipment design may be the result of a company continually making such improvements. How should VIM be dealt with in the financial statements? To answer this question we have to focus on the concept of "value." What is "value" from the standpoint of an enterprise? First, "value" is a much more complicated concept than "asset". For example, "value" may be derived from a feeling associated with a particular context or event. Second, different companies may perceive the value of same asset in different ways. Waste oil, for example, might have a great value for one company, while for another it represents an asset with a negative value. If "value" is related to the resources being used by an enterprise, the notion of value may be exchanged for "asset".

The definition of an asset is, according to FASB, as follows: "Assets are probable future economic benefits obtained or controlled by a particular entity as a result of past

transactions or events" (FASB Concepts Statement No. 6, "Elements of Financial Statements", 1991, paragraph 26). The definition is based on three essential components: (1) probable future economic benefits, (2) which have been obtained or controlled by a particular entity, and (3) are the result of past transactions or events. First, assets are equivalent to probable future economic benefits. They are "probable" because they refer to the future and, thereby can only be "reasonably expected or believed on the basis of available evidence or logic" (ibid., footnote on p. 9). The future is, by definition, uncertain, but the accountant is obliged to consider it. This calls for a reasoning methodology based on well-founded assumptions about future events and conditions. FASB's definition has been challenged by different scholars (Schvetze, 1993). One position holds that this definition "is so complex, so abstract, so open-ended, so all inclusive and so vague that we cannot use it to solve problems" (Schvetze, 1993, p. 67). It is not hard to disagree with the lodged critique; the FASB definition is complex, abstract, and open-ended. However, the notion of asset as used in this paper relates to tangible assets, and they are in the long-term perspective, exchangeable for cash. Ijiri (1975) maintains that among various classes of resources the class called "money" has a particular distinction. "All other classes of resources are held by an entity not because of their intrinsic class properties, but because of their contribution to the monetary resources under the entity's control" (Ijiri, 1975, p. 60). Transformations across classes, Ijiri argues, take place by exchanges. But the point here is that even a narrower definition such as "cash, contractual claims to cash or services, and items that can be sold separately for cash" (Schvetze, 1993, p. 69), does not contradict our proposed division of maintenance items into VIM and VPM. First, to generate future services or economic benefits, an asset has to be scarce. If there is limited supply of an asset, and it has utility, then it has economic value. As mentioned before, the primary element of an asset is its ability to generate future services or benefits. Paton and Littleton (1940, p. 13) maintain that "Service is the significant element behind the account, that is, service-potentialities, which, when exchanged, bring still other service-potentialities into the enterprise."

Second, the asset must be under control of a given entity. Control over resources, in the view of Ijiri (1975, p. 51) means the discretionary power to utilize or dispose of resources. He asserts that "the basis for control may be legal ownership (the strongest form), a contractual right (e.g., leased properties), majority power (in consolidation), or organizational authorization (in divisional accounting)". Conversely, legal ownership, for example, does not always imply control. Instead, "possession of a thing is merely the right to use it or control it" (Sprague, 1907, p. 44). As an example, the government may prohibit the possession or manufacture of a certain type of asset. By its power of eminent domain, it can nullify an entity's control over its property.

However, the notion of control over resources is considered to be the fundamental concept in determining what resources will be measured in accounting (see for example, Ijiri, 1967, p. 69). Accordingly, an entity's economic goal is to increase its resource set, that is, the set of resources or assets under its control (ibid., 1975, p. 60).

Third, an asset should be the result of past transactions or events. This qualification is included in the definition to ensure that contingent assets are excluded. For example, a machine that is to be acquired according to the budget is not an asset, because the transaction has not yet taken place. An acquisition consists of several phases, control and delivery, to name two. Normally, one lets the civil law govern in order to decide when an acquisition is to be accounted for as an asset. Then at what value worth should an asset be recorded in the books? The conventional wisdom in financial accounting is that an asset is recorded at its historical cost, that is, the cost at the time of acquisition. Under historical cost accounting, a recording of the actual transaction is made and the price is set by the market. It is argued that this is an objectively determined value of the asset.* However, this estimated value should be assessed with regard to potential needs for depreciation. In the following section we will argue that if maintenance expenses exceed the thresholds delineated by the SEC (see above), and if they can be defined as

* For a more extensive discussion see for example: A. C. Littleton, "Significance of Invested Cost," Accounting Review, April 1952, p. 168; Yuji Ijiri, "Studies in Accounting Research #10, Theory of accounting measurement", American Accounting Association, 1975, Ch. 6; Robert Mautz, "A Few Words for Historical Cost," Financial Executive, January 1973, p. 23.

VIM, then these expenses should be capitalized and openly disclosed in the financial statements.

7. DISCUSSION

An analysis of the annual reports of several major companies reveals that it is not atypical for maintenance costs to comprise 20% to 30% of total operating costs, especially in the heavy industries (Rushworth and Mason, 1992, p. 2). These authors conclude that the use of machines which are faster and easier to maintain should be regarded as a key area for potential and substantial cost reductions through the use of maintenance measures that can be defined as VIM. Lack of adequate access is generally the greatest single cause of poor maintainability. This has been shown to be the case in industries as diverse as mining (Ferguson et al., 1985) and nuclear power generation (Seminara and Parsons, 1982). This limiting aspect of machine design, which unnecessarily extends maintenance time, can be alleviated by way of Improvement Maintenance (Willmott, 1990) or, to put it in another way, by VIM. As stated above process innovation, and thus organizational learning, is an important ingredient in a lean production environment. The single most distinguishing feature separating Japanese management from Western management is the former's focus on learning, and, by its extension, competence (Schiller, 1999). VPM and especially VIM can be used as management tools for attaining and maintaining "continuous improvement". Hence, maintenance measures can be carried out in a way that is a prerequisite for the responsiveness and flexibility needed in today's global markets. This is of utmost importance! Besides the significant role of maintenance as process innovation projects that have to be balanced with other determinants of the financial result, maintenance by itself has a profound impact on the efficiency and effectiveness of an enterprise.

The impact of VIM on the financial statements is both direct and indirect. Directly, capitalizing VIM expenses increases total assets. Indirectly, VIM increases competitiveness, which will result in the company outperforming competitors and consequently increasing equity. The justification for the capitalization of expenditures

is that they can be traced directly to definable streams of future benefits (Kam, 1990). Kam maintains that "For an asset already acquired, an expenditure should be capitalized if it (a) increases the productive capacity of the asset, (b) increases its economic life, or (c) increases the asset's value" (ibid. p. 152). Furthermore, even if an expenditure does not meet this rule, it may be capitalized because the amount is material. When it comes to VPM measures, these are anticipated when the economic life of the asset is estimated at acquisition. Beyond the principle of materiality, the expenditures for VPM do not meet the qualifications mentioned by Kam. VIM measures, on the other hand, are directed at increasing the productive capacity of the asset, and its economic life. As a consequence, the value of the asset will be enhanced. Consequently, VIM activities fulfill the qualifications and, accordingly, the related expenditures should be capitalized. Major components of some equipment may require replacement at regular intervals. The old component should be written off, while the replacement component is to be accounted for as a separate asset (IAS 16, paragraph 28). As mentioned, process innovation efforts are directed at increasing the original standard of performance of an asset, and not just the performance of a component. Accordingly, VIM measures should be capitalized because future benefits, associated with this improvement, will flow to the enterprise; and, the cost of carried out VIM measures can reliably be accounted for. One disadvantage, however, arises in countries that directly link taxation with accounting: capitalization of VIM measures may accelerate taxation because some proportion of the tax deduction will be deferred. However, in our opinion, it is preferable not to favor tax planning over the presentation of a true and fair view of the financial position, performance and changes in the financial position of an enterprise. Secondly, as a result of capitalizing VIM measures, the value of an asset may change over time, in contravention to the historical cost concept, which traditionally is closely related to the realization concept in the measurement of income. However, some countries allow different types of assets to be revalued for financial statement purposes, recognizing the relevance of such practice within an otherwise historical cost - oriented accounting framework. Furthermore, the Japanese view of continuous improvement

challenges the significance and the legitimacy of the historical cost valuation concept. Through the implementation of "continuous improvement" and, thus, "organizational learning", the traditional textbook classification (Welsh, Zlalkovich and White, 1976, pp. 516-518) of expenditures subsequent to asset acquisition as maintenance costs, ordinary repairs, extraordinary repairs, replacements, and betterments is no longer valid. The grounds for this claim is that continuous improvement aims for perpetual betterments. Maintenance measurements are important tools in achieving continuous improvement. Hence, standard textbook definitions of common expenditures subsequent to asset acquisition are dysfunctional due to technical and process development. Gordon and Shillinglaw (1974, p. 343) maintain that "the total productive capacity of a plant asset, or any complex of assets, is a joint function of the output per unit of time and the length of time over which satisfactory output is achieved, both of which factors are in turn more or less dependent upon the level of maintenance provided." The authors offer the following rules for classification of expenditures related to different levels of maintenance measures: (1) any cost incurred to obtain the service initially expected is a maintenance cost; and (2) any cost incurred to increase lifetime productivity capacity by raising the output rate or by extending the economic life or by reducing operating cost is a capitalizable betterment (ibid., p. 343). From the classification used in this paper, the former type of maintenance is assignable to VPM measures, while the latter pertains to VIM measures. This indicates that our classification of maintenance expenditures from a continuous improvement perspective might prove useful in a financial accounting context.

An important issue that arises is disclosure of maintenance expenses. If the SEC's 1-percentage-rule is to establish the materiality principle, then companies in several industries should openly disclose the maintenance expenditures in their financial statements. In Table 2 (see above) the tendency of maintenance expenses to exceed the above mentioned thresholds of the SEC is clear. It can be seen, from Table 2, that every industry-trade, with the exception of electro-mechanical, fulfills the stated thresholds of the SEC. Obviously, whether to disclose maintenance expenses in the financial

statements is also a question of industry-trade. How should a disclosure be made in order that to make the financial statements clear and understandable (IAS 5, paragraph 6)? There are several methods of disclosure. The selection of the best method in each case depends on the nature of the information and its relative importance (Hendriksen, 1977). The most relevant information should be summarized in quantitative terms and should be presented in the formal statements to the extent possible and desirable and then in footnotes, supplementary schedules, and supplementary statements. Supplementary statements can be used for presenting additional information or information arranged in a different way. Since supplementary statements are not necessarily included in the formal statements, they can be used as methods of developing and experimenting with exhibits and statements. Thus, supplementary statements are the appropriate form for disclosing maintenance items and maintenance related aspects in the financial reports.

In summary, the arguments in favor of capitalization of VIM-measures are as follows: (1) maintenance expenditure typically amount up to 20-30 percent of total operating costs; (2) maintenance measures have a profound impact on the firm's efficiency and effectiveness; (3) VIM measures can be used as a management tool for attaining and maintaining continuous improvements; (4) currently, most industries fall within the SEC's requirements for an open disclosure of maintenance expenditures; (5) the justification for the capitalization of maintenance expenditures is that they are traceable to definable streams of future benefits; (6) VIM measures are directed at increasing the productive capacity of the assets, and their economic life, and, hence, enhancing their value to the business. Thus, VIM measures meet the qualification for capitalization of expenditures, and should, as such, be disclosed.

8. CONCLUSIONS

VIM measures are consistent with the notion of economies of scope and in that flexible machines are used on existing product designs and also on future redesigns of these

products (as well as on totally new products). Hence, in order to support the economies of scope in production, flexible machines constantly have to be upgraded, and VIM (continuous improvement) is one important method of doing so. Further, VIM, as a change project, has an effect on the financial result. Hence, it is important to gain a better understanding of VIM measures and their implications for the financial results. The importance of VIM measures increases with the leanness of production. For the reasons elaborated on previous sections, we argue that maintenance, that is VPM and VIM measures, should be openly disclosed (made transparent) in the financial statements. However, special consideration to industry-trade should be made. Further, VIM measures meet the qualifications for capitalization of expenditures, as they can be traced to definable streams of future benefits. As was demonstrated, many countries already have a praxis in accordance with the proposed capitalization of VIM-measures. It is argued in this paper that other countries should adopt the same policy.

It is important to split maintenance expenditures into VPM and VIM items in the supplementary statements. That is, into maintenance items which can be capitalized and not. We are content that these disclosure requirements will help users to make, confirm or correct earlier predictions. For example, the proposed classification of maintenance measures will help financial analysts make a more correct valuation of fixed assets, which will increase the validity of the profitability analysis, and, in turn, might lead to a higher efficiency in the capital markets.

As initially indicated, our intention in this article is to introduce the issue of how to disclose maintenance measures for debate. In doing so, a number of questions worth considering have to be raised; for example, how to report VPM and VIM measures by segments, the pros and cons of relating capitalization of maintenance expenditures to different models of investment, and at what organizational level should capitalization decision be delegated.

Also the legitimacy of the historical cost concept must be questioned. The Japanese view of improvement has a direct bearing on the potentialities of tangible assets. Further, according to conventional accounting theory, income represents a change in

the wealth of a firm, but it is also indicative of the performance of the firm and its management. Given the significance of maintenance expenditures, the ease of singling out VPM and VIM measures, and the importance of continuous improvement as a key requirement of success, then VIM measurement is a readily available and valid indicator of management and firm performance. In addition, VIM measures give a more true and faire view of the change in wealth of the enterprise than the accumulated maintenance expenses that conventionally are treated as an income adjustment entry. And, the suggested disclosure requirements are in conformity with the international tendency that is gaining momentum, i.e., to emphasize substance (economic considerations) over form (legal thinking). Finally, to measure the impact of the proposed disclosure requirements on the efficiency of the capital market, it is necessary to conduct empirical studies; and we put forward disclosure requirements concerning maintenance measures as a subject for future research.

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