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SOLVING THE RANKING TASK OF THE LARGEST PUBLICLY TRADED COMPANIES IN FINLAND USING EFFICIENCY MATRIX APPROACH

Bachelor's thesis
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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.
The document length is 9,460 words from the introduction to the end of conclusion.

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ABSTRACT

Investing has become easily available for majority of the people in recent years and the demand for new methods to analyse companies has increased with it. Without a higher financial knowledge, the analysis of companies can become insurmountable for a retail investor. Therefore, clear and understandable rankings measuring company's overall efficiency are perfect comparison tool for a novice investor. Rankings are common way to study order of precedence of various instruments but generally not that used in company comparison.

The aim of this study is to prove the applicability of the benchmark index of company's overall efficiency (BICOE) when conducting a ranking on publicly traded companies using the information from their annual reports. Overall efficiency matrices for every company was built in order to achieve the BICOE scores. The study is conducted with the use of 30 largest companies in the Helsinki stock exchange measured by market capitalisation excluding banks, leasing and insurance companies.

The most efficient company in 2020 based on the ranking developed in this research was pharmaceutical company Orion Oyj. Reasons for Orion Oyj's great performance was due to efficient asset usage and high free cash flow. Orion's great 2020 was due to unexpected increase in demand on their health products, which for the most part can be explained by Covid-19. At the bottom of the ranking was telecommunications company Nokia Oyj. Nokia's poor perfomance is caused by issues in the long duration required for research and development of their products which harms the company's overall efficiency in the short term.

Keywords: overall efficiency, financial statement analysis, static ranking

INTRODUCTION

The amount of information available in today's society has made public companies' observation more transparent. Numerous new databases and stock analysing companies have been introduced in recent years. However, there is a limited quantity of information and analysis made on smaller stock exchanges such as Helsinki Stock Exchange when comparing to more significant exchanges. A group that has benefited most from this trend of increasing information has been private investors. In the year 2020, the amount of registered shareholders in Finland in the book-entry system has increased by 12.2% from the end of December in 2019 to last day of December 2020. As the popularity of investing increases among people, the same happens to analyse these public companies (Euroclear, 2021).

Several ways to analyse companies already exist, but precise methods to analyze company's efficiency are still quite a few. When discussing economic efficiency, the goal is to achieve the highest possible output with a minor input. Some aspects of efficiency can be measured in many ways using single financial ratios, but getting a better understanding of its overall efficiency has not been established for the general public.

Rankings give a new perspective into regular company analysis and comparison. With the help of rankings, investors can instantly see their potential investment targets position compared to other firms in the same industry based on their desired financial indicators. Companies with a high position in a highly considered ranking increase their exposure to the general public and make them more established.

The actuality of the study is supported by the increasing growth in stock market participation, as well as the lack of rankings made in the Helsinki Stock Exchange.

The aim of this study is to rank the 30 largest companies by market capitalization in the Helsinki Stock Exchange by their overall efficiency and examine the reasoning behind these well-performing companies.

The object of this study is Nasdaq Helsinki's 30 largest companies measured by market capitalization excluding banks, insurance and leasing enterprises. The objective is to examine which companies were most efficient in 2020. The objective is also to evaluate why a particular company might perform better than its peers. The research questions are:

1. Which quantitative indicators are suitable to be included when constructing an efficiency matrix for a stock listed companies?
2. Which Finnish public companies have been most efficient when comparing their financial statements in 2020?
3. What is the reasoning behind well-performing companies, when comparing companies overall efficiency?

The methodology used in the study is based on the overall efficiency matrix analysis in 2020 with information conducted only from the company's annual reports, comparing the companies based on the benchmark index of selected company's overall efficiency.

The thesis begins with an introduction to financial analysis and an investigation of previously tested company's efficiency measuring techniques. The first chapter also presents the overall efficiency matrix used in the thesis and the benchmark index method to get the companies' static ranking.

The second chapter of the thesis represents the overall efficiency matrix analysis's empirical results. It will demonstrate the companies' complete ranking using the company's overall efficiency benchmark index. Furthermore, the thesis will end with analysis both the top and bottom portion of the static ranking and will investigate the possible causes of the results.

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1. THEORETICAL BACKGROUND

1.1. Rankings in business environment

In the world of business, many different rankings comparing different features of companies are compiled to put these companies into an order of precedence. Attributes of the rankings can be freely chosen based on the creator's aim of the ranking. The ranking can involve only one or a multitude of different qualitative and quantitative features.

Probably the most well-known rankings are conducted by the American business outlet Fortune. Fortune magazine releases various rankings, mainly focusing on the company's performance and the company's work environment. Examples of Fortune's most recognizable rankings are:

- 100 Fastest-Growing Companies
- 100 Best Companies to Work For

100 Fastest-Growing Companies is a compilation of domestic and foreign companies traded on a major U.S. stock exchange. For a company to qualify on the list, it must have a market capitalization minimum of $250 million. Companies also must have a stock price of at least $5; the stock must be continuously traded since 2017, the revenue of at least $50 million since last four quarters and net income of at least $10 million during the same period and at least a 20% annual growth rate in revenue and earnings per share over a three years.

After that, all the qualified companies are ranked by a sum of revenue growth rate, EPS growth rate and an annualized total return over three years.

100 Best companies to Work For ranks 100 best employers in America. Evaluation is based on a questionnaire of over 60 survey questions. 85% of the questions are about employees possibilities, feeling of belongingness and importance regardless of their background or job description. These qualities are reflected in the company's size and industry and regions preconceptions. The remaining 15% of the questions consist of an employees vision of the company's values,employees individual ability to get heard and the efficiency of the company's managers.

To rank, the companies must apply by compiling over 200 parts describing the company's practices and regulations. To achieve a reliable representation of the company, the test organizer demands many questionnaire takers, to ensure a 95% confidence level. Three-quarters of the total score is evaluated by the surveys. The test organizers form the rest by their own evaluation of its values and policies (Fortune … 2021).

Numerous amount of other rankings exist from the U.S. stock exchange companies. However, in Finland, things are quite another way around. Compilation of rankings is not common in Finland since only a few rankings have been previously made. The most noticeable ranking in Finland is the business magazine Kauppalehti's "Menestyjät" (translates to "Successors"). The only requirement for a company to be involved is to have a sales revenue of at least 500 thousand euros. Kauppalehti's Menestyjät ranking is reviewed on six different financial indicators. Each indicator is compared to similarly-sized firms; all companies in the trade register database and their industry and graded accordingly. The financial indicators are a three-year weighted average of revenue growth, return on invested capital, earnings before taxes, current ratio, equity ratio and measurement on risk tolerance based on three variables Z-score. The indicators are worth an equal amount of points, and in the end, the companies get the point up to 100 (Kauppalehti … 2021).

In conclusion, various rankings are being made around the world based on quantitative and qualitative indicators of the company. In Finland, rankings are not that common, but this thesis contributes information to fix that issue.

1.2. Overview of financial analysis

Financial analysis is a procedure where a company's financial strengths and weaknesses are evaluated using standardised financial information to ensure comparability and reliability when comparing with the peer group data. The peer's analysis becomes applicable when the data is comparable and coherent. Financial analysis is formed to analyse company's operational efficiency, evaluate its ability to meet its obligations and to make forecasts about company's future developments and risks (Lewis, 2012; Robinson *et al.* 2012).

Financial statement analysis has two kinds of users, internal and external. The internal users of financial statements include the company's management, employees and the owners. All of the users have their purposes for analysing the company. Managements objective is to understand whether the company is operating efficiently, making a profit, making budgets, tax planning and evaluating its future. Employees reason to analyse the company's financials is to make sure the company is paying the workers salary and estimating whether the company is on a solid framework to keep its employees long term. Owners of the company might analyse the company's financials in order to estimate the company's ability to pay dividends and the return they should get for their investment (Melicher & Norton, 2014; Robinson *et al.* 2012; Davidson, 2020).

External users can easily be distinguished from internal users by evaluating whether they are involved in the company's day-to-day operations. External users are not involved in the company's daily operations and are more interested in its liquidity issues and its ability to meet its financial obligations. External users include creditors, customers and suppliers. All user groups are interested in the company's solvency and estimate regarding their objectives going forward. Creditors are being interested in the ability to meet its interest payments. Customers concerns are regarding the company's ability to get the product or service delivered. Suppliers are interested in whether the company can pay for the purchased items or services used in its operations (Melicher & Norton, 2014).

In general, there are no restrictions on how to present a company's financial statement under IFRS. Highly regulated elements in the financial statement are the elements that concern the company's accounting principles. According to IFRS, financial reports should include a statement of financial position, income statement, a cash flow statement, notes to the financial statements and the auditors' opinion. Financial reports should give a fair presentation of the company's activities. Also, the statements should be conducted in a neutral manner, where biased and misleading information is prohibited (Mackenzie, 2014).

Income statement has three main intentions. First, the income statement summarises the revenues and expenses for the chosen period, usually a financial year. An income statement also gives us an overall recap of its sales profitability. Lastly, the income statement's account balances indicate the company's activity for the described accounting period. When all the expenses are deducted from the revenues, we either have profit or loss generated for the period reported.

A balance sheet or statement of financial position measures the company's assets and liabilities at a single period of time, which is agreed to be at the end of its reporting period, usually at the end of fiscal year. Statement of financial position is divided into two sides, assets and liabilities + owners' equity. Assets are the various current and noncurrent commodities the company owns. The liabilities and owner's equity side tells us how our assets are financed. Sides of the financial position are always balanced.

Cash flow statement is a more detailed report to show where the company's cash is coming from, and where is it going during the reporting period. It gives us a reflection of the company's financing, operating and invesment activities. A cash flow statement is essential for creditors and investors to analyse its financial liquidity.

Notes in the financial statement are the source for detailed information such as the company's accounting pratices, taxation, pension plans, depreciation principles and terms of bonds. Auditor's opinion is basically an unbiased approval of the accuracy of the financial statements and points out if any misstatements might be in the financial statement (Tschopp *et al.* 2018; Zack, 2012).

There are various ways to compile financial analysis; the reason for many methods is to examine different aspects of the company. Financial analyses are conducted in order to get an overview of the company's financial activities for making evaluations of the company and making comparisons to peer companies (Lewis, 2012; Zack, 2012). Generally used techniques and methods used include:

- Comparative analysis
- Horizontal analysis
- Vertical analysis
- Trend analysis
- Financial ratio analysis

Comparative analysis chooses multiple periods of financial statements and compares them to each other. A comparative analysis is conducted using the base period, and the additional periods are compared to the base. A comparative analysis can be used when analysing the financial position and income statement. Comparative analysis can be conducted when analysing the largest competitors or only within the company (Lewis, 2012).

Horizontal and vertical analysis are widely used methods for analysing income statements and financial positions. For example, the vertical analysis presents sales revenue as 100% in the income statement and then calculates the expenses and other items as a proportion of sales. On the other hand, the horizontal analysis reflects the numbers on the last period's income statement. In horizontal analysis, the goal is to analyse the change compared to the previous period. Changes in both absolute figures and percentage terms are presented (Lewis, 2012; Zack, 2012).

Trend analysis aims to identify if there has been development or diminishment in enterprises' activities over the examined years. The reason for making a trend analysis is to dig for the reasons behind the items in the company's financials (Dauber *et al.* 2012; Lewis, 2012).

Financial ratio analysis is a crucial analysis method when comparing its financial statement accounts with the peer group. Financial ratios can be divided into two main categories. One measures the company's profitability, and the other analysing the company's exposure to solvency and liquidity issues. Using ratio analysis instead of absolute values is simply mathematical. It makes the comparison easier with different sized firms, but it is good to keep in mind that different sized companies vary significantly in operational structure (Goel, 2016; Lewis, 2012).

Financial statement analysis is an overall analysis method; it combines the most well-known financial analysis methods. With a financial statement analysis, we get a more detailed overview of its performance. Financial statement analysis exploits and unwraps the factors that affect the underlying figures in a company's financial reports (Robinson *et al.* 2012).

In conclusion, there are various methods to analyse financial statements. Many user groups utilise information from financial statement analysis from inside and outside the company. The analysis is used for various reasons, but in general, the cause for analysis is related to a company's overall performance.

1.3. Conceptual framework of efficiency

Efficiency as a term has been academically argued for ages. There are multiple ways to express efficiency. However, in the business world, efficiency is often referred to as productivity, profitability and effectiveness.

The terms efficiency and effectiveness are both related to inputs, outputs and outcomes. Efficiency can be defined as the relationship between input and output. One of the most known efficiencies measuring methods is the ratio between input and output. The meaning of efficiency is getting the desired output with as little as possible input usage. On the other hand, effectiveness is the relation of input or output with the outcome. The outcome is the objective in the initial planning, but still, there are lots of disagreements on differentiating output and the outcome (Roghanian *et al.* 2012).

In 1952, an American economist Harry Markowitz came up with a mean-variance analysis called the efficient frontier. Markowitz proposed a method to analyse given average portfolio returns with the least possible risk taken. Also, analyse the maximum amount of return with a given level of risk. This same theory can be modified to apply to a company's efficiency analysis. For a company to be as efficient as possible in terms of output, we can change the risk factor for inputs such as materials, employees and time (Bauder *et al.* 2021; Barros & José Mascarenhas, 2005).

Efficiency can be divided into two categories when it is measured; technical and allocative efficiency. Technical efficiency solely focuses on the technicality of production. Technical efficiency weighs the connection between input and output, aiming to maximize the output with a level of input in hand. Allocative efficiency is the opposite of technical efficiency and measures efficiency from input and costs. Allocative efficiency aims to get the desired output level with less input as possible (Mandl *et al.* 2008; Barros & José Mascarenhas, 2005).

In economic literature, it is often said that the main objective of a corporation should be the maximization of its value. While maximizing an entity's value does not mean that the company is as efficient as possible. Maximizing a company's value is fundamentally dependent on three main aspects of a company. The first step towards value maximization is maximizing the company's profit margin. Profit margin is an essential factor for a healthy company. The second aspect is the company's solvency. Desired solvency ratios vary a lot between different industries. However, for a company to be efficient and, more importantly, survive, it should at the fewest make enough to meet its financing debts. The last aspect is liquidity. A company's liquidity refers to the assets that the company can quickly convert into cash. While high liquidity is vital for a company's survival, too high liquidity can imply that it is not using its assets efficiently (Kapil, 2010; Vallance, 1993).

In summary, there are several possibilities to define efficiency. Furthermore, to measure a company's efficiency, there is not only one correct method to be applied but also to understand a

company's efficiency. The testing should be done by taking financial management principles into account. In the author's opinion, efficiency is determined as a relation between inputs and outputs. A company should aim for maximizing the level of output in the form of revenue, earnings before interest and taxes (EBIT) and free cash flow. While at the same time minimizing the company's value, the number of employees and operating expenses. That way, the company maximizes its efficiency.

1.4. Formation and the structure of the efficiency matrix

1.4.1 Theory of efficiency matrix

This chapter of the thesis explains how the efficiency matrix is conducted and how it can be used as a tool for analyzing a company's overall efficiency. The comparison method proposed in Siimann (2018) using a benchmark index and growth index to measure a company's overall efficiency is being introduced in this chapter.

The original version of the efficiency matrix was presented in the late 1970s by an Estonian economist and academic Uno Mereste. The analysis method Mereste used was the so-called system integrated analysis, analyzing the data based on the theory of index numbers. Initially, the matrix approach targeted manufacturing companies and later for use at a national level. Later in Siimann (2018), it is argued that the efficiency matrices may also be applied to manufacturing and service companies (Siimann, 2018, pp. 33–37).

Luur (1982) argued that when constructing an efficiency matrix, the quantitative indicators can be divided into two different groups: input and output indicators and arriving at a 2x2 matrix. In a matrix form, the left side of the matrix is called an efficiency field consisting of three submatrices (Figure 1):

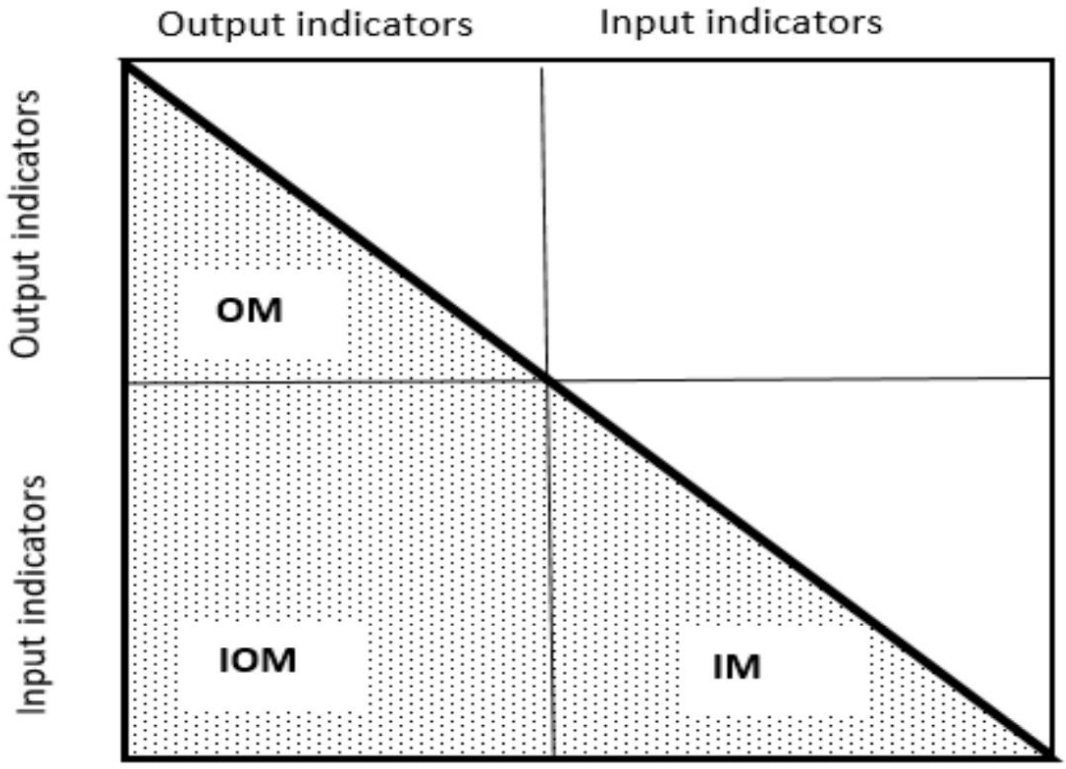

Figure 1: Division of efficiency matrix to submatrices
Source: Luur (1982, pp. 134–136)

Output matrix (OM) and Input matrix (IM) are considered to be coordination ratios, and Input-Output matrix (IOM) is considered to be intensity ratio. The right side of the matrix is called a reverse efficiency field and can be ignored since it only gives us the inverse values of the efficiency field (Siimann, 2018 pp. 65–69; Siimann, 2011).

In Alver (1989), a new version of the quantitative parameters classification was introduced, where the input indicators were split into two: resources and expenses, while the output indicator stayed the same.

Resources → Expenses → Results

Siimann (2018) proposed an even more advanced arrangement of input and output indicators. Both sides input and output indicators are divided into three different parameters and equalling a total of six indicators.

Capital → Assets → Expenses → Income → Profit → Cash Flow

From the parameters represented in Siimann (2018), we can notice that the indicators groups' characteristics follow a regular sequence of business activities in order of finality. First, the company needs to raise capital, and it can be done by using the owner's equity or getting an

external financier in the form of a loan. With the acquired capital, the company can acquire the required assets for running the business. After that, the operational costs or the costs needed to produce the company's output comes into question in the "Expenses" indicator. With the finished product or service, the company can generate income, profit and finally, a most liquid asset known, cash (Siimann, 2018, pp. 69–79).

In Siimann (2018), several suggestions to compile the quantitative indicators for the overall efficiency matrix. The initially suggested version gives a good overview of overall efficiency and is designed for most financial statements users:

1. Capital: Average capital
2. Resources: Average number of employees and Average assets
3. Expenses: Operating expenses
4. Income: Sales revenue
5. Profit: Earnings before interest and taxes (EBIT)
6. Cash Flow: Net operating cash flow and Free cash flow

For the capital section, quantitative indicator Siimann (2018) has chosen average capital, which consists of the average of the company's owner's equity and loan capital. This way, we eliminate the variability of different companies capital structure.

For assets, there are two indicators; the average number of employees and average assets. The reason for the indicators being averages is the fact that these two indicators are shown in one moment in time on the balance sheet. Taking an average of two previous periods, we get figures closest to reality. Therefore, being more comparable to the indicators taken from income statement or cash flow statement.

For expenses, operating expenses covers all the adequate costs the company needs for their day-to-day operations. The same thing goes for the income section, as the company's total sales revenue is the chosen quantitative indicator. Sales revenue reflects the company's activities and excludes other income that is not in its core operations.

For profit, the quantitative indicator chosen is earnings before interest and taxes (EBIT). Using EBIT over other profit measuring indicators is well-proven. EBIT eliminates the differences in tax

legislation between the countries. Also, EBIT gives the companies the best comparison results with different capital structures and depreciation methods.

Finally, the cash flow fragment also has two indicators: net operating cash flow and free cash flow. Free cash flow is the sum of net operating cash flow and net investing cash flow. In order to make the indicators comparable, it must be determined that interest paid and corporate taxes paid is stated in the financial activities. Whereas, interest and dividend received is stated in the investing activities (Siimann, 2018, pp. 83).

Table 1.1. presents the original version of the overall efficiency matrix from Siimann (2018). The efficiency field on the left side of the table illustrates a total of 28 efficiency field elements that are used for the analysis. As we can see from the table, the horizontal line's quantitative indicators are in the order of finality from right to left (Siimann, 2018, pp. 82–84).

Table 1.1. The company's overall efficiency matrix

Quantitative factor	Free cash flow (F)	Net operating cash flow (R)	EBIT (P)	Sales (S)	Operating expenses (O)	Average Assets (A)	Average number of employees (E)	Average Capital (C)
Free cash flow (F)	11 1	12 R/F Op. cash flow to Free cash flow	13 P/F EBIT to Free cash flow	14 S/F Sales to Free cash flow	15 O/F Op. expenses to Free cash flow	16 A/F Assets to Free cash flow	17 E/F No of employees to Free cash flow	18 C/F Capital to Free cash flow
Net operating cash flow (R)	21 F/R CM **Free cash flow to Op. cash flow**	22 1	23 P/R EBIT to Op. cash flow	24 S/R Sales to Op. cash flow	25 O/R Op. expenses to Op. cash flow	26 A/R Assets to Op. cash flow	27 E/R No of employees to Op. cash flow	28 C/R Capital to Op. cash flow
EBIT (P)	31 F/P Free cash flow to EBIT	32 R/P PCM **Op. cash flow to EBIT**	33 1	34 S/P Sales to EBIT	35 O/P Op. expenses to EBIT	36 A/P Assets to EBIT	37 E/P No of employees to EBIT	38 C/P Capital to EBIT
Sales (S)	41 F/S Free cash flow to Sales	42 R/S ICM Op. cash flow to Sales	43 P/S IPM **EBIT to Sales**	44 1	45 O/S Op. expenses to Sales	46 A/S Assets to Sales	47 E/S No of employees to Sales	48 C/S Capital to Sales
Operating expenses (O)	51 F/O Free cash flow to Op. expenses	52 R/O ECM Op. cash flow to Op. expenses	53 P/O EPM EBIT to Op. expenses	54 S/O EIM **Sales to Op. expenses**	55 1	56 A/O Assets to Op. expenses	57 E/O No of employees to Op. expenses	58 C/O Capital to Op. expenses
Average Assets (A)	61 F/A Free cash flow to Assets	62 R/A RCM Op. cash flow to Assets	63 P/A RPM EBIT to Assets	64 S/A RIM Sales to Assets	65 O/A REM **Op. expenses to Assets**	66 1	67 E/A No of employees to Assets	68 C/A Capital to Assets
Average number of employees (E)	71 F/E Free cash flow to No of employees	72 R/E Op. cash flow to No of employees	73 P/E EBIT to No of employees	74 S/E Sales to No of employees	75 O/E Op. expenses to No of employees	76 A/E RM **Assets to No of employees**	77 1	78 C/E Capital to No of employees
Average Capital (C)	81 F/C Free cash flow to Capital	82 R/C KCM Op. cash flow to Capital	83 P/C KPM EBIT to Capital	84 S/C KIM Sales to Capital	85 O/C KEM Op. expenses to Capital	86 A/C Assets to Capital	87 E/C KRM **No of employees Capital**	88 1

Source: Siimann (2018, p. 82)

There are both pros and cons to all financial analysis methods (Siimann, 2018, pp. 102; Ando, 1994, pp. 16−67). The advantages of using the overall efficiency matrix for company analysis is that:

- All the information used for the analysis are available for all interested parties

- Overall efficiency analysis can be used together with other financial analysis
- Matrix is easily modifiable by changing indicators, and therefore can reveal company's edge and drawbacks
- Analysis is understandable to those without a higher business education
- Usage of the matrix can be automated

Most of the restrictions of the analysis is regarding the comparability of the data. Limitations of using overall efficiency matrix are that:

- Analyzed entity can have various fields of business activities, making the analysis less comparable
- Companies having different fiscal years, meaning that the data is not fully comparable
- Companies in different fields of industries can have variability in their accounting principles
- In case of company has operating loss or negative cash flow, the analysis cannot be excecuted
- The use of singular matrices emphasizes heavily on the latter quantitative indicators

To sum up, a company's overall efficiency matrix is a versatile method for financial statement analysis. Predetermined quantitative indicators of the matrix can be modified, and the focus of the analysis is highlighted on comparability and availability. Overall, the analysis aims to be understandable without a higher business education.

1.4.2 Benchmark index of company's overall efficiency

Benchmark index of company's overall efficiency (BICOE) is developed to solve the static ranking problem. BICOE is used to analyse a company's efficiency and uncovering inefficiently used reserves. When conducting a BICOE, the benchmark has to be decided first. The benchmark is chosen based on the needs of the analyst. Benchmark can be the market leader, own company of the analyst, randomly chosen company from the sample or average indicators of all the companies in the sample (Siimann, 2018, pp. 97). Benchmarking is a method, where a two or more subjects are being compared to gain comparable information about the accomplishments of the subjects (Chambers & Miller, 2018).

Companies with negative values in the chosen quantitative indicators make the matrix calculations technically impossible or at least make the comparability inappropriate. There are two options to calculate BICOE. In this thesis, the author uses the one which is ground on the growth indices of all the efficiency field elements.

The first step is to conduct the overall efficiency matrices for all the companies in our sample, using financial information from the same period.

After that, we divide all the efficiency field elements of our sample companies by our benchmark. Finally, we get a comparative efficiency matrix.

$$\boldsymbol{c_{ij}^{A/0} = \frac{x_{ij}^{A}}{x_{ij}^{0}},} \tag{1.1}$$

where $c_{ij}^{A/0}$ - element of the efficiency field of the comparative matrix,

x_{ij}^{A} – value of an efficiency field element of the analyzed company (A),

x_{ij}^{0} – value of an efficiency field element of the benchmark company (0).

In the third step, we calculate the BICOE:

$$\boldsymbol{BICOE = \sqrt[\frac{n^2-n}{2}]{\pi c_{ij}^{A/0}},} \tag{1.2}$$

where $c_{ij}^{A/0}$ – elements of the comparative matrix,

n – quantity of indicators in the model.

The fourth step is to rank the companies based on the results relative to the benchmark index of overall efficiency from highest to lowest. Initially showing the companies with the highest overall efficiency at the top.

In the fifth step, we analyze the elements of the comparative matrix, basically investigating the reasons behind the outlier company's position in the ranking. Individual elements with a higher value than the benchmark indicate higher efficiency in the specific indicator. And vice versa, a lower value indicates lower efficiency or higher amount of reserves than the benchmark company.

In the sixth and last step, we propose new objectives and arrangements for the poorly ranked companies to increase the company's efficiency (Siimann, 2018 pp. 97–99).

In conclusion, the benchmark index of company's overall efficiency is used to compare the chosen sample companies relative to the benchmark company. The benchmark company is presented as 100%. With all the comparative matrix elements, we can expose the weaknesses of individual indicators in a company's financials.

2. RESULTS OF THE RANKING AND ANALYSIS

2.1. Methodology overview

This chapter presents the chosen companies and the quantitative indicators for the analysis. For this bachelor thesis, the author has selected eight quantitative indicators. Indicators have been chosen from (Siimann, 2018, pp. 81–83). The chosen indicators arrive at an 8x8 matrix. One quantitative indicator has been chosen from each input and output groups except resource and cash flow groups, where instead of one, two different indicators are selected. Indicators were chosen in a way to optimize the comparability. Chosen indicators are:

- Capital: Average capital
- Resources: Average number of employees and Average assets
- Expenses: Operating expenses
- Income: Sales revenue
- Profit: Earnings before interest and taxes (EBIT)
- Cash flow: Net operating cash flow and Free cash flow to the firm (FCFF)

The author first tried carried out the efficiency matrix indicators suggested in (Siimann pp. 120), which argued the option for the use of exchange price of the share or market capitalization instead of the free cash flow to the firm indicator. Siimann (2018) argued that it could reveal whether a company's price change is affected by a change in financial indicators or some other reason and could help retail investors make investment decisions. This testing turned out to be unsuitable for this thesis. Having market capitalization as one of the indicators overrun the other indicators due to some companies relatively expensive valuations regarding others. The market capitalization indicator filled the top of the ranking with companies with high expectations and immense growth potential. The use of market capitalization could have been more suitable if this study had investigated companies through a more extended period rather than one year's performance. Furthermore, the use of mentioned quantitative indicator was discarded.

Preparation for the analysis begun with the exclusion of unsuitable companies. For starters, the financial institutes, banks and insurance entities were discarded due to the industry's different structure in financial statements. This meant the discarding of Nordea Bank Oyj and Sampo Oyj. Also, the author had to discard companies with at least one negative value in the quantitative indicator to calculate the BICOE score. Due to the challenging year of 2020, the effects of Covid-19, meant that large industrial corporations SSAB AB Oyj and Outokumpu Oyj had to be discarded from the list due to negative earnings before interest and taxes (EBIT). Teleoperator Telia Oyj also ended the year 2020 with a negative result. Likewise, the real estate company Kojamo Oyj had to be taken out of the comparison due to the negative free cash flow to the firm, which occurred due to significant investments in new properties. Finally, the author had 30 largest companies based on the financial information from the annual reports, and the analysis could continue.

After conducting the sample group and their financial data from 2020, it was time to calculate the BICOE scores. The benchmark company was chosen at random and landed on Valmet Oyj. After calculating each company's BICOE, the author conducted a ranking based on the static ranking problem. The calculation of BICOE can be executed to solve the static ranking problem because the quantitative financial indicators are adjusted and chosen to ensure comparable results regardless of the differences in the industries and their variability in accounting principles. Adjusted financial indicators in this thesis focus on the last quantitative indicator, free cash flow to the firm (FCFF). Adjusted free cash flow in this thesis has moved interest expenses and income taxes paid to financial activities, as well as interest received and dividend received to investing activities.

2.2. Static ranking results and analysis

The static ranking of the companies (Table 2.1) presents the full and finalized ranking of 30 largest companies in Helsinki stock exchange after the exclusions made by the author. The data for the compilation of the static ranking is obtained from the (Appendices 1−30). For the purposes of making the ranking more informative the author has included the company's size position, which was measured by market capitalisation and the industry the company operates in.

Table 2.1. Static ranking of the companies in 2020

BICOE position	Size position	Company	Industry	BICOE
1.	10.	Orion	Health care	312.97%
2.	1.	Neste	Oil & Gas	285.88%
3.	22.	Neles	Industrials	270.51%
4.	23.	Qt Group	Technology	268.90%
5.	26.	Uponor	Industrials	254.77%
6.	25.	Revenio Group	Health care	253.99%
7.	2.	KONE	Industrials	242.78%
8.	8.	Elisa	Telecommunications	237.91%
9.	30.	Tokmanni Group	Consumer Services	220.49%
10.	16.	Metsä Board	Basic Materials	220.20%
11.	18.	Sanoma	Consumer Services	210.52%
12.	9.	Metso Outotec	Industrials	200.55%
13.	13.	Nokian Renkaat	Consumer Services	199.68%
14.	20.	Kemira	Basic Materials	189.03%
15.	28.	Fiskars	Consumer Services	186.42%
16.	11.	Wärtsilä	Industrials	185.70%
17.	19.	Ahlstrom-Munksjö	Basic Materials	161.83%
18.	29.	Vaisala	Industrials	152.46%
19.	27.	Terveystalo	Health care	149.95%
20.	7.	Kesko	Consumer Goods	149.26%
21.	17.	Konecranes	Industrials	148.72%
22.	12.	Huhtamäki	Industrials	147.23%
23.	15.	TietoEVRY	Technology	142.67%
24.	6.	Stora Enso	Basic Materials	135.76%
25.	21.	Cargotec	Industrials	127.97%
26.	5.	UPM-Kymmene	Basic Materials	120.79%
27.	4.	Fortum	Utilities	111.01%
28.	24.	Citycon	Real Estate	110.18%
29.	14.	**Valmet (Benchmark)**	Industrials	100.00%
30.	3.	Nokia	Telecommunications	90.02%

Source: author's calculations based on data from Appendices 1−30.

The most efficient company in 2020, according to the chosen quantitative indicators, was the pharmaceutical company Orion Oyj. The top four also included oil refining company Neste Oyj, valve manufacturer Neles Oyj and a global software company Qt Group Oyj, respectively.

First on the overall efficiency ranking was a pharmaceutical company Orion Oyj. Orion is a developer and manufacturer of various pharmaceutical products for humans and animals. Orion and the pharmaceutical industry overall are relatively stable with high profit margins compared to most sectors. Therefore, the Covid-19 did not seem to affect Orion's operations financially; quite the opposite.

Orion analyses that the effect of Covid-19 on operating profit was around 40 million euros and half of it came from increased international demand for dexmedetomidine products, a sedative used in intensive care. Orion's sales grew by 2.6% (1,051 million euros to 1,078 million euros) from 2019, whereas the earnings before interest and taxes grew by 10.8%. This difference can be justified as Orion's cuts in selling and marketing expenses. Sales of Orion's best-selling product Easyhaler®, a dry-powder inhaler, grew by 10.2% and represented 10.7% of Orion's total sales.

Orion had a great 2020 by being 312.97% more efficient than the benchmark company Valmet Oyj. The most noticeable factor of Orion Oyj's efficiency comes from their high adjusted free cash flow. For example, Orion's Adjusted free cash flow to Operating expenses (F/O) is 61.08 times higher than the benchmark company Valmet. Adjusted free cash flow to Operating expense (F/O) ratio was 0.41. Orion performed highly on every indicator; efficient use of assets and a high profit margin indicates a highly efficient company. Efficient asset usage comes to light in Sales to Average assets (S/A) ratio of 1.00 and EBIT to assets (P/A) of 0.26. Orion's high free cash flow indicates its ability to convert its sales into cash. Adjusted free cash flow to revenue (F/S) was 0.41, which for comparison was 49.43 higher than the benchmark company Valmet's same ratio. Orion's efficient employee usage is being featured in the company's Adjusted free cash flow to the Average number of employees (F/E) of 0.10. More specifically, on average, every employee earned around 100 thousand euros in adjusted free cash flow to the firm. After further research of Orion Oyj and its past annual reports, it can be summed up that Orion Oyj's business was positively affected by Covid-19 but is still a stable and efficient operator in the pharmaceutical industry and produces excellent numbers every year. Outlook for Orion in the near future does not look as promising as 2020. Orion estimates that their sales revenue will decrease in 2021 due to a couple of significant expiration of distribution agreements in the animal health segment and hardened competition in the industry.

Oil refining company Neste Oyj came second in the static ranking. The largest company in the Helsinki stock exchange, measured by market capitalization, was heavily affected by Covid-19.

Nowadays, defining itself more as a renewable fuel company than an oil refiner, Neste's position in the ranking surprised the author positively due to the decrease in revenue by 25.8% from 2019. The Covid-19 affected the oil market by decreasing demand significantly and created an oversupply of oil products. Neste did not remain steady but decided to take actions towards long-term competitiveness by shutting down the Naantali refinery and changing their vision into renewable energy. Neste's sales revenue (-25.8%) and operating profit (-62.9%) decreased substantially in 2020, but the increase in the sales volumes of renewable products and their high profit margins saved the company from embarrassment. Neste's substantial drop in operating profit was caused by the decrease in revenue and expenses caused by the closure of the Naantali refinery. Naantali refinery cost provision increased employee benefit expenses by 22 million euros, depreciation in the form of asset write-down of 167 million euros and other related expenses by 124 million euros. After inspection of Neste Oyj's annual report, it can be pointed out that out of the comparable operating profit, a staggering 94% came from the sales of renewable products. In contrast, renewable products represented only 23.1% of the company's total sales in 2020, so the possibility of being even more efficient financially exists. One of the most notifiable strengths in Neste's performance comes from efficient employee usage. On average, one employee brought over 2.43 million euros in revenue and 0.17 million euros in operating profit for the company in 2020. Moreover, compared to the benchmark company Valmet, Neste's Sales revenue to the Average number of employees (S/E) was 8.99 times higher. Neste's future looks bright regardless of the short-term volatility in oil and feedstock prices. Contributions towards renewable products segment in Porvoo and Singapore refineries turnarounds and a completely new refinery planning in Rotterdam foreshadows an excellent outlook for the future.

Third, in the ranking is industrial valve manufacturer Neles Oyj, which delivers approximately 500,000 valves every year. Neles was listed as its own company in July 2020 after the merger of Metso Oyj and Outotec Oyj, nowadays known as Metso Outotec Oyj. Neles' business got also hit by Covid-19, and its service and Maintenance, Repairs and Operations (MRO) driven business was heavily affected during the first half of 2020. Neles' revenue was 576 million euros, a 12.7% decrease from 2019. Most importantly, the project business managed held its position as a market leader in the valve manufacturing industry. Foundation in Neles' performance in 2020 was the Adjusted free cash flow ratios. For instance, Neles' Adjusted free cash flow to Sales revenue (F/S) was 0.76, a 123.37 times higher than the benchmark. The organizational arrangements are the primary explanation behind Neles' excellent performance in 2020. 2.15 billion euros profit from discontinued operations explain the significant difference with EBIT and adjusted free cash flow

to the firm in 2020. Neles' efficiency will most likely show entirely different figures in 2021. The size of Neles' assets was shrunk from 3,337 million euros to 644 million euros during 2020 and can almost entirely be explained by the discontinued operations. The use of average numbers in balance sheet items analysis inflates Neles' capital and assets, therefore lowering the values in those categories. However, simultaneously the demerger affected the company's change in net working capital and the company's adjusted net operating cash flow increased to 488 million euros (258 million euros) in 2020. The future for Neles is challenging to estimate since the development in the valve industry is moving towards automation and 3D printing. Neles seems to be aware of the trend in the valve industry, but the new market area is obtainable for anyone, and the author does not see any significant significance in Neles' current product development. In conclusion, Neles' business was negatively affected by Covid-19, but the demerger during 2020 affected Neles' financials positively and misled the company to the third position in the ranking.

The fourth position in the static ranking belongs to the global software company Qt Group Oyj. Qt Group is one of the recent success stories in Helsinki stock exchanges history. During 2020 alone, Qt group's stock price grown by around 300% and if we take from 2019 over 700%. At the time of writing this thesis, the stock does not seem to be slowing down any time soon. Qt Group is a provider of a software development platform. For example, their software can be seen nowadays in cars digital cockpits, consumer electronics and medical products. Qt Group's is behind over one billion devices and applications worldwide. Qt Group's business model is based on licensing their software development platforms.

Covid-19 did not seem to affect Qt Group's robust growth in recent years. Qt Group's revenue grew to 79.5 million euros (58.4), which totals a 36.1% growth in sales revenue. Licensing and consulting segments sales grew by 46.9%, while the maintenance segments sales increased by 11.7% in 2020. Qt Group's EBIT in 2020 was 17.0 million euros, which was 16.8 million euros higher than in 2019. After going through Qt Group's annual report, it can be notified that the increased revenue is the general cause for Qt's growth in EBIT.

Qt Group came fourth by being 268.9% more efficient in the overall efficiency ranking than the benchmark Valmet Oyj. Qt's efficient operations came from three key indicators, Adjusted free cash flow, EBIT and Average assets. Qt's EBIT to Sales revenue (P/S) ratio was 0.21, meaning the company made 21 cents operating profit for every euro sold. Another notifiable ratio was Qt's Sales revenue to Average assets (S/A) ratio with 1.43. Amplifying that Qt had 1.43 times more

sales than their Average assets. High sales to assets and profit margins are usual for platform providers after a successful product launch. This can be backed by the fact that costs can usually be kept relatively stable. Apart from the significant increase in sales and operating profit, it can be said that the future looks at least as promising. The global software development tools market was estimated to be worth over 10 billion US dollars in 2016, and the amount of software developers is expected to be at 25 million by 2020. In conclusion, the last year was a jackpot for Qt Group as they were able to increase their sales and profits in 2020 significantly. Apart from the excellent financials, Qt Group's future also looks extremely promising, but the increased expectations are starting to show in the company's valuation.

The last position of the ranking belongs to probably the internationally most well-known company from Finland, Nokia Oyj. The company, formerly recognized for its mobile phones, nowadays focuses on building network infrastructure and is a significant player in developing the 5G network against competitors Swedish LM Ericsson and Chinese Huawei Technology Co. As a company, Nokia Oyj has changed drastically from its glory days in the early 2000s, and it seems like the company has tried to find its place for around a decade. 2020 was a challenging year for Nokia. The net sales decreased by 6.3% from 2019 but managed to increase its profit margin to 4.15% (2.1% in 2019). According to Nokia, decreases in sales was mainly caused by network deployment and planning services within the company's Mobile Access segment. Regionally speaking, the reason for Nokia's decreased sales occurred in Asia Pacific, Greater China and Latin America. The rest of the regions sales either stayed the same or grew slightly. The reasons for increased operating margin, Nokia reports the focus of sales to higher-margin region North America. For a disclaimer, the sales in North America grew by 2% in 2020. When investigating Nokia's financials, apart from the poor profitability (P/S of 0.04), Nokia struggled particularly with the use of their assets and employees, only having revenue to average assets (S/A) of 0.58 and revenue of 237 thousand euros per every employee. The future for Nokia looks dualistic. Nokia mentions the significant increase in reliable and efficient networks, but the revenue recognition from these operations depends on the success of their development. Nokia also mentions the increased competition, where the world's largest enterprises have started to invest in cloud technology and network infrastructure. In the author's opinion, Nokia's opportunities to increase its overall efficiency and grow to its old glory depends heavily on the 5G network's successful development over its competitors.

Second to last in the ranking came the benchmark company Valmet Oyj, a process technologies, automation and service providing company operating in the pulp, paper and energy industries.

Valmet Oyj did not necessarily have a weak 2020. The company is said to be in a transition phase, where their significant investments towards electric cars batteries manufacturing will affect the company's financials in the short run. Valmet Oyj acquired a 29.54% position in the newly listed company Neles Oyj, which happened to be third in the static ranking. Investment into Neles Oyj partly explains Valmet's poor performance in the ranking, but if the investment in Neles appears to be successful, the position in the ranking should improve in the following years. Also, rumours of Valmet's complete acquisition of Neles Oyj has been predicted. Covid-19 virus harmed Valmet's business heavily as their received orders decreased by 8% in 2020 compared to the previous year. Valmet still managed to increase its sales by 5% by received multiple larger-sized orders. Increased sales came from the Paper and Pulp, and Energy segments. Multiple major orders from China caused growth in the Paper segment, and the revenue growth in Pulp and Energy segment came from around the world. So the poor performance in overall efficiency is not caused by the sales revenue indicator.

Total investing cash flow for Valmet Oyj was 588 million euros, leading to adjusted free cash flow to the firm of only 23 million euros and an inferior position in the ranking. It can be concluded that Valmet's inferior position in the ranking is generally caused by the low adjusted free cash flow, which is caused by the one-time investing cash outflow due to investment towards Neles Oyj. Strengths in Valmet's overall efficiency occurred in the EBIT ratios (P/X). Notable statistics in Valmet's financial was the EBIT to Average capital ratio (P/C). Valmet's P/C was 0.22, meaning that every euro in Valmet's capital generated the company 22 cents. For comparison, Neste, who was second in the static ranking, had a P/C of 0.11, almost a half less. Trends affecting Valmet's business are mostly related to the cleaner future. The Pulp and Energy segments will be critical in Valmet's future success.

Third to last in the ranking was the real estate investment company Citycon Oyj, specialising in shopping centres in Northern Europe. Due to the Covid-19 pandemic, mobility restrictions affected the shopping centre business heavily. Still, Citycon Oyj managed to end the year with a 93.6% economic occupancy rate in their premises, a only 1.9% decrease (95.5%) from the end of 2019. Net rental income declined by 5.5% in 2020, but with pleasant exchange rates, the adjusted net rental income declined only by 3.0%. Citycon's results were also affected by new investments towards two new shopping centres in Norway and the development of a new shopping centre in Espoo, Finland. The total amount invested was 166.1 million euros and explained the low adjusted free cash flow. The low position of the real estate investment company did not surprise the author

since the property management business requires lots of capital to generate cash flow. These factors explain the poor efficiency of assets and capital usage.

On the other hand, property management does not tie up lots of staff, and Citycon Oyj had the third-highest free cash flow to the average number of employees (F/E), at 128 thousand euros per employee in 2020. Citycon's To sum up, Citycon's business model differs significantly from the other companies in the sample. The real estate business ties up lots of assets and capital, explaining the low position in the ranking. The future for Citycon still looks promising as it is estimated that after the mobility restrictions loosen up, people will most likely return to shopping centres. The trend of online shopping during Covid-19 is probably here to stay, but the transformation into more experience-based shopping centres is well notified by Citycon's management. In conclusion, Citycon is a stable operator in the real estate industry with a well-diversified portfolio across Northern Europe.

Even though the ranking appeared to be relatively equal, there were no apparent trends regarding the industries. The health care industry and, more specifically, in health technology benefitted from the Covid-19, with both Orion and Revenio Group, who finished on the first and sixth position in the ranking, respectively. The one negatively affected health care company from Covid-19 was a private healthcare service provider Terveystalo Oyj, which services faced a negative demand due to the changes in customer behaviour. The more traditional industrial companies were the most affected companies by Covid-19. An excellent example of this is Cargotec and Huhtamäki, whose sales were negatively affected due to uncertainty in the market. The effect of uncertainty reached most large industrial producers in the ranking, whose results are heavily dependant on large orders and therefore could not achieve higher efficiency in 2020.

When analysing trends regarding company sizes, a couple of assumptions can be made. Generally speaking, the smaller companies were overall more efficient than larger companies. In the top 10 of the overall efficiency ranking, five companies measured by size were at the bottom third (Neles 3rd, Qt Group 4th, Uponor 5th, Revenio Group 6th, Tokmanni Group 10th). At the same time, the bottom of the ranking was packed with larger companies. The last ten positions in the ranking included five companies, which by market capitalisation would have been in the top 10 (Kesko 20th, Stora Enso 24th, UPM-Kymmene 26th, Fortum 27th, Nokia 30th). The whys and wherefores for these results are not unambiguous. Nevertheless, when examining financial causes from the quantitative indicators used in the overall efficiency matrix, it can be summarised that larger

companies are generally more inefficient in the use of balance sheet items. This is usually caused by poor management and the agility of smaller corporations. However, it cannot be forgotten that most of the larger companies in the ranking are focused on manufacturing, which is generally more inefficient in balance sheet item usage than, for example, service businesses.

In conclusion, the structure of the method used to construct the BICOE scores emphasize the output indicators. Therefore, all the top companies in the ranking had high Adjusted free cash flow to the firm compared to other quantitative indicators. The ranking results did reveal that, in general, the smaller companies were able to be more efficient in assets and employee usage. Any significant trends favouring one industry over others were not discovered, except good efficiency among health technology companies and a weaker efficiency amongst traditional industrial manufacturing companies in 2020. Except for a couple of companies, it can be generalized that most companies at the top of the ranking were positively affected by Covid-19 and companies at the bottom of the ranking were negatively affected. The companies at the top of the ranking were able to either grow their sales or increase profitability by cutting their expenses.

2.3. Weaknesses and suggestions for improvement of the ranking methodology

A static ranking method based on the benchmark index of the company's overall efficiency differs from most rankings due to different financial indicators. The technique used in the study uses 28 different efficiency elements, whereas in comparison Kauppalehti's Menestyjät- ranking used only six financial indicators of a company. The static ranking's method is also conducted to emphasize the company's output indicators rather than evaluating all quantitative indicators equally. This way, the results are dependant on the company's efficiency rather than, for example, just increasing the company's sales.

There are various issues with the ranking. In this study, one of the issues is the cross-industry differences in the companies' formation of expenses and how the company's operations tie up assets. Manufacturing company's operating expenses far exceed companies whose sales revenue is generated from services. Simultaneously, for companies whose business focuses on managing assets such as real estate, like in Citycon Oyj, the need for employees is far less than companies with manufacturing based business model.

Another limitation of the study is regarding time. As annual reports are based on information compiled from the company's previous year, it creates a time lag on the financial data. Furthermore, the balance sheet items of a company are measured at one point in time and therefore does not describe the items at 100% accuracy. The issue was eliminated by taking average values but still is vulnerable, for example, where a company issues a new loan right after the report time. This study also examines the companies only for one year, which exposes the analyses accuracy with the possibility of one-time income or expenses. Compiling financial data for many years would increase the comparability and applicability.

In conclusion, the ranking using the overall efficiency is not perfected but is usable for company analysis purposes. The ranking based on efficiency matrix methodology also far exceeds most other rankings in their extent of investigated indicators while remaining understandable without having a broad business background.

CONCLUSION

This study aimed to rank the 30 largest companies in Helsinki Stock Exchange measured by market capitalisation in 2020 and analyse the causes behind the better performances. The author also narrated the chosen companies effects due to Covid-19 and how the pandemic influenced the financials. The object of the study was the largest companies by market capitalisation at 31.12.2020, and the objective was to create an overall efficiency matrix of all the companies based on their financials, rank them against each other and examine the reasoning behind the position in the ranking.

To answer the first research question, "Which quantitative indicators are suitable to be included when constructing an efficiency matrix for a stock listed companies?" In the end, the most appropriate quantitative indicators were the ones initially suggested indicators. The quantitative indicators included eight quantitative indicators, divided into input indicators (Average capital, Average number of employees, Average assets and Operating expenses) and output indicators (Sales revenue, EBIT, Adjusted net operating cash flow and Adjusted free cash flow). The author tried to execute the analysis with quantitative indicators from Siimann's suggestions which focused on the research designed for retail investors. This method had switched the last indicator of Adjusted free cash flow to Market capitalisation. The testing appeared to be incomplete. As the companies chosen were from various industries and some industries are valued considerably higher than others, the matrix only favoured the companies with higher valuations and made the ranking inapplicable.

To answer the second research question, "Which Finnish public companies have been most efficient when comparing their financial statements in 2020?" The four most efficient companies in 2020 were Orion Oyj, Neste Oyj, Neles Oyj and Qt Group Oyj, respectively. All of the top four companies excellent performance was ground to their high adjusted free cash flow ratios. Pharmaceutical company Orion Oyj's excellent performance exceeded analysts' expectations positively, and the increased demand for Orion's products due to Covid-19 caused great sales numbers. Orion's great overall efficiency was a combination of various indicators. Orion was

efficient in generating sales, with the sales revenue to average assets percentage of little over one, meaning that Orion could generate sales over the value of their assets. Orion also was profitable by bringing adjusted free cash flow to sales revenue at the rate of 0.30. Second, on the ranking was oil refining company Neste Oyj. Neste's high efficiency and position is proof of a quality company. Even though Neste had a difficult 2020, where both sales and profit decreased due to decreased demand because of Covid-19, they still achieved second place in the ranking. Neste's efficiency was also explained by high free cash flow, but the company also defeated most of the sample companies in efficient employee and asset usage. Also, the author believes that Neste's investments in renewable energy will only strengthen Neste's overall efficiency. Neles Oyj's position in the ranking was mainly caused by the discontinued operations, which increased the company's cash flow indicators. These one-time items were due to the demerger from its parent company in 2020, and the company will most likely have a lower position in the ranking when analysing the results from 2021. Software company Qt Group's performance was a cause of successful and massive growth in recent years. Digitalisation has driven the demand for their products remarkably, and the small operating expenses guarantee the company high operating margins. The future for Qt Group looks very promising; the amount software developers in the world are around 20 million, and the demand is expected to be multiplied in the following years.

To answer the third research question, "What is the reasoning behind well-performing companies when comparing companies overall efficiency?" As the overall efficiency matrices indicators are arranged in the order of finality in descending order, the results' weight heavily depends on the output indicators' final items. The last indicator was adjusted free cash flow to the firm, and all the top companies had high free cash flow values. As the analysis period was only one year, the analysis was exposed to the risk of one-time transactions. Therefore, companies might have higher or lower positions than they would have deserved. Exactly that happened with Neles Oyj, as the company benefitted from the organisational arrangements in the form of discontinued operations in 2020. In the bottom end of the ranking were the generally companies with low adjusted free cash flow. Low adjusted free cash flow was generally explained by an inefficient company and low profit margins. The ranking also included an exception, Valmet's poor position was not due to inefficiency but the investment in Neles Oyj, which temporarily grew the company's net investing cash flow and therefore lowering the free cash flow.

The limitations of the overall efficiency matrix when analysing companies across different industries occur in the differences in companies' type. For instance, manufacturing companies

require a lot more capital than, for example, service companies. Luckily, most of the companies in the sample of this thesis involved mostly companies from the manufacturing industry and did not affect the results of the static ranking.

Results of the ranking can be used and the other analytics methods for the use of retail investors when making investing decisions. The ranking and its characters are also conducted in a way to be understandable for the wider audience and not made too difficult to understand. It is essential to keep in mind that the ranking results should not be trusted unaccompanied as it only covers data from only one year's performance. Investors should also be familiar with the companies industry and pursue more detailed comparisons between main competitors rather than companies from various industries. Furthermore, the analysis method is easily automated and examined over a more extended period. The author of the thesis recommends using overall efficiency analysis but emphasises the importance of analysis over multiple years and the different company types.

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APPENDICES

Appendix 1. Neste Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	5,922
Owner's equity (31.12.2020):	5,929
Interest-bearing liabilities (31.12.2019):	1,322
Interest-bearing liabilities (31.12.2020):	1,307
Average capital:	7,240
Average number of employees:	4,833
Assets (31.12.2019):	9,793
Assets (31.12.2020):	9,815
Average assets:	9,804
Operating expenses:	10,923
Sales revenue:	11,751
EBT:	787
Interest expenses:	- 41
EBIT:	828
Adjusted net operating cash flow:	2,244
Net investing cash flow:	- 1,039
Adjusted free cash flow:	1,205

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.54	1						
EBIT	1.46	2.71	1					
Sales revenue	0.10	0.19	0.07	1				
Operating expenses	0.11	0.21	0.08	1.08	1			
Average assets	0.12	0.23	0.08	1.20	1.11	1		
Average number of employees	0.25	0.46	0.17	2.43	2.26	2.03	1	
Average capital	0.17	0.31	0.11	1.62	1.51	1.35	0.67	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	14.27	1						
EBIT	20.18	1.41	1					
Sales revenue	16.67	1.17	0.83	1				
Operating expenses	16.41	1.15	0.81	0.98	1			
Average assets	19.80	1.39	0.98	1.19	1.21	1		
Average number of employees	149.84	10.50	7.42	8.99	9.13	7.57	1	
Average capital	10.68	0.75	0.53	0.64	0.65	0.54	0.07	1

BICOE

285.88%

Source: Neste Oyj's annual report (2021) and author's calculations

Appendix 2. KONE Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	3,193
Owner's equity (31.12.2020):	3,197
Interest-bearing liabilities (31.12.2019):	549
Interest-bearing liabilities (31.12.2020):	509
Average capital:	3,724
Average number of employees:	60,376
Assets (31.12.2019):	8,613
Assets (31.12.2020):	8,792
Average assets:	8,703
Operating expenses:	8,726
Sales revenue:	9,938.5
EBT:	1,224.2
Interest expenses:	11.4
EBIT:	1,212.9
Adjusted net operating cash flow:	1,907.5
Net investing cash flow:	- 148.4
Adjusted free cash flow:	1,759

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.92	1						
EBIT	1.45	1.57	1					
Sales revenue	0.18	0.19	0.12	1				
Operating expenses	0.20	0.22	0.14	1.14	1			
Average assets	0.20	0.22	0.14	1.14	1.00	1		
Average number of employees	0.03	0.03	0.02	0.16	0.14	0.14	1	
Average capital	0.47	0.51	0.33	2.67	2.34	2.34	16.21	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	24.50	1						
EBIT	20.12	0.82	1					
Sales revenue	28.78	1.17	1.43	1				
Operating expenses	29.99	1.22	1.49	1.04	1			
Average assets	32.57	1.33	1.62	1.13	1.09	1		
Average number of employees	17.51	0.71	0.87	0.61	0.58	0.54	1	
Average capital	30.33	1.24	1.51	1.05	1.01	0.93	1.73	1

BICOE

242.78%

Source: KONE Oyj's annual report (2021) and author's calculations

Appendix 3. Nokia Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	15,401
Owner's equity (31.12.2020):	12,545
Interest-bearing liabilities (31.12.2019):	5,307
Interest-bearing liabilities (31.12.2020):	6,486
Average capital:	19,870
Average number of employees:	92,039
Assets (31.12.2019):	39,128
Assets (31.12.2020):	36,191
Average assets:	37,660
Operating expenses:	20,967
Sales revenue:	21,852
EBT:	743
Interest expenses:	- 164
EBIT:	907
Adjusted net operating cash flow:	2,041
Net investing cash flow:	- 1,550
Adjusted free cash flow:	491

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.24	1						
EBIT	0.54	2.25	1					
Sales revenue	0.02	0.09	0.04	1				
Operating expenses	0.02	0.10	0.04	1.04	1			
Average assets	0.01	0.05	0.02	0.58	0.56	1		
Average number of employees	0.01	0.02	0.01	0.24	0.23	0.41	1	
Average capital	0.02	0.10	0.05	1.10	1.06	1.90	4.63	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	6.39	1						
EBIT	7.51	1.17	1					
Sales revenue	3.65	0.57	0.49	1				
Operating expenses	3.48	0.55	0.46	0.95	1			
Average assets	2.10	0.33	0.28	0.57	0.60	1		
Average number of employees	3.21	0.50	0.43	0.88	0.92	1.53	1	
Average capital	1.59	0.25	0.21	0.43	0.46	0.76	0.49	1

BICOE

90.02%

Source: Nokia Oyj's annual report (2021) and author's calculations

Appendix 4. Fortum Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	13,235
Owner's equity (31.12.2020):	15,577
Interest-bearing liabilities (31.12.2019):	6,688
Interest-bearing liabilities (31.12.2020):	10,662
Average capital:	23,081
Average number of employees:	19,988
Assets (31.12.2019):	23,364
Assets (31.12.2020):	57,810
Average assets:	40,587
Operating expenses:	47,416
Sales revenue:	49,015
EBT:	2,199
Interest expenses:	- 56
EBIT:	2,255
Adjusted net operating cash flow:	2,570
Net investing cash flow:	- 2,307
Adjusted free cash flow:	263

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.10	1						
EBIT	0.12	1.14	1					
Sales revenue	0.01	0.05	0.05	1				
Operating expenses	0.01	0.05	0.05	1.03	1			
Average assets	0.01	0.06	0.06	1.21	1.17	1		
Average number of employees	0.01	0.13	0.11	2.45	2.37	2.03	1	
Average capital	0.01	0.11	0.10	2.12	2.05	1.76	0.87	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	2.72	1						
EBIT	1.62	0.60	1					
Sales revenue	0.87	0.32	0.54	1				
Operating expenses	0.83	0.30	0.51	0.95	1			
Average assets	1.04	0.38	0.65	1.20	1.27	1		
Average number of employees	7.91	2.91	4.89	9.06	9.58	7.57	1	
Average capital	0.73	0.27	0.45	0.84	0.89	0.70	0.09	1

BICOE

111.01%

Source: Fortum Oyj's annual report (2021) and author's calculations

Appendix 5. UPM-Kymmene Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	10,175
Owner's equity (31.12.2020):	9,513
Interest-bearing liabilities (31.12.2019):	1,382
Interest-bearing liabilities (31.12.2020):	2,139
Average capital:	11,605
Average number of employees:	18,557
Assets (31.12.2019):	14,722
Assets (31.12.2020):	14,858
Average assets:	14,790
Operating expenses:	7,819
Sales revenue:	8,580
EBT:	737
Interest expenses:	- 24
EBIT:	761
Adjusted net operating cash flow:	1,196
Net investing cash flow:	- 885
Adjusted free cash flow:	311

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.26	1						
EBIT	0.41	1.57	1					
Sales revenue	0.04	0.14	0.09	1				
Operating expenses	0.04	0.15	0.10	1.10	1			
Average assets	0.02	0.08	0.05	0.58	0.53	1		
Average number of employees	0.02	0.06	0.04	0.46	0.42	0.80	1	
Average capital	0.03	0.10	0.07	0.74	0.67	1.27	1.60	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	6.91	1						
EBIT	5.67	0.82	1					
Sales revenue	5.89	0.85	1.04	1				
Operating expenses	5.92	0.86	1.04	1.00	1			
Average assets	3.39	0.49	0.60	0.57	0.57	1		
Average number of employees	10.07	1.46	1.78	1.71	1.70	2.97	1	
Average capital	1.72	0.25	0.30	0.29	0.29	0.51	0.17	1

BICOE

120.79%

Source: UPM-Kymmene Oyj's annual report (2021) and author's calculations

Appendix 6. Stora Enso Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	7,423
Owner's equity (31.12.2020):	8,793
Interest-bearing liabilities (31.12.2019):	4,193
Interest-bearing liabilities (31.12.2020):	4,756
Average capital:	12,583
Average number of employees:	24,455
Assets (31.12.2019):	15,053
Assets (31.12.2020):	17,431
Average assets:	16,242
Operating expenses:	7,631
Sales revenue:	8,553
EBT:	773
Interest expenses:	- 149
EBIT:	922
Adjusted net operating cash flow:	1,307
Net investing cash flow:	- 719
Adjusted free cash flow:	588

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.45	1						
EBIT	0.64	1.42	1					
Sales revenue	0.07	0.15	0.11	1				
Operating expenses	0.08	0.17	0.12	1.12	1			
Average assets	0.04	0.08	0.06	0.53	0.47	1		
Average number of employees	0.02	0.05	0.04	0.35	0.31	0.66	1	
Average capital	0.05	0.10	0.07	0.68	0.61	1.29	1.94	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	11.95	1						
EBIT	8.85	0.74	1					
Sales revenue	11.18	0.94	1.26	1				
Operating expenses	11.46	0.96	1.30	1.03	1			
Average assets	5.83	0.49	0.66	0.52	0.51	1		
Average number of employees	14.45	1.21	1.63	1.29	1.26	2.48	1	
Average capital	3.00	0.25	0.34	0.27	0.26	0.51	0.21	1

BICOE

135.76%

Source: Stora Enso Oyj's annual report (2021) and author's calculations

Appendix 7. Kesko Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	2140.8
Owner's equity (31.12.2020):	2189.3
Interest-bearing liabilities (31.12.2019):	3037.3
Interest-bearing liabilities (31.12.2020):	2616.3
Average capital:	4,992
Average number of employees:	17,629
Assets (31.12.2019):	6,899
Assets (31.12.2020):	6,642
Average assets:	6,771
Operating expenses:	10,069
Sales revenue:	10,669
EBT:	528
Interest expenses:	- 73
EBIT:	600
Adjusted net operating cash flow:	758
Net investing cash flow:	- 426
Adjusted free cash flow:	332

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.44	1						
EBIT	0.55	1.26	1					
Sales revenue	0.03	0.07	0.06	1				
Operating expenses	0.03	0.08	0.06	1.06	1			
Average assets	0.05	0.11	0.09	1.58	1.49	1		
Average number of employees	0.02	0.04	0.03	0.61	0.57	0.38	1	
Average capital	0.07	0.15	0.12	2.14	2.02	1.36	3.53	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	11.63	1						
EBIT	7.67	0.66	1					
Sales revenue	5.06	0.43	0.66	1				
Operating expenses	4.90	0.42	0.64	0.97	1			
Average assets	7.89	0.68	1.03	1.56	1.61	1		
Average number of employees	11.31	0.97	1.48	2.24	2.31	1.43	1	
Average capital	4.27	0.37	0.56	0.84	0.87	0.54	0.38	1

BICOE

149.26%

Source: Kesko Oyj's annual report (2021) and author's calculations

Appendix 8. Elisa Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,150
Owner's equity (31.12.2020):	1,184
Interest-bearing liabilities (31.12.2019):	1,236
Interest-bearing liabilities (31.12.2020):	1,427
Average capital:	2,499
Average number of employees:	5,171
Assets (31.12.2019):	2,814
Assets (31.12.2020):	3,041
Average assets:	2,928
Operating expenses:	1,486
Sales revenue:	1,895
EBT:	398
Interest expenses:	- 11
EBIT:	409
Adjusted net operating cash flow:	682
Net investing cash flow:	- 297
Adjusted free cash flow:	385

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.56	1						
EBIT	0.94	1.67	1					
Sales revenue	0.20	0.36	0.22	1				
Operating expenses	0.26	0.46	0.28	1.28	1			
Average assets	0.13	0.23	0.14	0.65	0.51	1		
Average number of employees	0.07	0.13	0.08	0.37	0.29	0.57	1	
Average capital	0.15	0.27	0.16	0.76	0.59	1.17	2.07	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	15.01	1						
EBIT	13.07	0.87	1					
Sales revenue	33.08	2.20	2.53	1				
Operating expenses	38.59	2.57	2.95	1.17	1			
Average assets	21.21	1.41	1.62	0.64	0.55	1		
Average number of employees	44.79	2.98	3.43	1.35	1.16	2.11	1	
Average capital	9.90	0.66	0.76	0.30	0.26	0.47	0.22	1

BICOE

237.91%

Source: Elisa Oyj's annual report (2021) and author's calculations

Appendix 9. Metso Outotec Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,254
Owner's equity (31.12.2020):	2,040
Interest-bearing liabilities (31.12.2019):	1,001
Interest-bearing liabilities (31.12.2020):	1,345
Average capital:	2,820
Average number of employees:	14,821
Assets (31.12.2019):	3,457
Assets (31.12.2020):	5,508
Average assets:	4,483
Operating expenses:	3,080
Sales revenue:	3,319
EBT:	201
Interest expenses:	- 38
EBIT:	239
Adjusted net operating cash flow:	587
Net investing cash flow:	216
Adjusted free cash flow:	803

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	1.37	1						
EBIT	3.36	2.46	1					
Sales revenue	0.24	0.18	0.07	1				
Operating expenses	0.26	0.19	0.08	1.08	1			
Average assets	0.18	0.13	0.05	0.74	0.69	1		
Average number of employees	0.05	0.04	0.02	0.22	0.21	0.30	1	
Average capital	0.28	0.21	0.08	1.18	1.09	1.59	5.26	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	36.34	1						
EBIT	46.60	1.28	1					
Sales revenue	39.34	1.08	0.84	1				
Operating expenses	38.78	1.07	0.83	0.99	1			
Average assets	28.86	0.79	0.62	0.73	0.74	1		
Average number of employees	32.56	0.90	0.70	0.83	0.84	1.13	1	
Average capital	18.28	0.50	0.39	0.46	0.47	0.63	0.56	1

BICOE

200.55%

Source: Metso Outotec Oyj's annual report (2021) and author's calculations

Appendix 10. Orion Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	779
Owner's equity (31.12.2020):	731
Interest-bearing liabilities (31.12.2019):	10
Interest-bearing liabilities (31.12.2020):	109
Average capital:	815
Average number of employees:	3,337
Assets (31.12.2019):	1,036
Assets (31.12.2020):	1,116
Average assets:	1,076
Operating expenses:	798
Sales revenue:	1,078
EBT:	278
Interest expenses:	- 2
EBIT:	280
Adjusted net operating cash flow:	364
Net investing cash flow:	- 36
Adjusted free cash flow:	328

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.90	1						
EBIT	1.17	1.30	1					
Sales revenue	0.30	0.34	0.26	1				
Operating expenses	0.41	0.46	0.35	1.35	1			
Average assets	0.30	0.34	0.26	1.00	0.74	1		
Average number of employees	0.10	0.11	0.08	0.32	0.24	0.32	1	
Average capital	0.40	0.45	0.34	1.32	0.98	1.32	4.10	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	23.94	1						
EBIT	16.23	0.68	1					
Sales revenue	49.43	2.06	3.05	1				
Operating expenses	61.08	2.55	3.76	1.24	1			
Average assets	49.08	2.05	3.02	0.99	0.80	1		
Average number of employees	59.02	2.46	3.64	1.19	0.97	1.20	1	
Average capital	25.82	1.08	1.59	0.52	0.42	0.53	0.44	1

BICOE

312.97%

Source: Orion Oyj's annual report (2021) and author's calculations

Appendix 11. Wärtsilä Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	2,410
Owner's equity (31.12.2020):	2,188
Interest-bearing liabilities (31.12.2019):	1,096
Interest-bearing liabilities (31.12.2020):	1,327
Average capital:	3,511
Average number of employees:	18,307
Assets (31.12.2019):	6,398
Assets (31.12.2020):	6,232
Average assets:	6,315
Operating expenses:	4,370
Sales revenue:	4,604
EBT:	191
Interest expenses:	- 43
EBIT:	234
Adjusted net operating cash flow:	832
Net investing cash flow:	- 51
Adjusted free cash flow:	781

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.94	1						
EBIT	3.34	3.56	1					
Sales revenue	0.17	0.18	0.05	1				
Operating expenses	0.18	0.19	0.05	1.05	1			
Average assets	0.12	0.13	0.04	0.73	0.69	1		
Average number of employees	0.04	0.05	0.01	0.25	0.24	0.34	1	
Average capital	0.22	0.24	0.07	1.31	1.24	1.80	5.21	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	24.94	1						
EBIT	46.29	1.86	1					
Sales revenue	27.58	1.11	0.60	1				
Operating expenses	26.58	1.07	0.57	0.96	1			
Average assets	19.92	0.80	0.43	0.72	0.75	1		
Average number of employees	25.64	1.03	0.55	0.93	0.96	1.29	1	
Average capital	14.28	0.57	0.31	0.52	0.54	0.72	0.56	1

BICOE

185.70%

Source: Wärtsilä Oyj's annual report (2021) and author's calculations

Appendix 12. Huhtamäki Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,437
Owner's equity (31.12.2020):	1,365
Interest-bearing liabilities (31.12.2019):	1,120
Interest-bearing liabilities (31.12.2020):	1,193
Average capital:	2,558
Average number of employees:	18,440
Assets (31.12.2019):	3,611
Assets (31.12.2020):	3,596
Average assets:	3,603
Operating expenses:	3,037
Sales revenue:	3,302
EBT:	237
Interest expenses:	- 28
EBIT:	265
Adjusted net operating cash flow:	495
Net investing cash flow:	- 252
Adjusted free cash flow:	243

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.49	1						
EBIT	0.92	1.86	1					
Sales revenue	0.07	0.15	0.08	1				
Operating expenses	0.08	0.16	0.09	1.09	1			
Average assets	0.07	0.14	0.07	0.92	0.84	1		
Average number of employees	0.01	0.03	0.01	0.18	0.16	0.20	1	
Average capital	0.10	0.19	0.10	1.29	1.19	1.41	7.21	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	13.05	1						
EBIT	12.70	0.97	1					
Sales revenue	11.97	0.92	0.94	1				
Operating expenses	11.90	0.91	0.94	0.99	1			
Average assets	10.87	0.83	0.86	0.91	0.91	1		
Average number of employees	7.92	0.61	0.62	0.66	0.67	0.73	1	
Average capital	6.10	0.47	0.48	0.51	0.51	0.56	0.77	1

BICOE

147.23%

Source: Huhtamäki Oyj's annual report (2021) and author's calculations

Appendix 13. Nokian Renkaat Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,770
Owner's equity (31.12.2020):	1,521
Interest-bearing liabilities (31.12.2019):	260
Interest-bearing liabilities (31.12.2020):	487
Average capital:	2,019
Average number of employees:	4,859
Assets (31.12.2019):	2,333
Assets (31.12.2020):	2,337
Average assets:	2,335
Operating expenses:	1,194
Sales revenue:	1,314
EBT:	106
Interest expenses:	- 14
EBIT:	120
Adjusted net operating cash flow:	451
Net investing cash flow:	- 139
Adjusted free cash flow:	312

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.69	1						
EBIT	2.60	3.76	1					
Sales revenue	0.24	0.34	0.09	1				
Operating expenses	0.26	0.38	0.10	1.10	1			
Average assets	0.13	0.19	0.05	0.56	0.51	1		
Average number of employees	0.06	0.09	0.02	0.27	0.25	0.48	1	
Average capital	0.15	0.22	0.06	0.65	0.59	1.16	2.41	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	18.37	1						
EBIT	36.01	1.96	1					
Sales revenue	38.57	2.10	1.07	1				
Operating expenses	38.82	2.11	1.08	1.01	1			
Average assets	21.50	1.17	0.60	0.56	0.55	1		
Average number of employees	38.54	2.10	1.07	1.00	0.99	1.79	1	
Average capital	9.91	0.54	0.28	0.26	0.26	0.46	0.26	1

BICOE

199.68%

Source: Nokian Renkaat Oyj's annual report (2021) and author's calculations

Appendix 14. Valmet Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,046
Owner's equity (31.12.2020):	1,142
Interest-bearing liabilities (31.12.2019):	268
Interest-bearing liabilities (31.12.2020):	497
Average capital:	1,477
Average number of employees:	13,822
Assets (31.12.2019):	3,452
Assets (31.12.2020):	3,959
Average assets:	3,706
Operating expenses:	3,421
Sales revenue:	3,740
EBT:	307
Interest expenses:	- 12
EBIT:	319
Adjusted net operating cash flow:	611
Net investing cash flow:	- 588
Adjusted free cash flow:	23

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.04	1						
EBIT	0.07	1.92	1					
Sales revenue	0.01	0.16	0.09	1				
Operating expenses	0.01	0.18	0.09	1.09	1			
Average assets	0.01	0.16	0.09	1.01	0.92	1		
Average number of employees	0.00	0.04	0.02	0.27	0.25	0.27	1	
Average capital	0.02	0.41	0.22	2.53	2.32	2.51	9.36	1

BICOE

100%

Source: Valmet Oyj's annual report (2021) and author's calculations

Appendix 15. TietoEVRY Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,687
Owner's equity (31.12.2020):	1,626
Interest-bearing liabilities (31.12.2019):	1,262
Interest-bearing liabilities (31.12.2020):	1,169
Average capital:	2,872
Average number of employees:	23,788
Assets (31.12.2019):	3,834
Assets (31.12.2020):	3,605
Average assets:	3,719
Operating expenses:	2,640
Sales revenue:	2,786
EBT:	122
Interest expenses:	- 24
EBIT:	147
Adjusted net operating cash flow:	425
Net investing cash flow:	- 3
Adjusted free cash flow:	422

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.99	1						
EBIT	2.88	2.90	1					
Sales revenue	0.15	0.15	0.05	1				
Operating expenses	0.16	0.16	0.06	1.06	1			
Average assets	0.11	0.11	0.04	0.75	0.71	1		
Average number of employees	0.02	0.02	0.01	0.12	0.11	0.16	1	
Average capital	0.15	0.15	0.05	0.97	0.92	1.29	8.28	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	26.36	1						
EBIT	39.90	1.51	1					
Sales revenue	24.63	0.93	0.62	1				
Operating expenses	23.78	0.90	0.60	0.97	1			
Average assets	18.28	0.69	0.46	0.74	0.77	1		
Average number of employees	10.66	0.40	0.27	0.43	0.45	0.58	1	
Average capital	9.43	0.36	0.24	0.38	0.40	0.52	0.88	1

BICOE

142.67%

Source: TietoEVRY Oyj's annual report (2021) and author's calculations

Appendix 16. Metsä Board Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,338
Owner's equity (31.12.2020):	1,384
Interest-bearing liabilities (31.12.2019):	445
Interest-bearing liabilities (31.12.2020):	452
Average capital:	1,810
Average number of employees:	2,455
Assets (31.12.2019):	2,270
Assets (31.12.2020):	2,303
Average assets:	2,286
Operating expenses:	1,662
Sales revenue:	1,890
EBT:	212
Interest expenses:	- 15
EBIT:	227
Adjusted net operating cash flow:	349
Net investing cash flow:	- 120
Adjusted free cash flow:	229

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.66	1						
EBIT	1.01	1.53	1					
Sales revenue	0.12	0.18	0.12	1				
Operating expenses	0.14	0.21	0.14	1.14	1			
Average assets	0.10	0.15	0.10	0.83	0.73	1		
Average number of employees	0.09	0.14	0.09	0.77	0.68	0.93	1	
Average capital	0.13	0.19	0.13	1.04	0.92	1.26	1.36	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	17.42	1						
EBIT	13.95	0.80	1					
Sales revenue	19.67	1.13	1.41	1				
Operating expenses	20.46	1.17	1.47	1.04	1			
Average assets	16.11	0.92	1.15	0.82	0.79	1		
Average number of employees	55.96	3.21	4.01	2.84	2.74	3.47	1	
Average capital	8.11	0.47	0.58	0.41	0.40	0.50	0.14	1

BICOE

220.20%

Source: Metsä Board Oyj's annual report (2021) and author's calculations

Appendix 17. Konecranes Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,247
Owner's equity (31.12.2020):	1,251
Interest-bearing liabilities (31.12.2019):	1,034
Interest-bearing liabilities (31.12.2020):	1,171
Average capital:	2,351
Average number of employees:	17,027
Assets (31.12.2019):	3,854
Assets (31.12.2020):	4,017
Average assets:	3,935
Operating expenses:	3,005
Sales revenue:	3,179
EBT:	170
Interest expenses:	- 3
EBIT:	174
Adjusted net operating cash flow:	427
Net investing cash flow:	- 123
Adjusted free cash flow:	305

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.71	1						
EBIT	1.75	2.46	1					
Sales revenue	0.10	0.13	0.05	1				
Operating expenses	0.10	0.14	0.06	1.06	1			
Average assets	0.08	0.11	0.04	0.81	0.76	1		
Average number of employees	0.02	0.03	0.01	0.19	0.18	0.23	1	
Average capital	0.13	0.18	0.07	1.35	1.28	1.67	7.24	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	18.95	1						
EBIT	24.33	1.28	1					
Sales revenue	15.60	0.82	0.64	1				
Operating expenses	15.09	0.80	0.62	0.97	1			
Average assets	12.48	0.66	0.51	0.80	0.83	1		
Average number of employees	10.76	0.57	0.44	0.69	0.71	0.86	1	
Average capital	8.32	0.44	0.34	0.53	0.55	0.67	0.77	1

BICOE

148.72%

Source: Konecranes Oyj's annual report (2021) and author's calculations

Appendix 18. Sanoma Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	551
Owner's equity (31.12.2020):	710
Interest-bearing liabilities (31.12.2019):	564
Interest-bearing liabilities (31.12.2020):	775
Average capital:	1,300
Average number of employees:	4,255
Assets (31.12.2019):	1,998
Assets (31.12.2020):	2,048
Average assets:	2,023
Operating expenses:	792
Sales revenue:	1,062
EBT:	261
Interest expenses:	- 9
EBIT:	270
Adjusted net operating cash flow:	177
Net investing cash flow:	107
Adjusted free cash flow:	284

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	1.60	1						
EBIT	1.05	0.66	1					
Sales revenue	0.27	0.17	0.25	1				
Operating expenses	0.36	0.22	0.34	1.34	1			
Average assets	0.14	0.09	0.13	0.52	0.39	1		
Average number of employees	0.07	0.04	0.06	0.25	0.19	0.48	1	
Average capital	0.22	0.14	0.21	0.82	0.61	1.56	3.27	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	42.56	1						
EBIT	14.57	0.34	1					
Sales revenue	43.45	1.02	2.98	1				
Operating expenses	53.31	1.25	3.66	1.23	1			
Average assets	22.59	0.53	1.55	0.52	0.42	1		
Average number of employees	40.07	0.94	2.75	0.92	0.75	1.77	1	
Average capital	14.01	0.33	0.96	0.32	0.26	0.62	0.35	1

BICOE

210.52%

Source: Sanoma Oyj's annual report (2021) and author's calculations

Appendix 19. Ahlstrom-Munksjö Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,232
Owner's equity (31.12.2020):	1,185
Interest-bearing liabilities (31.12.2019):	1,051
Interest-bearing liabilities (31.12.2020):	1,044
Average capital:	2,256
Average number of employees:	7,814
Assets (31.12.2019):	3,201
Assets (31.12.2020):	3,123
Average assets:	3,162
Operating expenses:	2,507
Sales revenue:	2,683
EBT:	130
Interest expenses:	- 46
EBIT:	176
Adjusted net operating cash flow:	330
Net investing cash flow:	- 74
Adjusted free cash flow:	256

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.77	1						
EBIT	1.45	1.87	1					
Sales revenue	0.10	0.12	0.07	1				
Operating expenses	0.10	0.13	0.07	1.07	1			
Average assets	0.08	0.10	0.06	0.85	0.79	1		
Average number of employees	0.03	0.04	0.02	0.34	0.32	0.40	1	
Average capital	0.11	0.15	0.08	1.19	1.11	1.40	3.46	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	20.58	1						
EBIT	20.12	0.98	1					
Sales revenue	15.49	0.75	0.77	1				
Operating expenses	15.16	0.74	0.75	0.98	1			
Average assets	13.02	0.63	0.65	0.84	0.86	1		
Average number of employees	19.66	0.96	0.98	1.27	1.30	1.51	1	
Average capital	7.27	0.35	0.36	0.47	0.48	0.56	0.37	1

BICOE

161.83%

Source: Ahlstrom-Munksjö Oyj's annual report (2021) and author's calculations

Appendix 20. Kemira Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,231
Owner's equity (31.12.2020):	1,205
Interest-bearing liabilities (31.12.2019):	955
Interest-bearing liabilities (31.12.2020):	919
Average capital:	2,155
Average number of employees:	5,038
Assets (31.12.2019):	2,891
Assets (31.12.2020):	2,796
Average assets:	2,843
Operating expenses:	2,211
Sales revenue:	2,427
EBT:	181
Interest expenses:	- 35
EBIT:	216
Adjusted net operating cash flow:	433
Net investing cash flow:	- 195
Adjusted free cash flow:	239

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.55	1						
EBIT	1.11	2.01	1					
Sales revenue	0.10	0.18	0.09	1				
Operating expenses	0.11	0.20	0.10	1.10	1			
Average assets	0.08	0.15	0.08	0.85	0.78	1		
Average number of employees	0.05	0.09	0.04	0.48	0.44	0.56	1	
Average capital	0.11	0.20	0.10	1.13	1.03	1.32	2.34	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	14.63	1						
EBIT	15.33	1.05	1					
Sales revenue	15.98	1.09	1.04	1				
Operating expenses	16.05	1.10	1.05	1.00	1			
Average assets	13.52	0.92	0.88	0.85	0.84	1		
Average number of employees	28.46	1.95	1.86	1.78	1.77	2.11	1	
Average capital	7.11	0.49	0.46	0.44	0.44	0.53	0.25	1

BICOE

189.03%

Source: Kemira Oyj's annual report (2021) and author's calculations

Appendix 21. Cargotec Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1,427
Owner's equity (31.12.2020):	1,301
Interest-bearing liabilities (31.12.2019):	1,224
Interest-bearing liabilities (31.12.2020):	1,183
Average capital:	2,568
Average number of employees:	12,066
Assets (31.12.2019):	4,227
Assets (31.12.2020):	3,888
Average assets:	4,058
Operating expenses:	3,193
Sales revenue:	3,263
EBT:	35
Interest expenses:	- 36
EBIT:	70
Adjusted net operating cash flow:	296
Net investing cash flow:	- 18
Adjusted free cash flow:	278

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.94	1						
EBIT	3.95	4.21	1					
Sales revenue	0.09	0.09	0.02	1				
Operating expenses	0.09	0.09	0.02	1.02	1			
Average assets	0.07	0.07	0.02	0.80	0.79	1		
Average number of employees	0.02	0.02	0.01	0.27	0.26	0.34	1	
Average capital	0.11	0.12	0.03	1.27	1.24	1.58	4.70	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	24.92	1						
EBIT	54.77	2.20	1					
Sales revenue	13.85	0.56	0.25	1				
Operating expenses	12.95	0.52	0.24	0.93	1			
Average assets	11.04	0.44	0.20	0.80	0.85	1		
Average number of employees	13.85	0.56	0.25	1.00	1.07	1.25	1	
Average capital	6.95	0.28	0.13	0.50	0.54	0.63	0.50	1

BICOE

127.97%

Source: Cargotec Oyj's annual report (2021) and author's calculations

Appendix 22. Neles Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	1526
Owner's equity (31.12.2020):	263
Interest-bearing liabilities (31.12.2019):	103
Interest-bearing liabilities (31.12.2020):	218
Average capital:	1,055
Average number of employees:	2,840
Assets (31.12.2019):	3,887
Assets (31.12.2020):	644
Average assets:	2,266
Operating expenses:	506
Sales revenue:	576
EBT:	64
Interest expenses:	- 6
EBIT:	70
Adjusted net operating cash flow:	488
Net investing cash flow:	- 51
Adjusted free cash flow:	437

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.90	1						
EBIT	6.24	6.97	1					
Sales revenue	0.76	0.85	0.12	1				
Operating expenses	0.86	0.96	0.14	1.14	1			
Average assets	0.19	0.22	0.03	0.25	0.22	1		
Average number of employees	0.15	0.17	0.02	0.20	0.18	0.80	1	
Average capital	0.41	0.46	0.07	0.55	0.48	2.15	2.69	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	23.79	1						
EBIT	86.59	3.64	1					
Sales revenue	123.37	5.19	1.42	1				
Operating expenses	128.46	5.40	1.48	1.04	1			
Average assets	31.08	1.31	0.36	0.25	0.24	1		
Average number of employees	92.47	3.89	1.07	0.75	0.72	2.98	1	
Average capital	26.59	1.12	0.31	0.22	0.21	0.86	0.29	1

BICOE

270.51%

Source: Neles Oyj's annual report (2021) and author's calculations

Appendix 23. Qt Group Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	17
Owner's equity (31.12.2020):	30
Interest-bearing liabilities (31.12.2019):	4
Interest-bearing liabilities (31.12.2020):	3
Average capital:	29
Average number of employees:	348
Assets (31.12.2019):	50
Assets (31.12.2020):	61
Average assets:	56
Operating expenses:	62
Sales revenue:	79
EBT:	16
Interest expenses:	- 1
EBIT:	17
Adjusted net operating cash flow:	13
Net investing cash flow:	- 0
Adjusted free cash flow:	13

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.97	1						
EBIT	0.75	0.78	1					
Sales revenue	0.16	0.17	0.21	1				
Operating expenses	0.21	0.21	0.27	1.27	1			
Average assets	0.23	0.24	0.31	1.43	1.12	1		
Average number of employees	0.04	0.04	0.05	0.23	0.18	0.16	1	
Average capital	0.44	0.45	0.58	2.71	2.13	1.90	11.86	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	25.73	1						
EBIT	10.46	0.41	1					
Sales revenue	26.26	1.02	2.51	1				
Operating expenses	30.57	1.19	2.92	1.16	1			
Average assets	37.11	1.44	3.55	1.41	1.21	1		
Average number of employees	22.16	0.86	2.12	0.84	0.72	0.60	1	
Average capital	28.09	1.09	2.69	1.07	0.92	0.76	1.27	1

BICOE

268.90%

Source: Qt Group Oyj's annual report (2021) and author's calculations

Appendix 24. Citycon Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	2,325
Owner's equity (31.12.2020):	2,166
Interest-bearing liabilities (31.12.2019):	1,874
Interest-bearing liabilities (31.12.2020):	2,121
Average capital:	4,243
Average number of employees:	239
Assets (31.12.2019):	4,582
Assets (31.12.2020):	4,680
Average assets:	4,631
Operating expenses:	261
Sales revenue:	296
EBT:	- 46
Interest expenses:	- 80
EBIT:	34
Adjusted net operating cash flow:	185
Net investing cash flow:	- 154
Adjusted free cash flow:	31

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.17	1						
EBIT	0.90	5.41	1					
Sales revenue	0.10	0.62	0.12	1				
Operating expenses	0.12	0.71	0.13	1.13	1			
Average assets	0.01	0.04	0.01	0.06	0.06	1		
Average number of employees	0.13	0.77	0.14	1.24	1.09	19.38	1	
Average capital	0.01	0.04	0.01	0.07	0.06	1.09	0.06	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	4.40	1						
EBIT	12.45	2.83	1					
Sales revenue	16.84	3.82	1.35	1				
Operating expenses	17.41	3.95	1.40	1.03	1			
Average assets	1.06	0.24	0.09	0.06	0.06	1		
Average number of employees	76.94	17.47	6.18	4.57	4.42	72.28	1	
Average capital	0.46	0.11	0.04	0.03	0.03	0.43	0.01	1

BICOE

110.18%

Source: Citycon Oyj's annual report (2021) and author's calculations

Appendix 25. Revenio Group Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	64
Owner's equity (31.12.2020):	70
Interest-bearing liabilities (31.12.2019):	29
Interest-bearing liabilities (31.12.2020):	27
Average capital:	95
Average number of employees:	135
Assets (31.12.2019):	110
Assets (31.12.2020):	114
Average assets:	112
Operating expenses:	44
Sales revenue:	61
EBT:	17
Interest expenses:	- 0.4
EBIT:	17
Adjusted net operating cash flow:	19
Net investing cash flow:	- 2
Adjusted free cash flow:	17

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.92	1						
EBIT	1.01	1.11	1					
Sales revenue	0.28	0.31	0.28	1				
Operating expenses	0.39	0.43	0.39	1.39	1			
Average assets	0.15	0.17	0.15	0.54	0.39	1		
Average number of employees	0.13	0.14	0.13	0.45	0.33	0.83	1	
Average capital	0.18	0.20	0.18	0.64	0.46	1.18	1.42	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	24.33	1						
EBIT	14.04	0.58	1					
Sales revenue	46.17	1.90	3.29	1				
Operating expenses	58.70	2.41	4.18	1.27	1			
Average assets	24.92	1.02	1.77	0.54	0.42	1		
Average number of employees	77.19	3.17	5.50	1.67	1.31	3.10	1	
Average capital	11.71	0.48	0.83	0.25	0.20	0.47	0.15	1

BICOE

253.99%

Source: Revenio Group Oyj's annual report (2021) and author's calculations

Appendix 26. Uponor Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	370
Owner's equity (31.12.2020):	422
Interest-bearing liabilities (31.12.2019):	215
Interest-bearing liabilities (31.12.2020):	153
Average capital:	580
Average number of employees:	3,700
Assets (31.12.2019):	833
Assets (31.12.2020):	868
Average assets:	851
Operating expenses:	1,004
Sales revenue:	1,136
EBT:	122
Interest expenses:	- 11
EBIT:	132
Adjusted net operating cash flow:	231
Net investing cash flow:	- 36
Adjusted free cash flow:	195

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.84	1						
EBIT	1.47	1.75	1					
Sales revenue	0.17	0.20	0.12	1				
Operating expenses	0.19	0.23	0.13	1.13	1			
Average assets	0.23	0.27	0.16	1.34	1.18	1		
Average number of employees	0.05	0.06	0.04	0.31	0.27	0.23	1	
Average capital	0.34	0.40	0.23	1.96	1.73	1.47	6.38	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	22.40	1						
EBIT	20.44	0.91	1					
Sales revenue	27.91	1.25	1.37	1				
Operating expenses	28.90	1.29	1.41	1.04	1			
Average assets	36.93	1.65	1.81	1.32	1.28	1		
Average number of employees	31.67	1.41	1.55	1.13	1.10	0.86	1	
Average capital	21.57	0.96	1.06	0.77	0.75	0.58	0.68	1

BICOE

254.77%

Source: Uponor Oyj's annual report (2021) and author's calculations

Appendix 27. Terveystalo Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	541.2
Owner's equity (31.12.2020):	571.4
Interest-bearing liabilities (31.12.2019):	588.8
Interest-bearing liabilities (31.12.2020):	567.9
Average capital:	1,135
Average number of employees:	4,900
Assets (31.12.2019):	1,359
Assets (31.12.2020):	1,361
Average assets:	1,360
Operating expenses:	910
Sales revenue:	986
EBT:	57
Interest expenses:	- 11
EBIT:	67
Adjusted net operating cash flow:	151
Net investing cash flow:	- 26
Adjusted free cash flow:	125

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.83	1						
EBIT	1.86	2.24	1					
Sales revenue	0.13	0.15	0.07	1				
Operating expenses	0.14	0.17	0.07	1.08	1			
Average assets	0.09	0.11	0.05	0.73	0.67	1		
Average number of employees	0.03	0.03	0.01	0.20	0.19	0.28	1	
Average capital	0.11	0.13	0.06	0.87	0.80	1.20	4.32	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	22.02	1						
EBIT	25.78	1.17	1					
Sales revenue	20.59	0.94	0.80	1				
Operating expenses	20.41	0.93	0.79	0.99	1			
Average assets	14.79	0.67	0.57	0.72	0.72	1		
Average number of employees	15.32	0.70	0.59	0.74	0.75	1.04	1	
Average capital	7.07	0.32	0.27	0.34	0.35	0.48	0.46	1

BICOE

149.95%

Source: Terveystalo Oyj's annual report (2021) and author's calculations

Appendix 28. Fiskars Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	765
Owner's equity (31.12.2020):	762
Interest-bearing liabilities (31.12.2019):	271
Interest-bearing liabilities (31.12.2020):	207
Average capital:	1,002
Average number of employees:	5,993
Assets (31.12.2019):	1,364
Assets (31.12.2020):	1,342
Average assets:	1,353
Operating expenses:	1,018
Sales revenue:	1,116
EBT:	90
Interest expenses:	- 8
EBIT:	98
Adjusted net operating cash flow:	224
Net investing cash flow:	- 29
Adjusted free cash flow:	194

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.87	1						
EBIT	1.98	2.28	1					
Sales revenue	0.17	0.20	0.09	1				
Operating expenses	0.19	0.22	0.10	1.10	1			
Average assets	0.14	0.17	0.07	0.82	0.75	1		
Average number of employees	0.03	0.04	0.02	0.19	0.17	0.23	1	
Average capital	0.19	0.22	0.10	1.11	1.02	1.35	5.98	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	23.08	1						
EBIT	27.51	1.19	1					
Sales revenue	28.32	1.23	1.03	1				
Operating expenses	28.40	1.23	1.03	1.00	1			
Average assets	23.15	1.00	0.84	0.82	0.82	1		
Average number of employees	19.49	0.84	0.71	0.69	0.69	0.84	1	
Average capital	12.45	0.54	0.45	0.44	0.44	0.54	0.64	1

BICOE

186.42%

Source: Fiskars Oyj's annual report (2021) and author's calculations

Appendix 29. Vaisala Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	198
Owner's equity (31.12.2020):	206
Interest-bearing liabilities (31.12.2019):	52
Interest-bearing liabilities (31.12.2020):	57
Average capital:	256
Average number of employees:	1,911
Assets (31.12.2019):	362
Assets (31.12.2020):	352
Average assets:	357
Operating expenses:	335
Sales revenue:	380
EBT:	41
Interest expenses:	- 4
EBIT:	45
Adjusted net operating cash flow:	53
Net investing cash flow:	- 31
Adjusted free cash flow:	22

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.41	1						
EBIT	0.48	1.18	1					
Sales revenue	0.06	0.14	0.12	1				
Operating expenses	0.06	0.16	0.13	1.13	1			
Average assets	0.06	0.15	0.13	1.06	0.94	1		
Average number of employees	0.01	0.03	0.02	0.20	0.18	0.19	1	
Average capital	0.08	0.21	0.17	1.48	1.31	1.39	7.46	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	10.94	1						
EBIT	6.72	0.61	1					
Sales revenue	9.30	0.85	1.38	1				
Operating expenses	9.64	0.88	1.44	1.04	1			
Average assets	9.80	0.90	1.46	1.05	1.02	1		
Average number of employees	6.82	0.62	1.02	0.73	0.71	0.70	1	
Average capital	5.44	0.50	0.81	0.58	0.56	0.55	0.80	1

BICOE

152.46%

Source: Vaisala Oyj's annual report (2021) and author's calculations

Appendix 30. Tokmanni Group Oyj's Overall efficiency matrix

Quantitative indicator (2020)	mil €
Owner's equity (31.12.2019):	185
Owner's equity (31.12.2020):	217
Interest-bearing liabilities (31.12.2019):	409
Interest-bearing liabilities (31.12.2020):	411
Average capital:	611
Average number of employees:	3,873
Assets (31.12.2019):	731
Assets (31.12.2020):	785
Average assets:	758
Operating expenses:	974
Sales revenue:	1,073
EBT:	89
Interest expenses:	- 10
EBIT:	99
Adjusted net operating cash flow:	172
Net investing cash flow:	- 13
Adjusted free cash flow:	159

Overall efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	0.92	1						
EBIT	1.61	1.74	1					
Net revenue	0.15	0.16	0.09	1				
Operating expenses	0.16	0.18	0.10	1.10	1			
Average assets	0.21	0.23	0.13	1.42	1.29	1		
Average number of employees	0.04	0.04	0.03	0.28	0.25	0.20	1	
Average capital	0.26	0.28	0.16	1.76	1.59	1.24	6.34	1

Comparative efficiency matrix:

Quantitative indicator	Adjusted free cash flow	Adjusted net operating cash flow	EBIT	Sales revenue	Operating expenses	Average assets	Average number of employees	Average capital
Adjusted free cash flow	1							
Adjusted net operating cash flow	24.51	1						
EBIT	22.28	0.91	1					
Net revenue	24.09	0.98	1.08	1				
Operating expenses	24.27	0.99	1.09	1.01	1			
Average assets	33.79	1.38	1.52	1.40	1.39	1		
Average number of employees	24.66	1.01	1.11	1.02	1.02	0.73	1	
Average capital	16.70	0.68	0.75	0.69	0.69	0.49	0.68	1

BICOE

220.49%

Source: Tokmanni Group Oyj's annual report (2021) and author's calculations

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