

# Impact on financial performance by physical asset management

*E H Nielsen\**

\* *MSc.Eng. / MBA, Denmark, e-mail: erik.helms@reliasset.com, mobile: +45 4119 4105*

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## Abstract

Asset management, as defined in the ISO 55000 standard, enables organizations to realize value from its asset. One of the stated benefits of asset management is increased financial performance. Based on standard financial statement analysis, the paper will explain how asset management on physical assets can improve the financial performance of the organization. The paper will then propose specific measures of asset intensiveness based on data from financial statements. Organizations can use these measures to evaluate the potential impact physical asset management can have on their financial performance. Finally, the paper will present the results of a new survey of asset intensiveness grouped by industry sector. The survey is based on data from all financial statements with end of period in the year 2014 of all Danish companies. In total 187,184 financial statements published in XBRL-format, have been analysed in the survey.

The paper concludes that the financial statement is a good and valid source of information for organizations who wants to conduct an initial assessment of the potential impact physical asset management can have on the organizations financial performance. Furthermore, the paper concludes that there is a clear linkage from the industry sector to the measures of asset intensiveness and further to the financial performance of an organization. Even though the industry sector can give a qualified hint of the potential financial impact of asset management, each organization should be assessed individually due to the variations within each sector.

## 1 Introduction

Asset management, as defined in the ISO 55000 standard, enables organizations to realize value from its asset in the achievement of its organizational objectives. Whereas assets in the ISO standard can be both tangible or intangible, financial or non-financial, assets in this paper refer to physical assets. Whereas value in the ISO standard depends on what constitutes the organizational objectives, value in this paper refers to financial value. One of several potential organizational benefits of asset management, stated in the ISO 55000 standard, is to increase financial performance.

This paper explores what the key question is, to many asset owners today. How can well applied asset management,

within the scope of physical assets, help increase the financial performance of organizations?

The financial performance of an organization can be analysed from publically available financial statements. Such financial statement analysis is a discipline in its own with well-defined structured methodologies. With the use of these methodologies, it is possible to link the potential benefits of asset management to financial performance of the organization.

The potential impact on financial performance from asset management depends on the financial structure of the organization where asset management is applied. Asset intensiveness of the organization is key to understand this dependency. A three dimensional measure of asset intensiveness is suggested.

Some industry sectors are more dependent on physical assets then others and it is expected that organizations within the same industry show similarities in the measures of asset intensiveness. This aspect is analysed in detail based on a thorough survey of the financial statements of all private and most publically owned companies in Denmark in year 2014.

Such a complete survey of financial statements has only recently become possible due to developments in the standardization, regulation and publishing of financial statements in the digital XBRL-format by the Danish authorities.

The relevance, methods and conclusions of the paper represents the independent view of the author and no external parties has influenced the paper. Reliasset® has sponsored the work in its entirety. Reliasset is a consulting firm fully owned and controlled by the author.

## 2 Financial statement perspective

Financial statements provide an ideal structure to analyse the implications to financial performance of asset management, as they are mandatory for most organizations to make and are uniform in structure between different organizations.

Financial statements generally comply with the International Financial Reporting Standards (IFRS) worldwide [10], but other standards like the United States Generally Accepted Accounting Principles (GAAP) are also widely used. The standards IFRS and GAAP are different [4], but does still have similarities in content and structure.

Today the digital XBRL-format for sharing financial statement information is becoming increasingly common worldwide. As an example, the Danish authorities require that all organizations must report their financial statements in digital format. The different financial accounting standards has been mapped to XBRL using taxonomies [12]. Each standard has its own taxonomy and so has every version of a standard. In practice, analysis of financial statements in XBRL-format, even within one country like Denmark, requires the handling of multiple different taxonomies.

The structure of a compliant financial statement must include the following elements [5]:

- a statement of financial position (balance sheet)
- a statement of comprehensive income (profit and loss)
- a statement of changes in equity
- a statement of cash flows
- notes, comprising accounting policies etc.

The booked value of physical assets are listed in the statement of financial position as Property, Plant and Equipment (PPE) and Investment properties as part of the non-current assets.

A compliant financial statement must include a detailed overview of PPE by each asset type, which shows the total initial cost or valuation, total depreciations to date and all details of last period's changes to PPE [6]. This overview lists all additions and disposals of PPE including assets under construction.

The statement of comprehensive income includes all the incomes and costs generated from the physical assets. Asset management related income include any sales that are dependent on the physical assets. Asset management related costs include depreciations, insurance, operations and maintenance cost generated from the physical assets and part of the cost of sales. Furthermore, asset management affects the financial cost for financing the physical asset base.

### 3 Analysis of financial performance

Return on invested capital (ROIC) is used as key measure of financial performance. Like Return on common equity (ROCE), ROIC is an accounting measure with its benefits and limitations [3]. Compared to ROCE, ROIC include the debt to the equity in the denominator. This is relevant in this context as the financial benefit of asset management should be measured on the total capital needs irrespective of this is financed by equity or debt.

$$ROIC = \frac{\text{Comprehensive income (after tax)}}{\text{Avg CSE} + \text{Avg NFO}} \quad (1)$$

ROIC is calculated and decomposed based on a reformulation of the statements of financial position and comprehensive income that separate all items into either operation or finance

[11]. The reformulated statement of financial position provide the following information:

NOA: Net operating asset  
NFO: Net financial obligation  
CSE: Common shareholder equity

$$CSE = NOA - NFO \quad (2)$$

The reformulated statement of comprehensive income provide the following information:

OR: Operating revenue (Net sales)  
OE: Operating expense  
OI: Operating income  
FR: Financial revenue  
FE: Financial expense  
NFE: Net financial expense

$$OI = OR - OE \quad NFE = FE - FR \quad (3)$$

$$\text{Comprehensive income} = OI + NFE \quad (4)$$

Return on net operating assets (RNOA) and further, Profit margin (PM) and Asset turnover (ATO) are all decomposed from ROIC to analyse the drivers of performance.

$$RNOA = \frac{OI}{NOA} = ROIC - \frac{NFE}{NOA} = PM \cdot ATO \quad (5)$$

Asset turnover can further be broken down in multiple turnovers for each category of operating assets and liabilities. One of these is turnover on physical asset (PA turnover), which is key to understanding the financial impact of asset management.

$$PA \text{ turnover} = \frac{\text{Net sales}}{\text{Net physical assets}} \quad (6)$$

Turnover drivers have the following relationship:

$$\frac{1}{ATO} = \frac{\text{Net physical assets}}{\text{Net sales}} + \frac{\text{Other assets}}{\text{Net sales}} + \frac{\text{Operational liabilities}}{\text{Net sales}} \quad (7)$$

This model for analysis of financial performance now provide a complete structure from which the tangible benefits of asset management can be translated into improved financial performance of the organization.

If asset management enables the organization to delay the reinvestment of an asset type for a year, this will lead to an increased physical asset turnover through lower net physical assets next year. The analyst using the model can then calculate how much the ROIC is improved.

## 4 Linkage from asset management

In the terminology of the analysis model from chapter 3, asset management has four generic ways to improve financial performance:

1. Increase Operating revenue (Net sales)
2. Reduce Operating expense
3. Reduce Financial expense
4. Reduce Operating assets

The following sections give some examples of how asset management can improve financial performance.

### 4.1 Increase operating revenue

- Reduce downtime: improved reliability
- Reduce downtime: better procedures for maintenance and operation
- Reduce downtime: improved risk control and contingency planning
- Increase quality to reduce losses
- Increase sales volumes or prices through better and documentable quality and service levels
- Increase sales volumes or prices through better image (indirect)

### 4.2 Reduce operating expense

- Better capital investment planning to reduce lifecycle costs of new assets
- Systematic approach to reduce errors
- Increased work efficiency through improved systems and documentation
- More effective work procedures
- Better planning and prioritization
- Rightsizing workforce and competences
- Optimized maintenance
- Negotiate lower insurance costs through documentable procedure to risk control
- Motivated and competent employees: reduce waste / continual improvements

Note: When evaluating the benefits of asset management the costs to implement and maintain the asset management system must be included.

### 4.3 Reduce financial expense

- Reduced operating assets leads to less debt and thus less cost to service debt
- Negotiate lower interest rates through better capital investment planning and documentable systems and procedures

### 4.4 Reduce operating assets

- Rightsizing capacity through better demand analysis and design models

- Expand useful life of existing assets
- Decommission excess capacity assets
- Reduce total cost of new assets through better capital investment planning
- Reduce design and construction costs for new assets through better procedures

## 5 Definition of asset intensiveness

The potential impact of asset management on the financial performance of an organization depends on the financial structure of the organization. Literature and professional networks make frequent use of the term asset intensiveness to describe that some companies are more dependent of physical assets than others are. Often, this happens without giving a clear definition of the term.

A good measure of asset intensiveness must reflect both the volume of physical assets in the organization and the importance the physical assets has to the financial performance of the organization. If the measure is based on information from the publically available financial statements, it is highly useful for easy benchmarking.

This paper proposes the following three-dimensional measure of asset intensiveness, compliant to the conditions above:

1. Net physical assets
2. Physical asset turnover
3. Physical asset proportion

Net physical assets is the depreciated booked value (expressed in €) of PPE in the financial statement. The volume of physical assets is a driver of all costs related to managing the assets. The Gross physical asset (non-depreciated purchase price) may be a more objective cost driver of managing assets, but the paper suggest to use Net physical assets as data is easier accessible in practice.

The Physical asset turnover as defined in equation (6) is the Net sales divided by Net physical assets. An organization with a low Physical asset turnover will have a much higher impact on the ROIC of a reduction in physical assets, compared to an organization with high Physical asset turnover. A low Physical asset turnover is thus a multiplier to the ROIC of improvements to the physical assets.

The Physical assets proportion is defined as:

$$\text{PA proportion} = \frac{\text{Net physical assets}}{\text{Net assets}} \quad (8)$$

In this expression the Net assets is the booked value of all assets (total balance). In an organization with a high Physical asset proportion, reduction in the Net physical asset will have a much higher impact on the NOA and thus on the ROIC as in an organization with a low Physical asset proportion. Furthermore, the proportion of cost and revenue, which is

linked directly to the physical assets, is higher for organizations with a high Physical asset proportion. A high Physical asset proportion is thus a multiplier to the ROIC of asset management improvements, which works on both the financial position and the comprehensive income.

The proposed measures of asset intensiveness has been examined in two empirical surveys of actual financial statements in Denmark. The first survey published in [2], is based on the financial statements from year 2012 of the 350 largest asset owning companies in Denmark. The second survey is described in chapter 6.

These empirical surveys give support to the significance of the suggested measures of asset intensiveness and to the following rules of thumb:

As a rule of thumb, in organizations with Net physical assets above €100K (€20K for a daughter company), asset management has a high impact on the financial performance.

As a rule of thumb, in organizations with Physical assets turnover below the value of one, asset management has a high impact on the financial performance. The scale of Physical asset turnover is logarithmic in nature with values spanning from zero to infinite.

As a rule of thumb, in organization with Physical asset proportion above 50%, asset management has a high impact on the financial performance.

## 6 Asset intensiveness by industry sector

In year 2015, a survey of asset intensiveness grouped by industry sector has been conducted. The survey was based on the financial statements in digital XBRL-format of all companies in Denmark. In total 187,184 financial statements, have been analysed in the survey.

The scope of the dataset is the financial statements of all private companies and all publicly owned companies operated in accordance with the Danish Companies Act, with end of period in year 2014. A few state owned businesses like The Danish Rail are not included, as they do not operate in accordance with the Danish Companies Act. The dataset also excludes the financial statements of some affiliations of foreign companies.

The data was prepared for analysis through a query in the XBRL-files and subsequent manual quality enhancement in Excel spreadsheet, before the data was analysed in Excel. The query has been designed for 11 taxonomies based on Danish GAAP standard, 7 taxonomies based on Danish IFRS standard and 252 taxonomy extensions for IFRS standard. The query has been designed to handle both consolidated and solo financial statements.

Preparation of data include

- Currency conversion to Euro

- Identification of parent/daughter relationship
- Removal of duplicates
- Correction of decimal-tag errors

The identification of parent/daughter relationships is vital to avoid double accounting in cases where the reported financial statement of a daughter company is included in the reported consolidated financial statement of the parent company. The identification of parents and daughters was primarily a manual process, as the information available in XBRL-format was very scarce.

Duplicates is the situation where one company has reported more than one financial statement in a year. Duplicates was in a manual process.

The quality of the dataset is generally high, as random samples of data were verified to be accurate in comparison with the PDF-version of the financial statement. A common quality issue is misinterpretation of the XBRL decimal-tag which lead to factor errors like  $10^{-3}$  or  $10^6$ . This error was corrected manually.

The completeness of the dataset has limitations, as not all classes of companies are required to publish all data elements in a tagged and searchable format. Of the total dataset of 187,184 financial statements, 186,996 was identified as non-parent companies (single companies or daughter companies with no further daughters), 179,524 of these also has a valid value for total assets, 87,083 of these has a valid value for PPE and 16,378 of these also has a valid value for revenue. Finally, 16,326 of these financial statements can be mapped to an industry sector.

However, data completeness is much better for large companies than for small companies as 69% of the 1,000 largest (determined by total assets) non-parent companies has complete data compared to 9% of all non-parent companies.

The analysis of the financial statements include

- Mapping of industry sector codes
- Calculation of measures of asset intensiveness
- Ranking of industry sector by asset intensiveness

The analysis of asset intensiveness is based on the financial statements of non-parent companies, as these have a more precise identification of industry sector than the parent companies.

The financial statements are mapped to industry sector codes that follows the 21 aggregated sections of ISIC [13]. Only the sector of *activities of households as employers* are omitted as only one financial statement belongs to this sector.

The three measures of asset intensiveness from chapter 5, namely the Physical asset turnover (PAT), the Physical asset proportion (PAP) and the end of period value of Property, plant and equipment (PPE), are calculated per industry sector.

Only the financial statements that has valid data for all three measures are included.

The industry sectors are ranked by asset intensiveness as a simple ranking of each of the three measures, which is combined into one ranking of the sum of the three ranks.

The result of the analysis is shown in the following table 1:

Rank	Industry sector	PAT	PAP	PPE Mill. €	Sample Size
1	Water Supply; Sewerage, Waste	0.10	92.4%	52.17	229
2	Real Estate	0.14	79.1%	5.79	3,474
3	Electricity, Gas, Steam and Air Condition	1.14	67.7%	23.03	266
4	Transportation and Storage	1.17	58.8%	6.94	463
5	Mining and Quarrying (incl. Oil & Gas)	2.00	63.4%	25.21	16
6	Agriculture, Forestry and Fishing	0.79	54.2%	2.28	708
7	Extraterritorial Organisations	1.86	49.8%	1.90	1,468
8	Accommodation and Food	1.74	54.4%	0.81	339
9	Arts, Entertainment and Recreation	2.20	42.3%	2.04	193
10	Education	1.68	51.9%	0.39	72
11	Human Health and Social Work	1.70	30.7%	0.89	320
12	Administrative and Support	2.55	37.2%	1.84	689
13	Manufacturing	4.61	28.4%	3.31	760
14	Financial and Insurance	3.18	25.0%	4.46	1,668
15	Professional, Scientific and Tech.	3.14	28.0%	1.99	1,608
16	Other Service Activities	2.82	31.0%	0.60	160
17	Information and Communication	2.50	21.6%	1.28	824
18	Construction	4.92	34.4%	0.47	1,064
19	Wholesale and Retail Trade	8.80	22.7%	1.07	2,001
20	Public Admin. Social Security	80.72	27.1%	0.17	4
-	Total	-	-	-	16,326

Table 1: Ranking of asset intensiveness by industry sector.

In the table the dark green colour, indicates that the industry sector is highly asset intensive by at least two of the rules of thumb from chapter 5. The light green colour indicates that the industry sector is highly asset intensive by at least one of the rules of thumb.

The table shows a very clear distinction of asset intensiveness for the different industry sectors. Each of the three scales of asset intensiveness are used from very low to very high and the industry sectors are well distributed across the scales. The results for each of the three scales are well aligned.

The clear distinction of asset intensiveness by industry group is visualized in the following graph in figure 1. The graph is designed so the upper right corner represents the highest asset intensiveness by Physical asset turnover and Physical asset proportion, and the lowest left corner the lowest asset intensiveness. Property, plant and equipment in Euro is represented by the size of each of the marks in the graph.

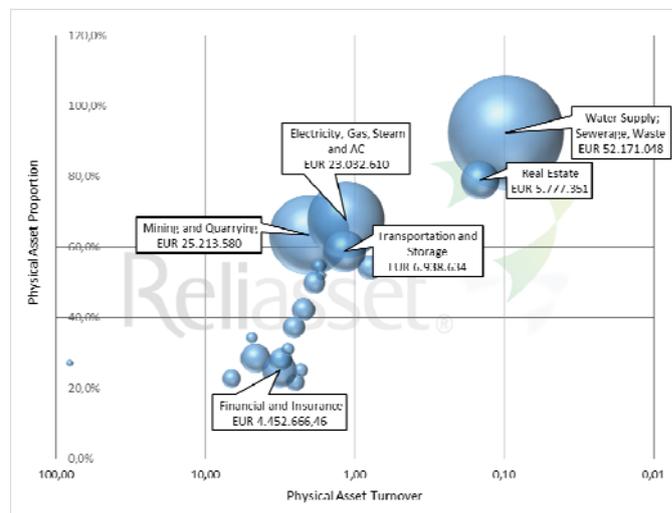


Figure 1: Asset intensiveness by industry sector.

Despite the very clear distinction of asset intensiveness by industry sector, one must remember that this represents the average of a wider distribution of the results of the individual organizations. Care should be taken not to stereotype and assume all organizations within an industry are alike, because this is not the case. An example of the distribution of asset intensiveness for each organization on two industry sectors are shown in the following graph in figure 2.

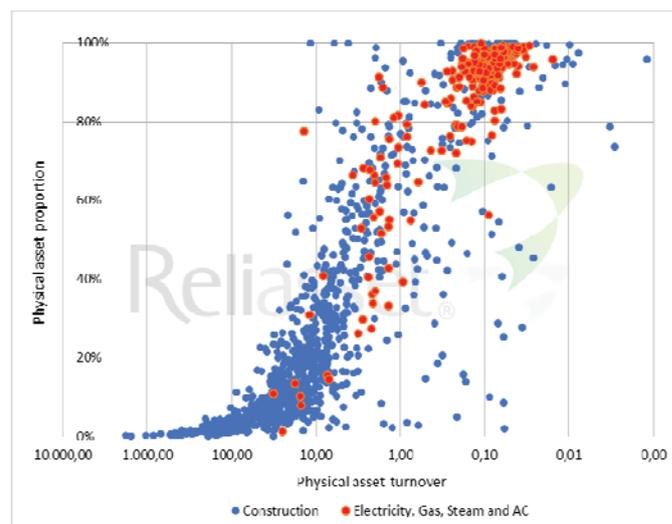


Figure 2: Asset intensiveness by organizations in industry sectors construction and electricity, steam gas and AC.

Figure 2 shows a very clear distinction in asset intensiveness of the two industry sectors, but it also shows a wide distribution of the individual organizations within an industry.

## 7 Conclusion

It is concluded that the financial statement is a good and valid source for organizations who want to conduct an initial assessment of the potential impact physical asset management can have on the organizations financial performance.

Using the methodologies of financial statement analysis, the financial performance of an organization is linked to physical asset management as well as to the three measures of asset intensiveness of a company. The empirical studies of financial statements gives support to the usefulness of these measures, and it is concluded that the three measures of asset intensiveness have a linkage to the potential impact on financial performance of the organization from asset management.

The empirical study of all financial statements from all companies in Denmark in year 2014 shows that different industry sectors can be distinctly differentiated by the use of the measures for asset intensiveness. It is thus concluded, that different industry sectors have significant differences in asset intensiveness. As asset intensiveness is linked to potential impact on financial performance from asset management, simply knowing the industry sector of an organization can give a qualified hint of the potential financial impact of asset management to an organization. However, due to large variations in asset intensiveness of the individual organizations within an industry sector, each organization should always be assessed individually.

The digital XBRL-format for financial statements opens the opportunity for big data in financial statement analysis, and based on the survey of all Danish financial statements it is concluded that the data is available in vast amounts and at a sufficient quality for digital analysis. The full potential of XBRL in relation to analysis of physical asset management is yet to be explored.

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