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COMPARATIVE ANALYSIS OF THE FINANCIAL STATEMENTS OF TELECOMMUNICATION TECHNOLOGY COMPANIES ON THE EXAMPLE OF TELEFONAKTIEBOLAGET LM ERICSSON AND NOKIA CORPORATION DURING 2018–2020

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has not been previously presented for grading.
The document length is 16 239 words from the introduction to the end of the conclusion.

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ABSTRACT

In the current thesis, the author analyses the financial performance and overall efficiency of two telecommunication equipment producers, Telefonaktiebolaget LM Ericsson and Nokia Corporation, using their annual reports from the period 2018–2020. The aim of the thesis is to identify strengths and weaknesses in the two important 5G networking equipment producing companies by using comparative financial statement analysis.

A variety of financial statement analysis methods was used. For example, vertical analysis was used to study the balance sheet structure of both companies. Analysis reveals that balance sheet structures of both companies were similar and comparable. Financial ratios were used to study asset usage efficiency, short-term liquidity, long-term solvency and return on capital employed (ROCE). The results showed that Ericsson is using its assets more efficiently overall. Nokia's short-term liquidity and ratios were higher compared to its competitor Ericsson. However, both companies still have high short-term liquidity. A key contributor to high liquidity is due to the large amount of cash and cash equivalents each company owns. ROCE has improved for both companies during the period studied. Decomposition analysis shows that an increasing operating margin for both companies had the largest impact on improvement in ROCE.

Overall efficiency matrix was compiled using six quantitative indicators to analyse the overall efficiency of both companies. Dynamic ranking problems were solved in order to analyse how the overall efficiency of each company has changed during the period studied. Analysis revealed that Ericsson's overall efficiency has increased more rapidly than Nokia's. Static ranking problems was solved in order to determine which company's overall efficiency is higher. Analysis demonstrates that Ericsson outperformed its competitor Nokia during the entirety of the studied period.

Key words: Efficiency matrix, telecommunication equipment, comparative analysis, financial statement.

INTRODUCTION

The spread of mobile communication and the internet have become one of the enablers in driving economic growth and overall prosperity. The internet has become an important part of the infrastructure that enables digital society we have become accustomed to to function. Access to the internet is considered to be so important that there are even discussions to include right of access to the internet as a human right (Joyce 2015). The internet is not solely used for people to communicate each other; it also has a very important role in modern banking, shopping, entertainment, research, etc. In 2015, there was 3.17 billion internet users globally (Statista 2015) and in 2021 this number had grown to 4.66 billion. In fact, the number of mobile internet users has grown more rapidly (Statista 2021).

In order to provide these mobile connection services to customers, mobile network operators need network hardware, software, planning, managing and services. In recent years, 5th generation mobile communication (5G) network roll-out has begun and there are no signs that the pace of the roll-out will slow down. Currently, there are three key 5G networking equipment developers and producers: Nokia Corporation (Finland), Telefonaktiebolaget LM Ericsson (Sweden) and Huawei Technologies Co., Ltd. (China). In the last number of years, there have been many security concerns emerging related to the spread of Chinese 5G technology in western countries (North America and Europe) (Bryan-Low et al. 2019). Some countries have already restricted the use of Huawei telecommunication network technology, including the United States, Australia, the United Kingdom and Poland, while many countries are currently considering banning Huawei's technology outright (Sacks 2021). This has led to a situation whereby Ericsson and Nokia have become the preferred suppliers in the mentioned regions. The author of the thesis considers that this is why these two companies have become extremely significant in the development of the digital infrastructure for western countries.

Developing and introducing new technology takes a significant amount investment. Complex technology developing companies need to invest a significant amount in research and development (R&D) in order to develop or acquire patents. These are long term investments, and there is always

the risk that the chosen technological direction turns out not to be competitive. As a result, there is a need to constantly monitor a company's effectiveness and financial performance in order to evaluate if long-term goals are achievable.

One way in which an external analyst can analyse a company's performance is through financial statement analysis, which is to analyse a company's accounting reports. The main aim of this is to measure a company's past and present performance. This help in predicting a company's future outcome and leads to mapping strengths and weaknesses, which in turn supports the company management in its decision-making processes.

The aim of the thesis is to identify the strengths and weaknesses of two important 5G networking equipment producing companies by using comparative financial statement analysis. This knowledge helps give recommendations that can reduce the weaknesses and empower the strengths that will enhance achievement of the companies' long-term goals and indirectly support the development of digital society.

The following research questions were posed in order to achieve the aim of the thesis:

1. Which research methods have been used in previous comparative financial statement analysis?
2. How do the structures of the financial statements of the analysed companies differ?
3. How do the companies differ in short-term liquidity and long-term solvency?
4. How do the companies differ in efficiency of resource (assets and labour) usage?
5. How do the companies differ in return on capital employed (ROCE)?
6. Which company has higher overall efficiency and how has it changed during the analysed period?

The following research tasks must be completed to answer the above research questions:

1. Analyse existing literature regarding comparative financial statement analysis.
2. Check the comparability of the financial statements analysed.
3. Perform vertical analysis of the financial statements.
4. Perform ratio analysis of the financial statements.

5. Chose telecommunication industry specific quantitative indicators and use these in efficiency matrix analysis.

It was planned to integrate Huawei into the analysis, but it became clear during the planning phase that Huawei's business model is too different to that of Nokia and Ericsson. Huawei's main revenue comes for developing, producing and selling consumer electronics. Telecommunication equipment production is a side business for the company (Huawei 2021).

The thesis contains three chapters: the first gives an overview of the current situation of and future trends in the telecommunications equipment industry market and it includes a brief overview of Ericsson's and Nokia's background. The theoretical section covers previous research conducted in the field and explains the background of methods used in the study. The second chapter compares company's financial statements and explains the results by using information from annual reports. In the third chapter, industry specific efficiency is compiled with solving static ranking problems and dynamic ranking problems. The results will be analysed and recommendations for improvements given.

The author believes that the thesis is useful and meaningful for management in the telecommunication equipment industry, creditors, investors and other stakeholders.

Hereby, the author would like to thank his supervisor, Paavo Siimann, for his valuable advice and feedback during writing the thesis.

1. OVERVIEW OF TELECOMMUNICATION INDUSTRY AND COMPANIES' BACKGROUND

1.1. Industry overview

The term telecommunication equipment covers hardware used in communication systems, such as wireless packet cores, smartphones, mobile radio access network (RAN) equipment, routers, switches, optical networking devices, etc. The fast expansion of the smartphone industry and the spread of smartphones are expected to increase the market size of telecommunication equipment. Telecom service providers are increasing their investments into data hardware like cell towers, satellite communication, broadband spectrum, etc. All of these factors have increased the revenue of telecommunication equipment. The development of the telecom sector has had a significant influence on other industry sectors, including consumer electronics, banking, media, retail, defence, etc. Geographically, the most important markets are North America, Europe and Asia-Pacific. (Verified Market Research 2021).

Generally, there are two types of connection: wired and wireless. The first one mainly uses fibre optics technology. The second one usually relies on using RAN solutions. In parallel with RAN technology development, the importance of wireless communication is increasing. In 2015, 84 % of internet users used mobile internet, but in 2021 this number had increased to 93 % (Statista 2021). This change has been influenced by increased mobile network coverage and more importantly an increase in mobile network capacity. Estimates show that mobile internet capacity will increase from 65 exabytes in 2021 to 288 exabytes per month by 2026. The main enabler of this growth has been the rollout of 5G RAN (Ericsson 2021b).

Currently, the majority of mobile subscriptions are using 4th generation RAN, which is also called Long-Term Evolution (LTE). This technology is effective in serving smartphones. For example, network latency and capacity are enough for voice communication, browsing the internet and streaming videos on mobile devices. It is have hoped that the roll-out of 5G will make it possible to introduce completely new services that will foster business innovation and

economic growth. 5G will significantly increase network capacity. On the one hand, it will increase overall data transmission speed but on the other hand it will make it possible for the network to simultaneously serve much more devices compared to previous generation technology. It will also make it possible to introduce more widely different Internet of things (IoT) solutions, in turn allowing for the development of more new use-case, such as smart-city, industry 4.0 solutions, augmented reality, etc. Certain analysts believe that telecom operators might see additional revenue of up to 700 billion dollars (USD) in the next ten years (Ericsson 2021b). Some even estimate that 5G technology will become as world changing as the printing press, steam engine, electricity, the internet, etc. (Campell et al. 2017).

In 2020, the global telecom equipment market size was 481.75 billion USD. This is expected to reach 743.8 billion USD by 2027, with a compound annual growth rate (CAGR) of 6.4 %. (Research and Markets 2021) The global 5G networking hardware market share was estimated to grow to 2.3 billion USD by the end of 2021 which constitutes 42.5 % of growth compared to the previous year. It is estimated that market share will reach 189.5 billion USD by 2031. This increase is dependent on the commercialisation of 5G technology and an increase in the number of devices requiring very fast wireless connection. 5G networking equipment currently has quite a low market size compared to the overall telecommunication equipment market share. This is somewhat misleading, as market size growth for next 10 years is expected to be significant (Persistence Market Research 2021).

5G has become a transformational technology that will significantly change how people and machines communicate with each other. This technology will prove to be one of the important cornerstones for future digital society. Currently, the roll-out of 5G networks globally is in a very early phase. On the one hand, it provides significant business opportunities to companies that are developing and producing 5G technology devices. On the other hand, the development of future digital society is strongly related to the success of these companies.

1.2. Overview of analysed companies

The core business of both Ericsson and Nokia is to provide hardware, software and services to mobile communication service providers; in parallel, they are constantly looking for new revenue streams. It is difficult to say which type of companies they are. First, they are typical electronics

manufacturers because they produce communication hardware. Second, they seem to be information and communication technology (ICT) companies as they develop and sell software. Third, they can be called high-tech companies because they place important emphasis on R&D activities in their strategies. Additionally, they have been two of the main contributors to 5G RAN technology development by obtaining thousands of 5G related patents. It is worth mentioning that both companies have previously been successful mobile phone producers. Today, they have exited that business area, which clearly shows their ability to be flexible and adapt to the changing business environment. According to sales revenue and employee count, the size of these companies is similar (Table 1). (Ericsson 2021a; Nokia 2021).

Table 1. Key statistics for Ericsson and Nokia 2018–2020

Indicator, in million euros	**Ericsson**			**Nokia**		
	2020	**2019**	**2018**	**2020**	**2019**	**2018**
Sales revenue	23,160	21,750	20,560	21,852	23,315	22,563
Operating profit/(loss)	2,771	1,011	121	885	485	(59)
Net profit/(loss)	1,756	176	(612)	(2,516)	11	(335)
R&D expenses	3,958	3,715	3,794	4,087	4,532	4,777
Total assets (end of year)	27,060	26,456	26,208	36,191	39,128	39,517
Employee count (end of year)	95,359	99,417	100,824	92,039	98,322	103,083

Source: Drawn up by the author based on appendices 1─4; the employee count is from the annual reports of Ericsson and Nokia.

Ericsson is a Swedish company that was founded on 1876 in Stockholm, Sweden, by Lars Magnus Ericsson. Its headquarters remains in Stockholm today. Throughout its history, the company has always produced various communications equipment. Today, Ericsson's activities are divided between four business areas (BA): BA Networks which provides RAN hardware and software, BA Managed Services which provides network management services to telecommunication operators, BA Digital Services which provides software-based business support solutions for different companies and BA Emerging Business and Other which looks for emerging business options. The company operates in more than 180 countries. (Ericsson 2021a)

In 2015, Ericsson's sales revenue was approximately 247 billion Swedish Krona (SEK) and its operating profit was approximately 22 billion SEK. In 2016, its financial performance started to decrease in all business segments, which was primarily due to its very wide product and service mix not being competitive enough. One possible cause was that R&D expenses had been in decline for several years. At the beginning of 2017, the chief executive officer (CEO) and the

majority of the executive team was changed. 2017 was a year of change and restructuring in the company. Investments into R&D were increased, and the focus was set to support the core business: RAN equipment development and production. During the restructuring, the company discarded many legacy products and services. As a result, a large number of investments were written off, which resulted in a big loss for the company. In 2017, the operating loss of the company reached approximately 35 billion SEK. In 2018, Ericsson managed to start earning profit again, which increased to 17 billion SEK by 2020.

In 2013, Ericsson started to voluntarily cooperate in an investigation led by the US Securities and Exchange Commission. In 2015, the company also participated in a second investigation led by the US Department of Justice. The aim of the investigations was to ensure that Ericsson's operations were in line with the US Foreign Corrupt Practices Act. (Ericsson 2017) As a result of the investigation, in 2019 Ericsson agreed to pay a penalty of over 1 billion USD due to previous corrupt actions (US Department of Justice 2019). This incident had a significant impact on Ericsson's financial results.

In the 2018–2020 period Ericsson acquired eight companies. The most important were acquisitions of Kathrein (2019) and Cradlepoint (2020). Kathrein is a German antenna and radio filter technology company which has a strong R&D organisation. This acquisition has broadened Ericsson's RAN equipment portfolio. Cradlepoint is a US company that focuses on Wireless Edge wide area network (WAN) 4G and 5G Enterprise solutions. This acquisition adds additional products and services to Ericsson's existing 5G enterprise portfolio. (Ericsson 2021)

Nokia also has very long history. Nokia was established in 1865 as a wood pulp producing company near Nokianvirta River, Finland, by Fredrik Idestam. It has been constantly developing and changing its core business areas during its history as the business environment changes. In its long history, Nokia has been active in wood pulp, forestry, rubber, cable, power generation, electronics and communication technology. Today, Nokia's business areas are networks, software, technologies and others. Nokia networks provides hardware and software for telecommunication service providers. Nokia software provides software solutions for managing networks and for other networking equipment producers. Nokia Technologies is responsible for managing Nokia's intellectual property, including patents, technologies and the brand itself. The headquarters of Nokia is in Espoo, Finland and it operates in more than 130 countries. (Nokia 2021)

At the beginning of 2016, Nokia acquired French American telecommunication equipment company Alcatel-Lucent. This was a significant change for Nokia. The purchase significantly increased its market share in North America and Asia. Sales revenue and number of employees almost doubled. The financial results were affected for several years after the acquisition. The amount of intangible assets increased about 20 times from 560 million euros to 10 960 million euros. Amortisation of intangible assets in the coming years was one driver for increased R&D expenditure. (Nokia 2017)

In the past decade, both companies have significantly changed. They have both increased their core business by purchasing other companies. The companies have also suffered huge losses from closing product and service segments. Several years ago, both companies decided to put significant effort into 5G technology development. It has been successful direction for them because they are globally two of the largest 5G telecommunication equipment providers.

1.3. Theoretical background and overview of previous studies

Financial analysis is the process of evaluating finance-related transactions with the aim of understanding the performance of the company. Usually, analysis is done to gauge a firm's solvency, liquidity, profitability, efficiency, sustainability, etc. Financial analysis can be divided into two categories: internal and external analysis. Internal analysis uses public and non-public financial information. Usually, it is accessible only for limited persons, such as a company's top management. External analysis is done by using only publicly available information, including financial statements, that is published regularly. Analysing financial statements helps a company's external stakeholders (investors, creditors, partners, etc.) to investigate a company's performance. (Fridson et al. 3–8)

Comparative financial statement analysis is used to compare competitive enterprises with the aim of identifying a company's strengths and weaknesses. The first step in comparative financial analysis is to make sure that the companies in scope have a similar business model and accounting principles. (Poongavanam 2017)

Vertical analysis is a simple but very powerful financial statement analysis method. It is helpful in bringing out relations in financial statements. Vertical analysis expresses all items in the balance sheet as a percentage of a base. Usually, the base is the amount of total assets. This method provides a better view of the balance sheet structure and removes the confusion that can emerge when companies with a different balance sheet size are compared. (Wahlen et al. 2014, 42)

Financial ratio analysis is another traditional method of studying the financial performance of a company. Ratios can be used for the analysis of profitability, activity, liquidity, long-term solvency, etc. The main advantage of financial ratios is that they can be used for comparing the relation of different financial recording to the different size of firms. The main disadvantage of ratios is that they ignore differences between industries, the effect of varying capital structures and accounting methods. (White et al. 1998, 141) Additionally, the geographic location must be considered while using financial ratios. For example, Chinese manufacturing companies have lower liquidity and lower inventory turnover, but they have higher account receivable turnover compared to Japanese manufacturing firms. The roots of these differences come from differences between the economy models of Japan and China. The study investigated the financial statements of 150 manufacturing firms in 2006. (Liu et al. 2013) Meric et al. (2008) compared the financial results of US and Japanese electronics manufacturers in 2001 to 2005. They used the multivariate analysis of variance (MANOVA), which revealed that Japanese companies had a significantly higher inventory turnover and liquidity risk. US companies had higher asset turnover. The profitability ratios of firms from both countries were similar. Another study analysed four Indonesian telecommunication companies in 2014–2018 by using financial ratio analysis. They found that there was not one company which outperformed all other analysed companies according to all financial ratio sets. These findings indicate that respective industry competitiveness in Indonesia is tough, and innovation is crucial because it creates new product and services which can significantly change the market situation for competitive companies. (Daryanto et al. 2020)

Usually, businesses are established to generate maximum wealth for the owners. This is mainly done by producing goods or providing services for customers. The success of the firm is directly related to efficiency, which shows how well the company manages to use as less input to produce and sell as much output as possible. To increase efficiency, management needs to improve the company's business processes. Before that, it is important to measure efficiency and understand

what affects it. There are many different financial ratios that can be used to measuring efficiency, such as return on assets (ROA), which measures how well a company uses assets; return on equity (ROE), which measures how efficiently a firm generates profit; inventory turnover, which shows the efficiency of a company's inventory management, etc. It needs to be considered that there is no one ratio that can be used to measure overall efficiency. (White et al. 1998, 182–183)

While using financial ratios, it needs to be considered that there are three interrelationships among financial ratios (White et al. 1998, 182–183):

- Economic relationship – Components of financial statement are connected to each other. For example, higher revenue increases investments into working capital components, for example inventories, receivables, etc.
- Overlap of components – The components of different ratios overlap because they share the same numerator or denominator. A change in one financial component influences many ratios to the same extent. For example, if revenue changes, this influences all turnovers that use revenue as one component.
- Ratios as composites of other ratios – Some ratios are related to each other over categories. A good example is ROA, which combines profitability and turnover ratio. A change in the right side will have an impact on the left side (see Equation 1).

$$\frac{\text{Profit}}{\text{Assets}} = \frac{\text{Profit}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Assets}} \tag{1}$$

The decomposition of financial ratio into component elements helps to gain a better insight into the factors affecting a company's performance. In the current example, ROA is a product of net profit margin and asset turnover (see Equation 1) (White, et al. 1998, 182–183). The same approach can also be used for other financial ratios. In the current thesis, the author uses the return on capital employed (ROCE) ratio to analyse how efficiently companies are using capital that is under their control to generate operating profit. ROCE is decomposed into three ratios to gain a better picture of what impacts ROCE the most (see Equation 2). (Vernimmen et al. 2014, 216–217)

$$\text{ROCE} = \frac{\text{Operating profit}}{\text{Capital employed}} = \frac{\text{Operating profit}}{\text{Sales revenue}} \times \frac{\text{Sales revenue}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Capital employed}} \tag{2}$$

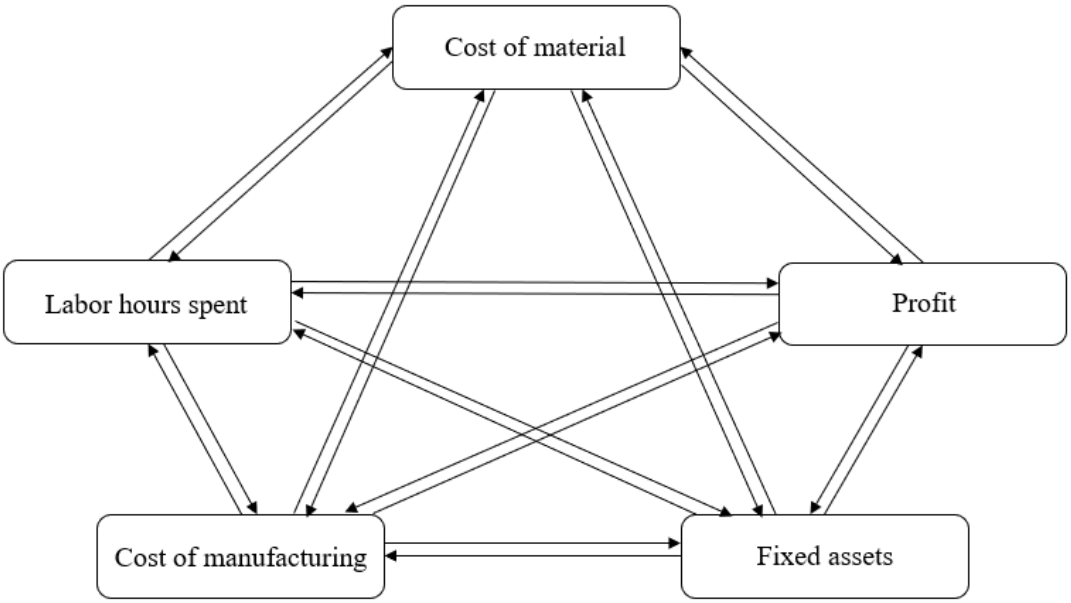
The author of the thesis considers that an important indicator in analysing companies producing high-tech equipment should be R&D expenditure and the amount of intangible assets. R&D involves all creative activities that need to be performed to create new products and technologies. Both companies in this study state that their strategic goal is to be technology leaders in their market segment, and specific attention is paid to 5G technology development (Ericsson 2021a; Nokia 2021). It is vital for a technological leader to use R&D resources efficiently to maintain the sustainable growth of the company. It is challenging to directly measure R&D efficiency. In a high-technology industry, the outcome of successful R&D is mainly stored in intangible assets; as a result, in more advanced and technology intense industries, intangible assets have higher importance. One study used ratio analysis on the financial statements of 17 Chinese listed telecommunication companies in 2014–2016. They found that during the period the amount of investment into intangible assets increased, which had a positive effect on ROA. (Zhang 2017) Cortez et al. (2015) investigated 12 electronics producers from America, Japan, Korea and Taiwan in 2002–2012 to study the relationship between R&D, innovation and financial performance. They used panel data regression and found that R&D and intangible assets have a positive effect on a company's financial performance. Another work investigated R&D efficiency in 49 global leading companies. They used DEA/Malmquist index analysis and found that the R&D efficiency of these globally leading companies slightly declined during the period 2007–2013. (Jang et al. 2016)

Besides R&D efficiency, working capital management efficiency is the next area of importance in influencing a firm's overall performance. A study using correlation and regression analysis investigated the relationship between working capital management efficiency and profitability in 349 listed USA telecommunication equipment companies in 2001–2007. This study found that if working capital management efficiency increases, then company's profit margin also increases. Overall, it can be said that the investigated companies had rather poor working capital management efficiency. (Ganesan 2007)

To analyse a company's overall efficiency, many financial ratios must be observed simultaneously. Mereste (1987, 238–246) proposed that one possibility is to use efficiency matrix analysis. This involves quantitative indicators and qualitative indicators. Qualitative indicators are ratios that are calculated by dividing quantitative figures with each other. The detailed level of analysis is related to the number of chosen quantitative indicators. The minimum number is two quantitative indicators, which gives a 2x2 matrix, which in turn gives n^2-n qualitative

indicators (two in the current case). This efficiency matrix will not describe overall efficiency in sufficient detail. Mereste used 5x5 matrix, which involved the following quantitative measures: cost of materials, fixed assets, labour hours spent, cost of manufacturing and profit. These five quantitative indicators were used to form 20 qualitative indicators. These indicators together form an efficiency field (see Figure 1). There is a possibility to increase the number of qualitative indicators and change them to better fit the goal of the analysis. It needs to be kept in mind that quantitative indicators must be related to a company's main business activities.

Figure 1. Efficiency field. Quantitative indicators are in the boxes and qualitative indicators are represented with arrows.



Source: Mereste (1987, 239)

According to Vensel (1985), the next important aspect that needs to be considered is in which order to use quantitative indicators. It is proposed to arrange quantitative figures by finality level while at the same time considering the company's business activity. One option is to use the following arrangement:

Capital → Resources → Expenses → Income → Profit → Cash flow

This arrangement describes a company's business activities in sequential order, where the company first raises capital to be used for investing in resources. Expenses are made to convert

resources into revenue, which in turn will generate profit and finally lead to cash flow. Example of quantitative elements that are arranged in sequential order is the following: average capital, average number of employees, average assets, operating expenses, sales revenue, earnings before interest and tax expense (EBIT), net operating cash flow, free cash flow. Qualitative indicators whose increase positively influences overall efficiency are positioned under the main diagonal (Table 2). (Siimann 2018, 81)

Table 2 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 $\frac{R}{F}$ Op. cash flow to Free cash flow	13 $\frac{P}{F}$ EBIT to Free cash flow	14 $\frac{S}{F}$ Sales to Free cash flow	15 $\frac{O}{F}$ Op. expenses to Free cash flow	16 $\frac{A}{F}$ Assets to Free cash flow	17 $\frac{E}{F}$ No of employees to Free cash flow	18 $\frac{C}{F}$ Capital to Free cash flow
Net operating cash flow (R)	21 $\frac{F}{R}$ CM **Free cash flow to Op. cash flow**	22 1	23 $\frac{P}{R}$ EBIT to Op. cash flow	24 $\frac{S}{R}$ Sales to Op. cash flow	25 $\frac{O}{R}$ Op. expenses to Op. cash flow	26 $\frac{A}{R}$ Assets to Op. cash flow	27 $\frac{E}{R}$ No of employees to Op. cash flow	28 $\frac{C}{R}$ Capital to Op. cash flow
EBIT (P)	31 $\frac{F}{P}$ Free cash flow to EBIT	32 $\frac{R}{P}$ PCM **Op. cash flow to EBIT**	33 1	34 $\frac{S}{P}$ Sales to EBIT	35 $\frac{O}{P}$ Op. expenses to EBIT	36 $\frac{A}{P}$ Assets to EBIT	37 $\frac{E}{P}$ No of employees to EBIT	38 $\frac{C}{P}$ Capital to EBIT
Sales (S)	41 $\frac{F}{S}$ Free cash flow to Sales	42 $\frac{R}{S}$ ICM Op. cash flow to Sales	43 $\frac{P}{S}$ IPM **EBIT to Sales**	44 1	45 $\frac{O}{S}$ Op. expenses to Sales	46 $\frac{A}{S}$ Assets to Sales	47 $\frac{E}{S}$ No of employees to Sales	48 $\frac{C}{S}$ Capital to Sales
Operating expenses (O)	51 $\frac{F}{O}$ Free cash flow to Op. expenses	52 $\frac{R}{O}$ ECM Op. cash flow to Op. expenses	53 $\frac{P}{O}$ EPM EBIT to Op. expenses	54 $\frac{S}{O}$ EIM **Sales to Op. expenses**	55 1	56 $\frac{A}{O}$ Assets to Op. expenses	57 $\frac{E}{O}$ No of employees to Op. expenses	58 $\frac{C}{O}$ Capital to Op. expenses
Average Assets (A)	61 $\frac{F}{A}$ Free cash flow to Assets	62 $\frac{R}{A}$ RCM Op. cash flow to Assets	63 $\frac{P}{A}$ RPM EBIT to Assets	64 $\frac{S}{A}$ RIM Sales to Assets	65 $\frac{O}{A}$ REM **Op. expenses to Assets**	66 1	67 $\frac{E}{A}$ No of employees to Assets	68 $\frac{C}{A}$ Capital to Assets
Average number of employees (E)	71 $\frac{F}{E}$ Free cash flow to No of employees	72 $\frac{R}{E}$ Op. cash flow to No of employees	73 $\frac{P}{E}$ EBIT to No of employees	74 $\frac{S}{E}$ Sales to No of employees	75 $\frac{O}{E}$ Op. expenses to No of employees	76 $\frac{A}{E}$ RM **Assets to No of employees**	77 1	78 $\frac{C}{E}$ Capital to No of employees
Average Capital (C)	81 $\frac{F}{C}$ Free cash flow to Capital	82 $\frac{R}{C}$ KCM Op. cash flow to Capital	83 $\frac{P}{C}$ KPM EBIT to Capital	84 $\frac{S}{C}$ KIM Sales to Capital	85 $\frac{O}{C}$ KEM Op. expenses to Capital	86 $\frac{A}{C}$ Assets to Capital	87 $\frac{E}{C}$ KRM **No of employees Capital**	88 1

Source: (Siimann 2018, 82)

An efficiency matrix gives a well-formatted overview of the overall efficiency of a company, but it does not give a single figure that can be used for benchmarking or ranking problem solving. For example, when comparing two companies the first might show higher results in some matrix fields while the other company might show better performance according to other matrix fields. In this situation, it is very difficult to deem which company's overall performance is higher. Therefore, two tasks must be solved: dynamic ranking problem and static ranking problem. (Mereste 1987, 248–249)

Static ranking problem solving allows for comparing a company's overall economic efficiency with the industry leader, the average of the reference group or with another specific company. This is a great tool for the benchmarking and ranking of companies. For problem solving, the

benchmark index of a company's overall efficiency (BICOE) is calculated using the following steps (Siimann 2018, 97–99):

1. Set-up overall efficiency matrixes for companies under investigation during same time.
2. Divide the efficiency matrix elements with respective reference efficiency matrix elements.
3. BICOE is calculated using the following equation:

$$BICOE = \sqrt[\frac{n^2-n}{2}]{\Pi c_{ij}^{A/0}} \quad (3)$$

Where: n – number of quantitative indicators,

$c_{ij}^{A/0}$ – all efficiency field elements of comparative matrix.

The aim of dynamic ranking problem solving is to analyse the change in qualitative measures in a specific period. It helps to understand how a company's economic efficiency changes compared to the reference period. This method helps to understand trends in a company's efficiency. For dynamic ranking problem solving, the growth index of company's overall efficiency (GICOE) is calculated using the following steps (Siimann 2018, 100–101):

1. Set-up efficiency matrix for the analysed period and reference period.
2. Divide all efficiency matrix elements with respective reference efficiency matrix elements.
3. GICOE is calculated using the following equation:

$$GICOE = \sqrt[\frac{n^2-n}{2}]{\Pi c_{ij}^{A/0}} \quad (4)$$

Where: n – number of quantitative indicators,

$c_{ij}^{A/0}$ – all efficiency field elements of comparative matrix.

According to previous research, there are several different methods that can be used to analyse a company's performance. The author of the thesis considers that using a single method does not give a sufficiently precise overview. When using all previously described analysis methods in

parallel, it is possible to acquire an adequately detailed picture to understand what the firm's strengths and weaknesses are. The results will be valuable for company's internal and external stakeholders in decision making.

2. COMPARATIVE FINANCIAL STATEMENT ANALYSIS

The following chapter gives an overview of Ericsson's and Nokia's accounting principles and balance sheets structure. The selected financial ratios are used to analyse solvency, liquidity and asset usage efficiency. The background to the results will be explained.

2.1. Comparison of companies accounting principles

One assumption for comparative financial statement analysis is that all analysed companies use similar accounting principles. This sub-chapter analyses the differences of the accounting principles of companies and gives an overview of important accounting principles. The aim is to make sure that Ericsson and Nokia are using similar accounting principles in their financial statements.

In order to make the financial statements comparable, adjustments were made in the balance sheet and income statement. These adjustments are also covered in this sub-chapter.

Nokia reports its financial results in euros because the parent company is in Finland. Ericsson uses SEK as the accounting currency because the parent company is located in Sweden. Ericsson's financial statements are converted to euros by using the currency exchange rate value of the last day of the corresponding year. The currency exchange rates are taken from the European Central Bank Statistical Data Warehouse.

The financial statements of Ericsson and Nokia were prepared in accordance with International Financial Reporting Standards (IFRS), which is issued by International Accounting Standards Board (IASB).

Both companies' financial statements were audited. According to the auditors' opinions, both companies' financial statements give a true and fair view of the companies' financial position and performance. The financial statements were prepared in accordance with IFRS. Ericsson's

financial statements were audited by Deloitte AB and Deloitte OY audited Nokia's financial statements.

In 2018–2020, the accounting principles did not change, though IFRS 16 took effect on 1 January 2019. This standard regulates how companies must present leases in their financial statements. Shortly if a lease contract is longer than 12 months then at lease contract inception lessee records right-to-use asset on balance sheet asset section and reports lease liability on balance sheet liability section. Due to this change in 2019, the following lines emerged on Ericsson's and Nokia's balance sheets: right-of-use assets; lease-liabilities, non-current; and lease-liabilities, current.

The composition of the studied companies' income statements and balance sheets is similar, though with minor differences. The differences are mainly related to expressions the companies use in naming their financial statement recordings. To make companies' financial statements comparable, several adjustments were made; these are described in Appendices 1–2.

Companies report property, plant and equipment (PPE) at cost less accumulated depreciation and impairment losses. Depreciation is calculated on a straight-line basis over the expected useful lives of asset. Ericsson uses the following useful lives: real estate 25–50 years, machinery and equipment 3–10 years. For Nokia, useful lives are the following: buildings and constructions 20–33 years, light buildings and constructions 3–20 years, production machinery, measuring and test equipment 1–5 years, other machinery and equipment 3–10 years.

The companies measure inventories at the lower of cost and net realisable value. Cost is determined by the approximate actual cost on a first-in first-out (FIFO) basis. Net realisable value is the price that the inventory component can be sold at in a normal business situation.

Both companies have similar principles for intangible assets recording. Intangible assets acquired separately are measured on initial cost. Assets acquired in a business combination are recorded with fair value at acquisition date. Internal development costs are only capitalised if a company has a technical feasibility to complete the asset and can generate economic benefit with this. Useful life of an intangible asset except goodwill is finite. Nokia states that useful life of an intangible asset is usually 3–10 years. Ericsson states that useful life of intangible assets may not

be longer than 10 years. Both companies use the straight-line amortisation method for intangible assets.

Ericsson shows post-employment benefits as net value, but Nokia has divided it into assets and obligations. To make balance sheets more comparable, Nokia's post-employment benefits are converted to net value on its balance sheet. If net value is positive, it is part of other non-current assets; otherwise, it is part of non-current provisions.

Nokia includes interests paid and interests received to net operating cash flow while Ericsson incorporates these cash flows into financing activities cash flows. To make net operating cash flows comparable, the author has deducted interests paid and interests received from Nokia's net operating cash flows and added them to cash flows from financing activities.

The accounting principles and composition of both companies' financial statements are similar. As a result, it is possible to perform comparative balance sheet structure analysis to ensure that the companies' financial statements are comparable.

2.2. Comparison of balance sheet structure

2.2.1. Comparison of assets structure

In 2018, Ericsson's balance sheet contained 15.7 billion euros of current assets, which consisted of 59.9 % of total assets (see Appendices 3–4). In the next two years, the amount of current assets decreased by 0.8 billion euros to 14.9 billion, which is 55.2 % of total assets. The change in Nokia's current assets showed different dynamics. In 2018, Nokia's balance sheet contained 18.3 billion euros of current assets, which was 51.8 % of total assets. In 2019, the amount of current assets decreased by 1.5 billion euros to 16.8 billion, which was 48.3 % of total assets. In 2020, current asset's share on the balance sheet increased by 1.4 billion euros to 18.2 billion euros, forming 56.7 % of total assets.

The relative amount of Ericsson's intangible assets increased by 2 percentage points from 14 % to 16 % during the analysed period (from 3.7 billion euros to 4.3 billion euros) (see Figure 2). This was mainly caused by an increase of goodwill, which in turn was the result of different acquisitions. Ericsson's goodwill increased from 2.9 billion euros to 3.5 billion euros during the

studied period. The most important acquisitions were German antenna producer Kathrein (2019) and WAN technology provider Cradlepoint (2020). Nokia's intangible assets make a larger amount of assets than Ericsson's. The amount of Nokia's goodwill decreased from 5.4 billion euros to 5.1 billion euros. During the analysed period, Nokia's intangible assets share in balance sheet decreased from 25 % to 22 % (from 8.8 billion euros to 7.0 billion euros). This large amount of intangible assets was the result of Nokia's acquisition of Alcatel-Lucent in 2016 which significantly increased the amount of Nokia's intangible assets. At the end of 2015, the amount of Nokia's intangible assets was 560 million euros but for the end of 2016 the amount of intangible assets increased nearly 20 times to 11.0 billion euros due to the acquisition. The decrease in Nokia's intangible assets during the analysed period was mainly due to the speed of the amortisation of intangible assets being higher than investments made into new intangible assets. Nokia's R&D expenses decreased by 14 % from 4.8 billion euros to 4.1 billion euros during the studied period. Both companies' intangible assets contain a significant amount of goodwill.

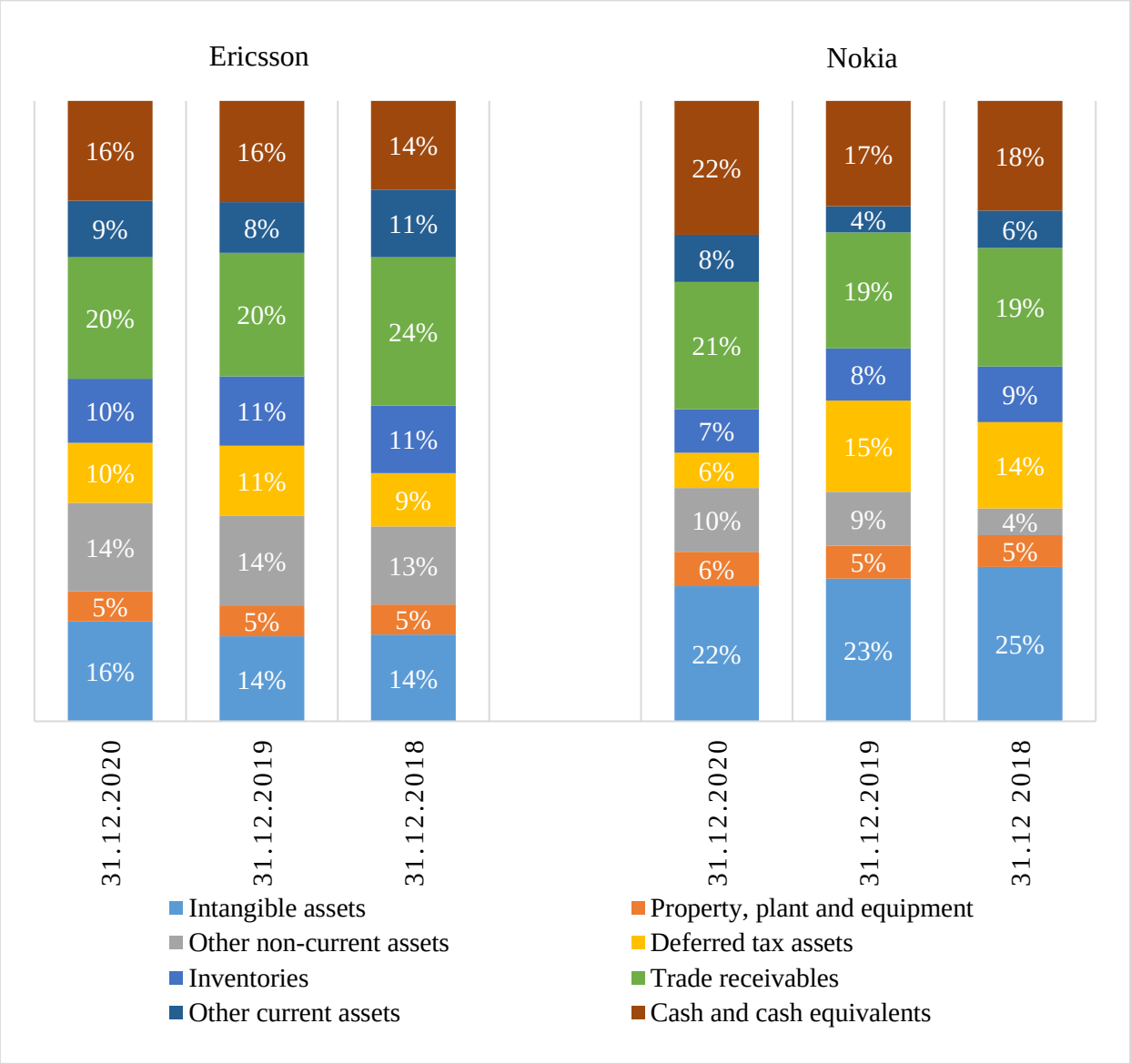


Figure 2. Ericsson's and Nokia's asset structure.
Source: Compiled by author according to Appendix 7

The amount of PPE stayed stable for both companies during the analysed period. For Ericsson, it remained at 1.3 billion euros and Nokia's PPE was between 1.8 billion euros and 1.9 billion euros. For both companies, it formed about 5 % of total assets. On the one hand, this is unusual for manufacturing companies. On the other hand, such a small amount of PPE can be explained by the large amount of intangible assets. In the technology sector, value is created more by non-physical assets (patents, licences, software, business combinations, etc.) rather than with physical machinery.

Ericsson's other non-current assets increased from 13 % in 2018 to 14 % in 2019 (from 3.3 billion euros to 3.8 billion euros). In 2020, the amount of non-current assets remained stable. This dynamic mainly related to IFRS 16 taking effect in 2019. Due to this, companies had to report their right-to-use assets on the balance sheet. In 2018, Ericsson's right-to-use assets were not reported on its balance sheet but in 2019 they were 812 million euros. Nokia's non-current assets increased from 4 % in 2018 to 9 % in 2019 and reached 10 % in 2020. Similarly to Ericsson, the main reason for this dynamic was the addition of right-to-use assets on the balance sheet in 2019, which increased non-current assets by 912 million euros. The second reason was the increase in net pension benefit assets.

Ericsson's deferred income tax asset increased from 9 % (2.3 billion euros) in 2018 to 11 % (3.0 billion euros) in 2019. In 2020, deferred income tax asset dropped to 10 % (2.6 billion euros). For Nokia, it decreased significantly from 15 % in 2019 to 6 % in 2020 (from 5.1 billion euros to 1.8 billion euros). The derecognition of deferred tax asset was related to the company's low profitability in Finland. The company has stated that it does not expect to earn profit in Finland in the near future; as a result, the company does not expect sufficiently high probability to realise this deferred income tax asset in the near future. There is a small chance of using this tax asset in the long term because the majority of unrecognised deferred tax assets are not subject to expiry. The decrease in deferred income tax asset had an increasing impact on the relative amount of the company's total current assets in 2020.

The amount of inventories remained relatively unchanged for Ericsson, decreasing from 11 % to 10 % (from 2.9 billion euros to 2.8 billion euros). Nokia's inventories decreased more rapidly from 9 % to 7 % (from 3.2 billion euros to 2.2 billion euros). The significant drop in inventories is the result of a successful working capital usage efficiency increase programme, which was announced in 2019 to strengthen the cash flow. For both companies, the inventory component "contract work in progress" has decreased. Nokia has decreased the amount of both finished goods and raw materials. Ericsson's amount of finished goods remained stable but the amount of raw materials increased by 16 % in 2020. The increase in raw materials in 2020 can be explained by the uncertainties in the supply chain reliability for key components due to Covid-19 related restrictions.

Ericsson's trade receivables dropped from 24 % in 2018 to 20 % in 2019 (from 6.3 billion euros to 5.3 billion euros). In 2020, trade receivables remained stable at 20 %. There is no solid

explanation for the trade receivables drop in 2019 in Ericsson's financial statement. Nokia's trade receivables relative amount increased from 19 % to 21 %, but in absolute figures trade receivables dropped from 6.7 billion euros to 6.6 billion euros during the analysed period. The explanation for this dynamic is that the amount of total assets decreased faster than the amount of trade receivables. The fact that the relative amount of trade receivables has increased indicates that the cash position strengthening programme has been relatively ineffective in releasing cash through a reduction in trade receivables.

Cash and cash equivalents comprise a significant portion of both companies' assets. Ericsson's cash and cash equivalents share in the balance sheet grew from 14 % to 16 % (from 3.7 billion euros to 4.3 billion euros) during the studied period. In 2019, Ericsson had to pay a 1 billion USD penalty, which did not have a visible effect on the balance sheet structure. This shows that Ericsson had strong cash flow during the studied period. Nokia's cash and cash equivalent amount increased from 18 % to 22 % (from 6.3 billion euros to 6.9 billion euros). During that period, Nokia stated that its aim was to improve its cash position, which led to different actions. For example, the dividend payment decreased from 1.1 billion euros per year in 2018 to 148 million euros per year in 2020. On the one hand, such a large amount of cash in total assets negatively affects investment profitability because cash itself does not generate sales. On the other hand, having a strong cash position gives a company flexibility to react fast to the changing business environment and invest into new emerging technology or business opportunities, which can be considered to be a strength of Nokia.

According to balance structure analysis, Nokia's total asset amount was 35 % (in 2018) and 19 % (in 2020) larger than Ericsson's. The amount of Nokia's total assets was 35.3 billion euros in 2018 and this decreased by 10 % to 32.1 billion euros in 2020. Ericsson's total assets amount was smaller than Nokia's but remained relatively stable during the analysed period, growing by 3.3 % from 26.2 billion euros in 2018 to 27.1 billion euros in 2020.

Ericsson's and Nokia's asset's structure was similar. The three biggest asset categories for both companies were intangible assets, trade receivables, and cash and cash equivalents. For both companies, PPE forms a relatively small amount of assets, being between 5 % and 6 %. According to asset structure, the companies' balance sheets are comparable.

2.2.2. Comparison of equity and liabilities structure

Ericsson's and Nokia's amount of total liabilities have moved in different directions. Ericsson's total liabilities increased by 5.4 % from 17.6 billion euros in 2018 to 18.6 billion euros in 2020, while Nokia's total liabilities decreased by 2.0 % from 20 billion euros in 2018 to 19.6 billion euros in 2020 (see Appendices 3–4). For both companies, total liabilities were larger than total equity.

Ericsson provisions, non-current increased from 13 % to 15 % (from 3.3 billion euros to 4.0 billion euros) during the studied period (see Figure 3). Post-employment benefit obligations were the largest part of Ericsson's provisions. This liability grew from 2.8 billion euros to 3.7 billion euros during the studied period. The fair value of Ericsson's pension plan assets is calculated by discount rate, which is related to the interest rate of Swedish government bonds. During the studied period, the interest rate of Swedish government bond dropped from 0.772 % on 1 January 2018 to 0.032 % on 28 December 2020 (World Government Bonds, 2022), which negatively affected pension plan assets. In 2018, the net value of Nokia's post-employment obligation were 103 million euros and in the subsequent years, the net value of post-employment assets was positive and did not affect liabilities.

Total borrowings (long-term and short-term) were stable and showed slight contraction for Ericsson, decreasing from 13 % to 11 % (from 3.2 billion euros to 3.0 billion euros) of total equity and liabilities. Nokia's relative amount of total borrowings increased from 11 % to 18 % (from 3.8 billion euros to 5.6 billion euros) during the studied period. At the same time, there were no significant acquisitions or increase in PPE that would have required financing with loans. In the same period, dividend payments significantly decreased. The increase of borrowings might be one option to strengthen the cash position that was declared in 2019. It is unknown why Nokia increased the cash position that intensively.

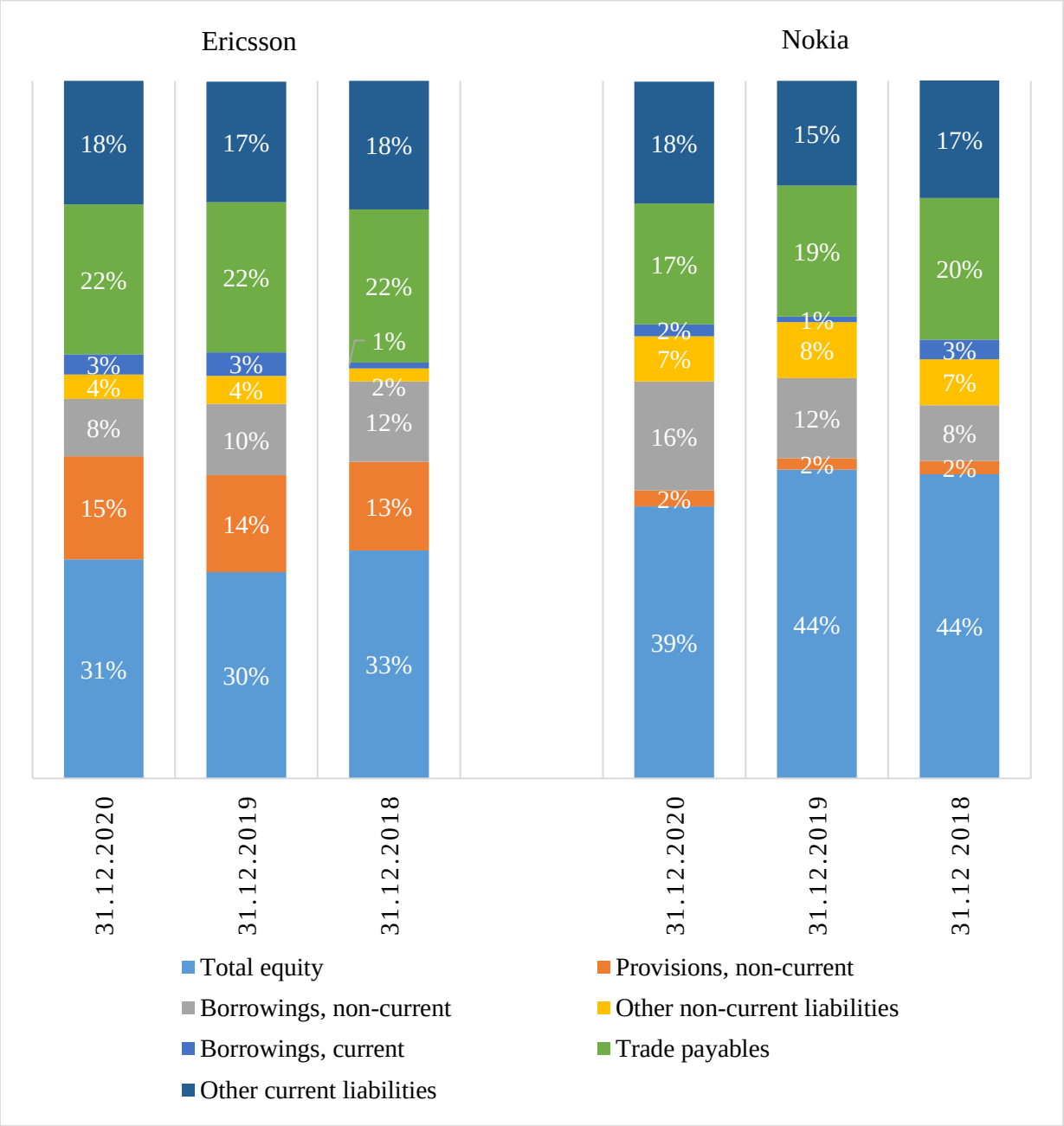


Figure 3. Structure of Ericsson's and Nokia's total equity and liabilities.
Source: Compiled by author according to Appendix 7

Trade payables is a large component in both companies' balance sheet, which is usual for manufacturing companies. Ericsson's trade payables remained stable at 22 % (5.8 billion euros) during the whole studied period. For Nokia, trade payables dropped by three percentage points from 20 % to 17 % (from 7.2 billion euros to 5.6 billion euros). The background to this dynamic is unclear because that change increased cash outflow from the company and did not support Nokia's working capital usage efficiency improvement and cash position strengthening goals.

Other current liabilities comprised 17 % to 18 % stably (4.8 billion euros) of Ericsson's total equity and liabilities during the studied period. The most important parts of current liabilities for Ericsson were employee related accrued expenses, supplier related accrued expenses and other expenses. For Nokia, other current assets dropped in 2019 from 17 % to 15 % (from 6.0 billion euros to 5.2 billion euros) and increased back to 17 % (5.6 billion euros) in 2020. Similarly to Ericsson, the main contributors to Nokia's other current liabilities are employee related accrued expenses.

Ericsson's amount of equity decreased from 33 % to 31 %. Despite the profit earned in 2019 and 2020, Ericsson's equity decreased from 8.6 billion euros to 8.5 billion euros. First, Ericsson's equity was reduced by 1.3 billion during the studied period due to re-measurements related to post-employment benefit obligations, which was caused due to decreased discount rates connected to Swedish government bonds interest rates. Ericsson decreased the increase in post-employment benefit liability by covering it with 1.3 billion euros from retained earnings. Second, equity decreased by 1.1 billion euros due to the dividend playout from 2018 to 2020. Third, the 1 billion USD penalty in 2019 negatively affected the amount of equity. Nokia's equity remained stable at 44 % in 2018 and 2019 but decreased to 39 % in 2020. This was mainly due to a 2.5 billion euros loss earned during the same year. This big loss was mainly caused due to a decrease in deferred income tax assets by 2.9 billion euros. Ericsson's equity share is smaller than Nokia's, which means that Ericsson's financial leverage is larger; this provides better conditions for a higher return on equity.

There were some differences in the equity and liabilities structures for companies studied. For both companies, the largest total equity and liabilities contributors were equity, trade payables and other current liabilities. The main difference between Ericsson's and Nokia's balance sheet structure was net post-employment benefit obligation. For Ericsson, it is significant part of total liabilities, but for Nokia it has almost no effect on the balance sheet. According to the structure of equity and liabilities, the companies' balance sheets are comparable.

2.3. Analysis of financial ratios

2.3.1. Analysis of operating efficiency

Operating efficiency ratios are also called activity ratios. With these ratios, it can be measured how efficiently a company manages different activities and how efficiently a company uses its various assets. The most widely used are inventory, receivables, payables, working capital, fixed asset and assets turnover. (Robinson et al. 2015, 314–315) The author considers that the intangible assets turnover calculation could be useful in this analysis because it helps to shed more light on how these companies are utilising their acquired and developed intellectual property and technology. Both companies are bringing up the importance of their people and stating that people are the one main enabler of their business. Due to that, it is reasonable to measure labour usage efficiency. To this ends, operating profit per employee and sales revenue per employee ratios were used. The calculation of the ratio is shown in Appendix 8.

Ericsson's inventory turnover decreased by 6.1 % during the studied period from 5.11 to 4.80 times (see Table 3). This means that the amount of inventories increased more rapidly than sales revenue. In 2018, the amount of raw materials nearly doubled, while other inventories components remained unchanged. Ericsson's raw material supply chain management has been becoming more conservative in order to secure the fulfilling of customer needs without delays. Being more conservative with inventory management could be the result of Covid-19 effects on the supply chain reliability of raw materials. Receivables turnover increased by 32.8 % from 3.29 to 4.37 times. During the same period, the company's payable turnover decreased by 4.4 % from 2.48 to 2.37 times. These changes were mainly due to Ericsson's goal to increase and strengthen its cash flow. The previously described changes increased working capital turnover by 65 % from 3.96 to 6.54 times. The second reason why working capital turnover increased is that the amount of cash remained relatively stable during the studied period. Intangible assets turnover increased by 7.2 % in 2019 from 5.56 to 5.96 times and was mainly affected by the increased sales revenue. The turnover of intangible assets in the following year dropped by 2.3 % to 5.82 times due to the fact that intangible assets increased faster than sales revenue. The increase in intangible assets is mainly related to the acquisition of Cradlepoint. Assets turnover steadily grew by 11.5 % from 0.78 to 0.87 times, which was mainly related to an increase in sales revenue, while the increase in total assets was relatively slow during that period. These figures show that Ericsson started to use its assets more efficiently to generate sales revenue.

For Ericsson, labour usage efficiency improved during the analysed period. Operating profit per employee grew more than 21 times from 1.24 thousand euros per employee to 27.68 thousand euros per employee. This growth is mainly related to strong improvement in operating profit during the analysed period. Sales revenue per employee improved by 10.3 % from 209.69 thousand euros per employee to 231.32 thousand euros per employee. It can be seen that Ericsson is able to successfully react to significant changes in the environment. This can be proved by the labour usage efficiency increase in 2020 though 90 % of Ericsson's workforce had to work remotely due to Covid-19 restrictions.

Table 3. Ericsson and Nokia, changes in activity ratios

	Ericsson			Nokia		
Operating activity ratio	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**
Inventory turnover	4.80	4.69	5.11	8.44	7.64	7.76
Receivables turnover	4.37	3.76	3.29	3.34	3.52	3.32
Payable turnover	2.37	2.40	2.48	2.14	2.16	2.65
Working capital turnover	6.54	5.15	3.96	3.90	5.23	4.00
Intangible asset turnover	5.82	5.96	5.56	2.92	2.78	2.50
Set turnover	0.87	0.83	0.78	0.65	0.67	0.62
Operating profit/(loss) per employee, thousand euros	27.68	10.38	1.24	9.85	5.05	(0.46)
Sales revenue per employee, thousand euros	231.32	223.33	209.69	237.42	237.13	218.88

Source: Source: Appendix 9. Compiled by author

Nokia's inventory turnover increased 8.8 % during the studied period from 7.76 to 8.44 times. Receivables turnover slightly increased by 0.6 % from 3.32 to 3.34 times and payables turnover decreased by 19.2 % from 2.65 times to 2.14 times. Nevertheless, the change in these three ratios working capital remained relatively stable, decreasing by 2.5 % from 4.00 to 3.90 times. The decrease of working capital turnover was the result of an increase of cash due to the implementation of a cash generation strengthening programme in 2019. On the one hand, a stronger cash position affects working capital turnover negatively, but on the other hand the flexibility that a large cash position provides is essential in allowing a technology company to react fast to changes in the market and taking maximum profit from emerging business options. Intangible assets turnover increased by 16.8 % from 2.50 to 2.92 times due to the decrease of intangible assets. This dynamic was mainly caused by a decrease in the amount of intangible

assets obtained during Alcatel-Lumen in 2016. Assets turnover improved by 4.8 % from 0.62 to 0.65 times. Assets turnover was positively affected by a decrease of total assets which in turn was mainly affected by a decrease in intangible assets and deferred income tax assets.

Nokia's operating profit/loss per employee increased from -0.46 thousand euros to 9.85 thousand euros during the studied period. This change was positively influenced by the increase in operating profit and decrease in the amount of workforce. In 2019, net sales per employee increased by 8.3 % from 218.88 thousand euros to 237.13 thousand euros. During 2020, sales per employee remained stable. This could have been the result of closed factories due to Covid-19 restrictions.

Activity ratio analysis reveals that Ericsson uses its assets more efficiently than its competitor Nokia. One exception is inventory usage in which Nokia outperforms Ericsson. Both companies have increased their labour usage. Operating profit per employee has increased for both companies mainly due to the increase in operating profit. Nokia uses its workforce more efficiently to generate sales revenue, but Ericsson is more efficient in generating more operating profit per employee. Ericsson was able to increase sales revenue per employee during the Covid-19 restriction period while Nokia's sales revenue per employee remained stable.

2.3.2. Analysis of short-term liquidity and long-term solvency of the companies

Short-term liquidity analysis measures a company's ability to meet its short-term obligations and how fast a company can convert its assets into cash (Robinson, Henry, Pirie, & Broihahn, 2015) pp 320. At the same time, it needs to be kept in mind that too large an amount of current assets negatively influences a company's profitability. The most widely used short-term liquidity ratios are quick ratio and current ratio. Long-term solvency analysis measures a company's ability to fulfil its long-term obligations. Debt-to-assets ratio measures the percentage of total assets covered by debt. Interest coverage ratio measures how many times a company's operating profit exceeds interest costs. It shows how well a company is able to serve its debt. The financial leverage ratio measures the amount of total assets covered by equity. (Robinson, Henry, Pirie, & Broihahn, 2015) pp 327

Ericsson's and Nokia's liquidity ratios changed in different directions during the studied period (see Table 4). Ericsson's current ratio dropped by 9.7 % from 1.45 to 1.31 times and quick ratio decreased by 10.9 % from 1.19 to 1.06 times. The reason behind this dynamic was the decrease

in trade receivables in 2019 from 6.3 billion euros to 5.3 billion euros, while at the same time the amount of cash increased only by 0.6 billion euros from 3.7 billion euros to 4.3 billion euros. In the same year, total current liabilities increased due to an increase of current borrowings. Nevertheless, decreasing liquidity ratios means Ericsson had a strong liquidity position.

Table 4. Ericsson and Nokia, liquidity ratios

	Ericsson			Nokia		
Liquidity ratio	**2020**	**2019**	**2018**	**2020**	**2019**	**2018**
Current ratio	1.31	1.32	1.45	1.55	1.39	1.30
Quick ratio	1.06	1.05	1.19	1.36	1.15	1.07

Source: Appendix 9. Compiled by author

In 2018, Nokia's liquidity ratios were lower than Ericsson's but by 2020 these ratios had grown higher. Nokia's current ratio increased by 19.2 % from 1.30 to 1.55 times and quick ratio increased by 27.1 % from 1.07 to 1.36 times. The first contributor to this dynamic is the decrease in trade payables, which decreased by 22.2 % from 7.2 billion euros to 5.6 billion euros. The second contributor is the increase by 9.5 % in the cash position from 6.3 billion euros to 6.9 billion euros. The decrease of trade payables had a positive effect on liquidity ratios, but at the same time it reduced the amount of cash contrary to Nokia's cash position strengthening programme. There is no good explanation in financial statements to explain why the trade payables decreased. The reason why the cash position increased in addition to cash position strengthening program is due to the significant drop in Nokia's dividend payment, which fell by 86.3 % from 1,048 million euros to 148 million euros during the studied period. The current ratio of 1.55 times and quick ratio of 1.36 times can be considered high results. On the one hand, it is positive and shows the strong liquidity of the company, but on the other hand it might impact negatively on overall ROA.

Ericsson's debt-to-assets ratios were relatively stable during the studied period, decreasing by 8.3 % from 0.12 to 0.11 times aside from a temporary rise in 2019 to 0.14 times (see Table 5). The increase was caused by a slight increase in debt, which probably was caused by the need for an increasing cash amount to cover cash outflow due to the 1 billion USD penalty at the end of 2019. During the studied period, Ericsson's interest coverage increased by 19 times from 0.87 times to 17.45 times, which was caused by a significant increase in operating profit, while interest expenditure remained relatively stable. The relative increase was very high because operating

profit in 2018 was low (121 million euros) compared to 2020 (1,756 million euros). Ericsson's financial leverage increased by 15.1 % from 2.85 times to 3.28 times. This dynamic was caused due to a decrease in average equity in 2019 compared to 2018. The main reason for the drop in equity was that Ericsson had significant losses in 2017 and 2018, which negatively affected the amount of total equity. These losses were caused due to restructuring and strategic changes in Ericsson which began at the beginning of 2017. In 2017, Ericsson's net loss was 3.3 billion euros and in 2018 its net loss was 0.6 billion euros.

Table 5. Ericsson and Nokia, solvency ratios

Solvency ratio	Ericsson			Nokia		
	2020	**2019**	**2018**	**2020**	**2019**	**2018**
Debt-to-assets ratio	0.11	0.14	0.12	0.17	0.12	0.11
Interest coverage	17.45	5.44	0.87	3.86	1.66	-0.18
Financial leverage ratio	3.28	3.21	2.85	2.39	2.28	2.29

Source: Appendix 9. Compiled by author

In 2019, Nokia's debt-to-assets ratio value increased by 9.1 % from 0.11 to 0.12 times but in 2020 this value increased 41.7 % from 0.12 to 0.17 times. This significant increase was related to the implementation of its cash position strengthening programme. While borrowings increased, total assets decreased at the same time. The main reasons for total assets decrease were impairment of deferred income tax asset and the decrease in intangible assets. Nokia's interest coverage increased from -0.18 to 3.86 times due to the increase in operating profit, which increased from -47 million euros to 907 million euros during the studied period. The financial leverage ratio increased by 4.4 % from 2.29 to 2.39 times, which was caused by an almost equal reduction in total assets and total equity due to the impairment of deferred income tax assets in 2020.

Nokia's debt-to-assets and financial leverage ratios slightly increased in 2019 but the increase accelerated in 2020. This was mainly caused by an increase of debt, while at the same time the amount of assets decreased. The main reason for the asset decrease was the impairment of income tax assets. This event did not have an effect on cash flows and could not be seen as the reason for increasing debt. It is unknown why Nokia increased its cash position. The increase in Nokia's interest coverage was caused by the increase in operating profit.

Both companies have a high liquidity and solvency level. On the one hand, it can be considered as strength and mainly so for creditors because there is a lower risk of liquidity problems and suffering from financial stress. On the other hand, from the owners' perspective, a strong liquidity level can also be considered a weakness because high amount of cash and cash equivalents reduces the profitability of investments. In the current case, the author considers a high solvency and liquidity level to be a strength because both Ericsson and Nokia have a wider impact on the development of digital society. A strong cash position gives a company the enhanced ability to adapt to the rapidly changing technology industry market. Both companies have good prospects for widening their business by acquisitions, which can be financed by their own assets or with the aid of external financing.

2.4. Analysis of return on capital employed

Return on capital employed (ROCE) is a financial ratio that is used to measure how efficiently a company uses its capital to generate operating profit. Generally, it is calculated by dividing operating profit with average capital. ROCE can be decomposed into operating profit margin, assets turnover and assets to capital ratio to analyse which financial ratio change has had the most significant impact on the change in ROCE.

Ericsson's ROCE increased from 1.0 % in 2018 to 24.2 % in 2020 (see Table 6). The main contributor was the increase in operating profit margin which impacted ROCE by 6.7 % and 13.7 % in 2019 and 2020, respectively. The relative impact was 86.1 % and 88.7 %, respectively. The increase in operating margin is mainly related to the growth of BA Networks operating profit. This is the result of the successful introduction of 5G RAN hardware and software to the telecommunication equipment market. Other business segments had a minor effect on the operating margin change.

The increase in asset turnover had a minor positive effect on ROCE. Assets turnover increased ROCE by 0.4 % in 2019 and 1.1 % in 2020 with a relative impact of 5.6 % and 6.9 %, respectively. The increase in assets turnover was mainly related to the rapid increase in sales revenue and slower increase in total assets. One contributing factor that held back the increase in total assets was the dividend pay-out which increased by 79 % from 334 million euros per year in 2018 to 598 million euros per year in 2020.

The increase in assets to capital positively impacted ROCE by 0.6 % in 2019 and 0.7 % in 2020. The relative impact was 8.3 % and 4.4 %, respectively. In 2019, the amount of total assets remained stable and the change in assets to capital came about from a decrease in equity, which was related to a decrease in post-employment obligations net value. This was caused by a reduction of discount rates, which were calculated using the Swedish government bond interest rate. In 2019, the Swedish government bonds interest rate decreased. In 2020, the amount of assets to capital increased but the relative impact to ROCE was almost two times lower. The increase in assets to capital was caused by a minor decrease in total debt and a minor increase in assets.

Table 6. Ericsson and Nokia, ROCE decomposition

					Absolute impact		**Relative impact**	
	Ratio	**2020**	**2019**	**2018**	**2020/2019**	**2019/2018**	**2020/2019**	**2019/2018**
Ericsson	**ROCE**	**24.2%**	**8.7%**	**1.0%**	**15.5%**	**7.7%**	**100.0%**	**100.0%**
	Operating profit margin	0.12	0.05	0.01	13.7%	6.7%	88.7%	86.1%
	Assets turnover	0.87	0.83	0.78	1.1%	0.4%	6.9%	5.6%
	Assets to total capital	2.33	2.23	2.10	0.7%	0.6%	4.4%	8.3%
Nokia	**ROCE**	**4.8%**	**2.6%**	**-0.2%**	**2.2%**	**2.8%**	**100.0%**	**100.0%**
	Operating profit margin	0.04	0.02	0.00	2.4%	2.7%	108.0%	96.4%
	Assets turnover	0.58	0.59	0.56	-0.1%	0.1%	-4.7%	5.1%
	Assets to total capital	1.99	2.02	2.06	-0.1%	-0.0%	-3.3%	-1.5%

Source: Appendices 10 and 11, compiled by author

Nokia's ROCE increased from -0.2 % to 4.8 %. Similarly to Ericsson, the main driver for ROCE growth was operating margin which increased ROCE by 2.7 % in 2019 and 2.4 % in 2020 with a relative impact of 96.4 % and 108.0 %, respectively. Operating margin increased due to an increase in sales revenue and a decrease in operating expenses. Operating profit could have been even higher if Nokia could have avoided a decrease in gross profit margin. The main reason for the gross profit margin decrease was the introduction of 5G radio technology, which had high costs at the beginning of production. Nokia's operating profit is divided between all business segments (excluding Group Common and others which generates loss), which means that Nokia has been less efficient in using 5G RAN equipment market opportunities. In 2020, though there

was a decrease in sales revenue, Nokia nevertheless managed to increase its operating margin due to successfully implementing a cost reduction programme.

Similarly to Ericsson, the assets turnover of Nokia had a relatively small impact on ROCE. In 2019, the relative impact was 5.1 % and in 2020 was -4.7 %. Assets turnover improved due to increased sales revenue and a slight decrease in average assets. The fact that IFRS 16 took effect forced companies to record their right-to-use assets on the balance sheet. The main driver of the decrease was the high amortisation of intangible assets and the reduction of other-current assets. In 2020, total average assets turnover had a minor negative effect on ROCE. The reduction of total average assets turnover was caused by a reduction in both sales revenue and the amount of average assets. Sales revenue contracted in all business segments. This was mainly caused by the temporary closure of production facilities due to the impact of COVID-19. The reduction of total average assets came mainly from the amortisation of intangible assets and the impairment of tax assets.

Assets to equity ratio also had a minor negative impact on ROCE. In 2019, the relative impact negative was -1.5 % and in 2020 it was -3.3 %. These changes were caused by the increase in total debt and decrease of equity. Nokia increased its amount of total debt to improve its cash position. The decrease in equity in 2019 was related to ta dividend pay-out (570 million euros) while there was almost no net profit (11 million euros) in that period. In 2020, total average equity decreased due to a net loss (2.5 billion euros), which was caused by the impairment of deferred tax asset in amount of 2.9 billion euros.

Conclusively, in 2018, Ericsson had a slightly better ROCE than its competitor Nokia. During the studied period, the ROCE of both companies improved but the pace was different. In 2020, Ericsson’s ROCE was about five time higher than that of Nokia’s. For both companies, the key contributor for the increase of ROCE was the growth in operating margin. Changes in assets turnover and assets to total capital also had a minor effect.

3. OVERALL EFFICIENCY ANALYSIS

Financial ratio analysis is a good method for analysing the financial results of companies, but it gives just a narrow insight into overall performance. If the aim is to analyse a company more extensively, then other methods must be used. In the current thesis, the efficiency matrix analysis method with benchmark and growth indices calculations were used to study the overall efficiency.

3.1. Compiling efficiency matrix

The first step in efficiency matrix compilation is to choose quantitative indicators that will describe the core activities of companies the best. This is followed by arranging quantitative indicators in a meaningful order in line with the finality level principle. While choosing quantitative indicators for the efficiency matrix, it needs to be kept in mind that there are several limitations. First, there must be an even number of quantitative indicators in the efficiency matrix. Second, all quantitative indicators must have a positive value.

The author uses six quantitative indicators to compile the efficiency matrix containing 15 qualitative elements. In the current efficiency matrix, quantitative indicators are used in the finality order, which is the following:

Average assets → Average number of employees → R&D expenses → Sales revenue → Gross profit → Operating cash flow

Assets and employees are used to generating expenses, which are the basis for sales revenue. Sales revenue generates gross profit which in turn is the source for operating cash flow. R&D expense has been brought out as a separate quantitative indicator because both companies have stated that technology development is an important part in their activities. The generic form of the efficiency matrix is shown in Table 7.

Table 7. Generic form of efficiency matrix for analysed companies

Quantitative indicator	Cash flow from operating activities (O)	Gross profit (G)	Sales revenue (S)	R&D expenses (R)	Average number of employees (E)	Average assets (A)
Cash flow from operating activities (O)	1					
Gross profit (G)	O/G	1				
Sales revenue (S)	O/S	G/S	1			
R&D expenses (R)	O/R	G/R	S/R	1		
Average number of employees (E)	O/E	G/E	S/E	R/E	1	
Average assets (A)	O/A	G/A	S/A	R/A	E/A	1

Source: compiled by author

Average assets are added to the efficiency matrix to analyse how efficiently companies have used all the assets that were under their control in order to generate operating cash flow.

Both companies emphasise the importance of their employees who are the main enabler for their business. Unfortunately, financial statements do not demonstrate clearly enough how efficiently workforce is used. Adding the average number of employees as a quantitative indicator to the efficiency matrix helps to shed more light on how workforce usage efficiency has changed during the studied period. Additionally, it will be interesting to see how Covid-19 restrictions have influenced labour usage efficiency. It should be kept in mind that both companies have stated that the majority of their employees worked remotely in 2020.

Technology is the next very important enabler for Nokia and Ericsson. Therefore, efficient R&D activities are important for their business success. R&D efficiency measurement is a difficult task because the delay between R&D expense and its effect on revenue might amount to several years. As Ericsson's and Nokia's R&D expenses were relatively stable in 2016–2020, the author

considers it appropriate to analyse R&D expenses together with other quantitative indicators from the same year.

Sales revenue is included in the efficiency matrix because it is the result of a company's activities. This is the one of the most important figures as it shows how much value a company provides to its customers.

Gross profit is a useful measure for manufacturing companies. It shows how much value a company creates directly from the manufacturing process. Using gross profit as a quantitative element helps to give an overview of how efficiently both companies have set up their manufacturing processes.

Net operating cash flow was selected for the efficiency matrix. On the one hand, net cash flow could be better choice because it shows how much cash company generates from all activities (operating, investing and financing). Net cash flow from operating activities shows how much cash a company generates from core activities, and it helps to give a better overview of how efficient a company is in its main activities.

Conclusively, during efficiency analysis, an efficiency matrix with 6 quantitative and 15 qualitative elements was compiled. The efficiency matrix was used to study how efficiently Ericsson and Nokia have used their assets to generate operating cash flow.

3.2. Efficiency matrix analysis

For Ericsson, all six quantitative indicators increased during the analysed period (CAGR was above one) (see Appendix 14). Net operating cash flow increased the most (CAGR was 1.78), while the average number of employees and average assets remained almost unchanged (CAGR was 1.01). Nokia showed a different dynamic, in which only one quantitative indicator increased during the analysed period (see Appendix 15). The CAGR of net operating cash flow was 1.98 and all other quantitative indicators slightly decreased. Nokia's R&D expenses showed the highest contraction during the analysed period (CAGR was 0.92).

The overall efficiency matrix shows that during the studied period all of Ericsson's 15 qualitative indicators increased (CAGR was above one) (see Table 8). This indicates that Ericsson's overall efficiency increase is broad-based and involves wide areas of the company. For Nokia, 13 out of the 15 qualitative indicators increased during the studied period (see Table 9). Despite the fact that two of Nokia's qualitative indicators slightly decreased during the studied period, it can be seen that Nokia's efficiency growth, similar to that of Ericsson's, was wide based and involved many different areas in the company.

Table 8. Ericsson overall efficiency matrix

		O	G	S	R	E	A
O		1					
G	2020	0.31	1				
	2019	0.20					
	2018	0.14					
	2020/2019	1.55					
	2019/2018	1.45					
	CAGR (2020/2018)	1.50					
S	2020	0.12	0.40	1			
	2019	0.07	0.37				
	2018	0.04	0.32				
	2020/2019	1.68	1.08				
	2019/2018	1.68	1.15				
	CAGR (2020/2018)	1.68	1.12				
R	2020	0.73	2.36	5.85	1		
	2019	0.43	2.19	5.85			
	2018	0.24	1.75	5.42			
	2020/2019	1.68	1.08	**1.00**			
	2019/2018	1.81	1.25	1.08			
	CAGR (2020/2018)	1.74	1.16	1.04			
E	2020	0.03	0.09	0.23	0.04	1	
	2019	0.02	0.08	0.22	0.04		
	2018	0.01	0.07	0.21	0.04		
	2020/2019	1.74	1.12	1.04	1.04		
	2019/2018	1.78	1.23	1.07	**0.99**		
	CAGR (2020/2018)	1.76	1.17	1.05	1.01		
A	2020	0.11	0.35	0.87	0.15	3.74	1
	2019	0.06	0.31	0.83	0.14	3.70	
	2018	0.03	0.25	0.78	0.14	3.73	
	2020/2019	1.76	1.13	1.05	1.05	1.01	
	2019/2018	1.77	1.22	1.06	**0.98**	**0.99**	
	CAGR (2020/2018)	1.76	1.17	1.05	1.01	1.00	

Source: Compiled by author

In the financial ratios of both companies, which denote net operating cash flow, generating efficiency has increased the most. The relative growth of net operating cash flow for both companies was significant during the analysed period (CAGR for Ericsson was 1.78 and CAGR for Nokia was 1.98). One explanation for this dynamic is the fact that net operating cash flow was relatively low for both companies at the beginning of the studied period. The current situation is a good example for demonstrating that, when using financial ratios for analysis, the results might be deceptive where the comparison base is low.

Ericsson has begun to use its assets more efficiently in order to generate cash flow from operating activities. In 2018, Ericsson generated 0.03 euros of net operating cash flow from one euro worth of assets. In 2020, the same value reached 0.11 euros (CAGR 1.76). In 2018, Nokia managed to generate 0.01 euros operating cash flow from one euro of average assets, but in 2020 this figure increased to 0.05 euros (CAGR 2.05). According to these results, Ericsson uses its assets more than two times more efficiently to generate operating cash flow than Nokia, though at the same time Nokia's efficiency has grown faster than its competitor.

Gross profit to sales revenue (gross margin) is an important metric for manufacturing companies. Generally, it shows how efficiently the production process is managed. For Ericsson, the gross profit margin increased from 0.32 to 0.40 (CAGR 1.12). During the analysed period, Ericsson increased gross profit by 0.08 euros from one euro of sales revenue. The increase was mainly due to the 5G RAN equipment portfolio becoming more mature. Manufacturing processes became more efficient. Nokia's gross profit margins remained relatively unchanged (CAGR 1.01) at 0.37. Its gross profit margin improvement was held back due to ongoing restructuring activities because these expenses increased by 37 % from 287 million euros in 2019 to 393 million euros in 2020.

Table 9. Nokia's overall efficiency matrix

		O	G	S	R	E	A
O		1					
G	2020	0.21	1				
	2019	0.04					
	2018	0.05					
	2020/2019	5.32					
	2019/2018	**0.74**					
	CAGR (2020/2018)	1.99					
S	2020	0.08	0.37	1			
	2019	0.01	0.35				
	2018	0.02	0.37				
	2020/2019	5.63	1.06				
	2019/2018	**0.72**	**0.96**				
	CAGR (2020/2018)	2.01	1.01				
R	2020	0.43	2.00	5.35	1		
	2019	0.07	1.82	5.14			
	2018	0.09	1.74	4.72			
	2020/2019	5.85	1.10	1.04			
	2019/2018	**0.78**	1.05	1.09			
	CAGR (2020/2018)	2.14	1.07	1.06			
E	2020	0.02	0.09	0.23	0.04	1	
	2019	0.00	0.08	0.23	0.05		
	2018	0.00	0.08	0.22	0.05		
	2020/2019	5.58	1.05	**0.99**	**0.95**		
	2019/2018	**0.75**	1.01	1.05	**0.96**		
	CAGR (2020/2018)	2.05	1.03	1.02	**0.96**		
A	2020	0.05	0.24	0.65	0.12	2.84	1
	2019	0.01	0.24	0.67	0.13	2.87	
	2018	0.01	0.23	0.62	0.13	2.83	
	2020/2019	5.52	1.04	**0.98**	**0.94**	**0.99**	
	2019/2018	**0.76**	1.03	1.07	**0.98**	1.02	
	CAGR (2020/2018)	2.05	1.03	1.02	**0.96**	1.00	

Source: Compiled by author

During the studied period, all of Ericsson's 15 overall efficiency matrix elements increased. For Nokia, 13 out of 15 overall efficiency matrix elements increased during the analysed period. The decrease in two elements was minor. For both companies, the qualitative elements related to net operating cash flow increased the most. The significant rise was mainly related to a significant increase in net operating cash flow and the fact that the comparison base was low. The results of the analysis showed that both companies have improved in using their assets more efficiently to generate net operating cash flow.

3.3. Solving dynamic and static ranking problem

Solving the dynamic ranking problem helps to understand how the overall efficiency of the companies has changed compared to the reference period. The task can be solved by calculating GICOE (see equation 4), using the efficiency matrix qualitative indicators as input.

Ericsson's overall efficiency has shown stable growth (see Table 10). The main driver for efficiency growth was the significant relative increase in net operating cash flow. In 2019, Ericsson had to pay a penalty of 1 billion USD, which significantly reduced Ericsson's operating cash flow. Despite this, Ericsson still managed to increase overall efficiency by 27 %. If they had managed to avoid that penalty, annual growth would have reached approximately 49 %. This, in effect, means that Ericsson's overall efficiency had increased significantly in 2019. In 2020, the overall efficiency rose by 23 %. This increase is deceptive because during the reference year (2019), operating cash was strongly reduced due to the penalty payment (one-time event). Without the penalty in 2019, overall efficiency growth in 2020 would have reached only 5 %. During the studied period, the CAGR of overall efficiency was 25 % and this number is not directly affected by the penalty.

Table 10. Growth index in overall efficiency

	GICOE	
Year	**Ericsson**	**Nokia**
2020/2019	123 %	179 %
2019/2018	127 %	92 %
2020/2018	125 %	128 %

Source: compiled by author

Nokia's overall efficiency decreased by 8 % during 2019. It is an interesting dynamic because in the same period the company managed to improve operating profit from -59 million euros in 2018 to 485 million euros in 2019. However, during the same period, the company was not able to convert this operating profit into operating cash flow due to decreased non-interest-bearing liabilities and increased net income tax paid. Nokia's overall efficiency rose by 79 % in 2020. In 2020, Nokia's net operating cash flow increased from 334 million euros (2019) to 1,761 million euros, with the main contributor being an increase in overall efficiency. Such a strong cash flow in 2020 was caused by different reasons. First, operating profit increased from 485 million in 2019 to 885 million euros in 2020. Second, net income tax paid dropped from 516 million euros

in 2019 to 280 million euros in 2020. Third, non-interest-bearing liabilities decreased less than in the previous year. Fourth, in 2019 Nokia announced that it put more effort in strengthening cash flow and its cash position. It seems that this programme bore positive results in 2020. During the studied period, Nokia's overall efficiency increased by 28 % per year and this slightly exceeds Ericsson, the overall efficiency of which increased by 25 %.

Solving the static ranking problem gives an insight in how the overall efficiency of companies has changed compared to the benchmark company. In the current study, Ericsson was chosen as the benchmark company because it has shown stable growth on overall efficiency. A comparative matrix is compiled by dividing all of Nokia's overall efficiency matrix elements with Ericsson's overall efficiency matrix elements. The static ranking problem was solved by calculating BICOE (see equation 3).

The comparative efficiency matrix for Nokia and Ericsson showed that in 2018 11 out of Nokia's 15 overall efficiency matrix elements were lower than its competitor, Ericsson (see Table 11). Three elements in which Nokia was more efficient than Ericsson related to the number of employees. It is worth mentioning that in 2018 Nokia's R&D expenses per one employee, sales revenue per one employee and gross profit per one employee were higher than that of Ericsson's. Across the entire studied period, Nokia's R&D expense per one employee was higher than that of Ericsson, but it needs to be kept in mind that this ratio steadily decreased during the analysed period due to the constant contraction of Nokia's R&D expenses.

Table 11. Nokia and Ericsson comparative efficiency matrix

		O	G	S	R	E	A
O		1					
G	2020	0.70	1				
	2019	0.20					
	2018	0.40					
S	2020	0.65	0.93	1			
	2019	0.19	0.95				
	2018	0.45	**1.14**				
R	2020	0.59	0.85	0.91	1		
	2019	0.17	0.83	0.88			
	2018	0.39	0.99	0.87			
E	2020	0.64	0.92	0.99	**1.09**	1	
	2019	0.20	0.98	**1.04**	**1.18**		
	2018	0.47	**1.20**	**1.05**	**1.21**		
A	2020	0.49	0.70	0.75	0.83	0.76	1
	2019	0.16	0.76	0.81	0.92	0.78	
	2018	0.36	0.91	0.80	0.92	0.76	

Source: Compiled by author

During the studied period, Ericsson operated significantly more efficiently than its competitor, Nokia (see Table 12). Nokia's overall efficiency was between 73 % and 89 % during the studied period. The main difference in overall efficiency was due to significant differences in operating cash flow related ratios. For example, in 2019, Nokia had only 40 % efficiency in using its assets to generate operating cash flow compared to its competitor, Ericsson. This number could have been even lower if Ericsson had managed to avoid paying a 1 billion USD penalty. This indicates that in 2019 Ericsson had a very successful year, while Nokia's performance did not show signs of improvement.

In 2018, Nokia's BICOE was 73 % compared to that of its competitor. In 2019, Ericsson's overall efficiency improved more rapidly than Nokia's, leading to a position where Nokia's BICOE had dropped to 53 %. This was mainly due to the fact that Ericsson's overall efficiency improved significantly during 2019 while Nokia's overall efficiency slightly dropped. In 2020, Nokia managed to reduce the overall efficiency gap between it and Ericsson to 77 %. This was mainly due to the significant increase in Nokia's operating profit and net operating cash flow, which was a result of restructuring activities that were started in 2018 and 2019.

Table 12. Benchmark index of overall efficiency

Year	BICOE	
	Ericsson	**Nokia**
2020	100 %	77 %
2019	100 %	53 %
2018	100 %	73 %

Source: Compiled by author

Conclusively, Ericsson had constant efficiency growth during the studied period. Nokia's overall efficiency slightly decreased during 2019 but overall efficiency increased significantly in 2020. In comparing these two companies, Ericsson's overall efficiency was higher than Nokia's during the studied period, but Ericsson's overall efficiency growth was slightly lower than Nokia's. Ericsson outperformed Nokia in almost all qualitative measures. The only area in which Nokia had higher efficiency was R&D costs per employee. According to the analysis results, the overall efficiency of both companies grew strongly during the analysed period.

3.4. Conclusion of strengths and weaknesses

This sub-chapter provides an overview of the analysed companies strengths and weaknesses. A summary is presented in Table 13.

Table 13. Summary of Ericsson's and Nokia's strengths and weaknesses

	Ericsson	Nokia
Strengths	• Strong cash position • Borrowings are decreasing • Higher ROCE • Higher overall efficiency • High liquidity level • Overall efficiency is increasing • 15 out of 15 qualitative efficiency indicators increased	• Strong cash position • Post-employment benefit net value is positive • Higher inventory turnover • High liquidity level • Overall efficiency is increasing • 13 out of 15 qualitative efficiency indicators increased
Weaknesses	• Post-employment benefit net value is negative • Lower inventory turnover • Profit is mainly generated by one business segment	• Borrowings are increasing • Lower ROCE • Lower overall efficiency • The amount of cash is increased in parallel with debt

Source: Compiled by author

Both companies have sizable amounts of cash and cash equivalents in their balance sheets. For Ericsson, it is 14 %–16 % of assets and for Nokia it reached 22 % in 2020. The large amount of cash can be considered both a weakness and strength. For shareholders, it constitutes a weakness because cash itself does not generate value; accordingly, it negatively impacts investment profitability. For creditors, it is strength. The large amount of cash and cash equivalents increases a company's liquidity and reduces the risk of financial stress during difficult periods. Also, it increases a company's ability to flexibly react to a changing business environment, which can be considered as strength. In the current thesis, the author considers the high amount of cash as a strength because the success of the analysed companies has a broader effect on society.

In terms of liabilities, Ericsson has quite a large post-employment benefit obligation, which Nokia does not have. Ericsson's post-employment benefit obligation value is directly impacted by the interest rate of Swedish Government bonds. The decrease in the interest rate had a significant impact on Ericsson's liabilities. Having a post-employment benefit obligation in liabilities is a weakness for Ericsson, and likewise the absence of it is a strength for Nokia. In 2019 and 2020, Ericsson had to use its equity to reduce the post-employment benefit obligation. The financing policy of the analysed companies is very different. During the analysed period, Ericsson steadily decreased debt but Nokia chose the opposite direction, by doubling the relative amount of debt on its balance sheet. This is a weakness for Nokia because the amount of cash and cash equivalents also increased in parallel with borrowings. This negatively affects the company's ROCE. Nevertheless, the short-term liquidity and long-term solvency of both companies are at a very high level.

The analysis of assets usage efficiency reveals that Nokia's inventory usage intensity is significantly higher than that of its competitor. On the one hand, this is a strength for Nokia but on the other hand having low inventories increases the risks of a sales decrease should there be a disruption in the supply chain. In the current situation, the author considers low inventory to be a strength for Nokia because it demonstrates that they were able to maintain a supply chain of raw materials without significant impacts during the COVID-19 pandemic period in 2020. Other activity measures show that Ericsson uses its assets more intensively than Nokia.

For both companies, ROCE has increased. High ROCE is one of the most important positives for Ericsson, reaching 24.2 % in 2020. Ericsson's ROCE was five times higher than Nokia's in 2020. For both companies, the improvement in operating profit margin had a significant impact on ROCE improvement. For Ericsson, the increase in operating profit was a result of improved gross margin, which in turn was a result of successful introduction of mature 5G RAN equipment portfolio to the market. Other business segments had a relatively small impact on operating profit. Nokia's operating profit was more equally divided between business segments, which means they were not as efficient in using 5G RAN equipment market increase opportunities as Ericsson. This is a weakness for Nokia but also an opportunity for them in the future.

Overall efficiency analysis demonstrates that both companies improved their assets usage to generate net operating cash flow during the analysed period. For Ericsson, all 15 qualitative efficiency indicators increased and for Nokia 13 of the 15 qualitative indicators increased during

the studied period. This dynamic demonstrates that efficiency improvement for both companies has been wide based. This is a strength for both companies.

Nokia's overall efficiency increased more than that of its competitor, Ericsson. This was mainly due to the low comparison base. At the beginning of the analysed period, Nokia's overall efficiency was lower than Ericsson's. Nevertheless, despite the slower growth rate of Ericsson's overall efficiency, Ericsson still outperformed Nokia over the entire period. It is worth mentioning that in 2020 14 of 15 Ericsson's qualitative indicators were higher than those of Nokia. This means that Ericsson beats Nokia's overall efficiency in almost all areas. According to the analysis, if current trends continue there is no indication that Nokia will reach the same level of overall efficiency as Ericsson in the coming years. This fact is an important strength for Ericsson and a weakness for Nokia.

The author of the thesis considers the following steps to be important for the individual companies in overcoming or reducing their weaknesses:

1. Nokia should start looking to utilise its large amount of cash and cash equivalents. One possibility is to look for acquisition options to strengthen its product portfolio. The second option is to decrease borrowings. This scenario is against a cash position strengthening policy, but holding a large amount of cash in bank accounts negatively affects a company's profitability.

2. Nokia should put a concerted effort into increasing gross margin. One possible option is to look for opportunities to manufacture product in countries with lower labour costs. Together with gross margin improvement, operating margin would also improve, which in turn would increase ROCE.

3. Ericsson should investigate the possibility of increasing post-employment benefit assets. By doing so, it does not need to cover its post-employment benefit obligations with shareholders' equity.
4. Ericsson's main revenue comes from telecommunication equipment development and production. Its main focus has been on one market segment – 5G networks. Ericsson should investigate options of how to increase the profitability of its other business

segments and widen its business to other technology areas. This helps to reduce the risks that manifest when a company relies on only one product segment.

5. Ericsson should look into the reduction of inventories to increase the efficiency of its asset usage. To reduce inventories, one possibility is to examine the supply chains of raw materials. Supply chain reliability will probably start to increase due to the decreasing effect of Covid-19 on supply chains.

Conclusively, both companies have their own strengths and weaknesses. The analysis performed reveals that in the main Ericsson uses its assets much more efficiently to generate more net operating cash than its competitor Nokia. This is the main strength of Ericsson and weakness of Nokia. The most important factor for both companies is that overall efficiency is improving and is across the board.

CONCLUSION

The author of the thesis performed a comparative financial statement analysis of two telecommunication equipment providers, Telefonaktiebolaget LM Ericsson and Nokia Corporation. The aim of the thesis was to identify the strengths and weaknesses of these companies during the 2018–2020 period. The analysed financial data is collected from both companies' annual reports. In order to achieve the aim of the thesis, the author has defined six research questions and five research tasks to provide answers to these research questions. The research questions and task were stated in the introduction.

1. Which research methods have been used in previous comparative financial statement analysis?

Different financial statement analysis methods were used in previous research. Financial ratio analysis as previously been used to analyse assets usage, short-term liquidity and long-term solvency. The financial ratio method was used together with MANOVA to compare the financial results of the different companies. Vertical analysis was used to compare the structure of the financial statement. Overall efficiency matrix together with solving dynamic and static ranking problems was used to compare the overall efficiency changes of the companies and to rank them compared to each other.

2. How did the structures of the financial statements of the analysed companies differ?

The amount of Nokia's assets was larger than Ericsson's during the whole studied period. Ericsson's assets slightly increased during the studied period while Nokia's assets decreased. The asset structure of Ericsson's and Nokia's balance sheets was similar. The three largest assets categories for both companies were intangible assets, trade receivables, and cash and cash equivalents. In 2020, Nokia's deferred income tax asset significantly decreased. This one-time event caused a significant loss during that period and had a negative effect on equity share in the balance sheet.

Ericsson's liabilities' structure was slightly different than that of Nokia. The main difference was the amount of non-current provisions. For Ericsson, the main contributor in the provision was post-employment benefit liability. This means that Ericsson's post-employment assets fair value is lower than the post-employment obligation fair value. As a result, Ericsson has to show the net value of post-employment benefit under liabilities. Nokia's post-employment benefits net value was slightly positive, and this was shown as an asset on the balance sheet. Borrowings was the next liability that was different between Ericsson and Nokia. During the studied period, Ericsson reduced its borrowings while Nokia nearly doubled its amount of borrowings. In parallel with the increase in borrowings, the amount of cash and cash equivalents also increased. In 2019, Nokia stated that it had started to increase its cash flows to strengthen the cash position. It is unclear why it is increasing borrowings and holding borrowed cash on its bank account.

Ericsson's and Nokia's balance sheet structure analysis demonstrates that the financial statements of these companies are comparable.

3. How do the companies differ in short-term liquidity and long-term solvency?

Current ratio and quick ratio were used to analyse the short-term liquidity of both companies. The analysis revealed that both companies had a strong short-term liquidity position in the studied period. The current ratio and quick ratio of both companies changed in parallel. Ericsson's short-term liquidity level decreased while Nokia improved its short-term liquidity during the studied period. The main reason why liquidity ratios were that high was that both companies own significant amounts of cash and cash equivalents. On the one hand, very high liquidity is good because there is a smaller risk to suffer from financial stress and a large amount of cash gives a company flexibility to react fast to business environment changes and make large investments, if needed. This is especially useful in the technology sector where companies have to constantly look for new business opportunities. On the other hand, high liquidity has a negative effect on shareholders because cash and other short-term assets are not generating value; as a result, it reduces the usage efficiency of assets.

Long-term liquidity was assessed by using debt-to-asset ratio, interest coverage and financial leverage ratios. The solvency of both companies is high. For Ericsson, all analysed ratios have been improved. In looking at interest coverage, it is clear that its ability to earn cash to cover its

interests is very high reaching 17.45 times in 2020. Such high interest coverage was achieved by reducing total borrowings and increasing operating profit. Nokia's debt-to-asset ratio and financial leverage ratio increased during the studied period mainly due to a doubling of borrowings. Nevertheless, an increase in borrowing the interest coverage improved significantly.

4. How do the companies differ in terms of efficiency of resource (assets and labour) usage?

Asset usage efficiency was measured by calculating operational efficiency ratios. The analysis demonstrates that Ericsson outperforms its competitor in all operational ratios except for inventory turnover. In 2020, Ericsson's inventory turnover was 4.80 times while Nokia's inventory turnover reached 8.44 times during the same period. Working capital turnover increased by 65 % for Ericsson from 3.96 to 6.54 times. This increase was mainly caused by a decrease in trade receivables and an increase in trade payables and short-term borrowings. Also, the stable cash position increased sales revenue and had a positive effect. Nokia's working capital turnover decreased instead. This was mainly caused by an increase in the cash position due to the working capital and cash position strengthening policy. The reasons why Nokia increased its working capital amount were unclear.

Both companies noted that people are one of the main enablers for their success. Therefore, labour usage efficiency was studied. The operating profit per employee and sales revenue per employee ratios were measured. The average number of employees remained stable for both companies during the studied period. This means that operating profit per employee and sales revenue per employee were mainly affected by changes in operating profit and sales revenue, respectively. For both companies, the above mentioned ratios improved. Ericsson's operating profit per employee (27.68 thousand euros per employee) outperformed Nokia (9.85 thousand euros per employee) by nearly three times. The sales revenue per employee shows different dynamics. Nokia slightly overperformed Ericsson in sales revenue per employee. Sales revenue per employee remained stable for Nokia in 2020 due to the Covid-19 restrictions, which had a significant impact on Nokia's manufacturing activities due to factories shut-down. Ericsson, in turn, mentioned in its annual report that Covid-19 had no significant impact on its activities. This is the main reason why Ericsson's sales revenue per employee maintained growth in 2020. It can be seen that Ericsson adapted better to the rapidly changing environment than Nokia.

5. How do the companies differ in return on capital employed (ROCE)?

ROCE for both companies increased during the studied period. The ROCE increase was higher for Ericsson. During the studied period, Ericsson's ROCE increased more than 24 times from 1.0 % to 24.2 %. Nokia's ROCE was -0.2 % in 2018 and rose to 4.8 % in 2020. For both companies, the main contributor to ROCE growth was the increase in operating margin. For Ericsson, operating margin growth was mainly the result of the increased operating margin of BA Networks, while other business segments had a minor impact. The BA Networks increased operating margin was mainly driven by the successful introduction of 5G RAN hardware and software to the telecommunication equipment market. Nokia's operating margin also increased during the studied period. The main limiting factor was the relatively low gross margin. This was explained by the start of production of 5G RAN equipment. At the beginning of new product portfolio production, the gross profit margins are lower. For both companies, changes in other ROCE components (assets turnover and assets to capital) had a minor impact on ROCE.

6. Which company has higher overall efficiency and how did it change during the analysed period?

The overall efficiency of Ericsson and Nokia was studied by using the overall efficiency matrix analysis method. Six quantitative indicators were integrated to the overall efficiency matrix following the finality order: average assets, average number of employees, R&D expenses, sales revenue, gross profit and net operating cash flow. For both companies, operating cash flow showed the largest increase during the studied period.

GICOE and BICOE were calculated to solve dynamic and static ranking problems, and this, in turn, was used to compare the overall efficiencies of the companies. Ericsson's overall efficiency increased by 25 % but did not outperform its competitor, whose overall efficiency increased by 28 %. It is worth mentioning that all of Ericsson's quantitative elements increased during the studied period, which indicates that Ericsson's overall efficiency improvement was wide based and involved the whole company. A comparison of the overall efficiencies of both companies reveals that Ericsson was operating more efficiently than Nokia. In 2018, Nokia's BICOE was 73 % (Ericsson 100 %) and this increased to 77 % by 2020. This dynamic means that Nokia's overall efficiency increased slightly faster than Ericsson's. The overall efficiency of both

companies was mostly affected by increased qualitative indicators related to net operating cash flow, while other qualitative indicators showed moderate growth.

The author considers the aim of the thesis was fulfilled. The thesis could be more detailed to give a more precise picture of the basis for overall efficiency sources. One option could be to analyse the business segments of both companies more thoroughly to understand which segments provide the most values to the company. The second option would be to integrate more quantitative indicators into the efficiency matrix to achieve a more detailed picture.

LIST OF REFERENCES

Bryan-Low, C., Packham, C., Lague, D., Stecklow, S., & Stubbs, J. (2019, May 21). *Hobbling Huawei: Inside the U.S. war on China's tech giant*. Retrieved from Reuters Investigates: https://www.reuters.com/investigates/special-report/huawei-usa-campaign/

Campell, K., Diffley, J., Flanagan, B., Morelli, B., O'Neil, B., & Sideco, F. (2017). *The 5G economy: How 5G technology will contribute to the global economy.* Retrived from IHS Economics & IHS Technology: https://cdn.ihs.com/www/pdf/IHS-Technology-5G-Economic-Impact-Study.pdf, 25.02.2022

Cortez, M. A., Ikram, M. I., Nguyen, T. T., & Pravini, W. P. (2015). Innovation and financial performance of electronics companies: A cross-county comparison. *Journal of International Business Research, 14*(1), 166-179.

Daryanto, W. M., Hasanah, A. N., Milqisthi, M. A. (2020). Analysis the competitiveness of telecommunication industry after the era of internet of things (IOT). *South East Asia Journal of Contemporary Business, 21*(3), 21-29.

Ericsson. (2017). *Ericsson Annual Report 2016.* Ericsson

Ericsson, (2019). *Ericsson Annual Report 2018.* Ericsson

Ericsson, (2020). *Ericsson Annual Report 2019.* Ericsson

Ericsson. (2021a). *Ericsson Annual Report 2020.* Ericsson.

Ericsson. (2021b). *Ericsson Mobility Report.* Ericsson.

Fridson, M., Alvarez, F. (2002). *Financial Statement Analysis: A Practitioner's Guide*. (4th ed.) New York, USA: John Wiley & Sons, Inc.

Ganesan, V. (2007). An Analysis of working capital management efficiency in telecommunication equipment industry. *Rivier Academic Journal, 3*(2), 1-10.

Huawei. (2021). *2020 Annual Report.* Huawei

Jang, H., Lee, S., & Suh, E. (2016). A comparative analysis of the change in R&D efficiency: a case of R&D leaders in the technology industry. *Technology Analysis & Strategic Management, 28*(8), 886-900.

Joyce, D. (2015). Internet Freedom and Human. *The European Journal of International Law, 26*(2), 493-514.

Liu, C. M., O'Farell, G., Wei, K., Yao, L. J. (2013). Ratio analysis comparability between. *Chinese and Japanese firms, 7*(2), 185-199.

Mereste, U. (1987). *Majandusanalüüsi teooria.* Tallinn: Valgus.

Meric, I., McCall, C. W., & Meric, G. (2008). U.S. and Japanese Electronic and Electrical Equipment Manufacturing Firms: A Comparison. *European Journal of Scientific Research, 20*(2), 297-301.

Nokia. (2017). *Nokia Annual Report 2016.* Nokia.

Nokia. (2019). *Nokia Annual Report 2018.* Nokia,

Nokia. (2020). *Nokia Annual Report 2019.* Nokia.

Nokia. (2021). *Nokia Annual Report 2020.* Nokia.

Poongavanam, S. (2017). A Study On Comparative Financial Statement Analysis With Reference To Das Limited. *IOSR Journal Of Humanities And Social Science, 22* (10), 9-14.

Presistence Market Research. (2021). *5G Network Equipment Market.* Retrived from: https://www.persistencemarketresearch.com/market-research/5g-network-equipment-market.asp, 25.02.2022

Research and Markets. (2021). *Global Telecom Equipment Market Size by Type, by Infrastructure, by Geographic Scope And Forecast*. Retrieved from https://www.researchandmarkets.com/reports/5301492/global-telecom-equipment-market-size-by-type-by, 25.02.2022

Robinson, T. R., Henry, E., Pirie, W. L., Broihahn, W. A. (2015). *International Financial Statement Analysis.* Hoboken, USA: John Wiley & Sons, Inc.

Sacks, D. (2021, March 29). *China's Huawei Is Winning the 5G Race. Here's What the United States Should Do To Respond*. Retrieved from Council on Foreign Relations: https://www.cfr.org/blog/china-huawei-5g

Siimann, P. (2018). *Usage of Efficiency Matrix in the Analysis of Financial Statements.* Tallinn: TTÜ Press.

Statista. (2015). *Regional distribution of internet users worldwide 2015.* Statista Research Department. Retrieved from https://www.statista.com/statistics/271401/regional-distribution-of-internet-users-worldwide/, 25.02.2022

Statista. (2021). *Global digital population as of January 2021.* Joseph Johnson. Retrieved from https://www.statista.com/statistics/617136/digital-population-worldwide/, 25.02.2022

Zhang, N. (2017). Relationship between intangible assets and financial performance of listed telecommunication firms in China, based on empirical analysis. *African Journal of Business Management, 11*(24), 751-757.

US Department of Justice. (2019). *US Department of Justice*. Retrieved from: https://www.justice.gov/opa/pr/ericsson-agrees-pay-over-1-billion-resolve-fcpa-case, 05.03.2022

Wahlen, J. M., Baginski, S. P., Bradshaw, M. T. (2014). *Financial Reporting, Financial Statement Analysis and Valuation.* Boston, USA: Chengage Learning.

Vensel, V. (1985). *Kergetööstusettevõtete majandusliku tegevuse analüüsi ja prognoosimise automatiseeritud süsteemi aluste väljatöötamine: aruanne (6. köide).* Tallinn: Tallinna Polütehniline Instituut.

Verified Market Research. (2021). *Global Telecom Equipment Market Size By Type (Network Communication Equipment, Mobile Communication Device, and Optical Communication Equipment), By Application (Consumer Electronics, Banking, Media, Retail), By Geographic Scope And Forecast.* Retrived from https://www.verifiedmarketresearch.com/product/telecom-equipment-market/, 25.02.2022

Vernimmen, P., Quiry, P., Dallocchio, M., Fur, Y. L., & Salvi, A. (2014). *Corporate Finance: Theory and Practice.* John Wiley and sons, INC.

White, G. I., Sondhi, A. C., & Freid, D. (1998). *The Analysis and use of financial statements.* (2nd, ed.) John Wiley and Sons, INC.

World Government Bonds. (2022, 02 27). Retrieved from: http://www.worldgovernmentbonds.com/bond-historical-data/sweden/10-years/, 15.03.2022

APPENDICES

Appendix 1. Income statement harmonisation

Terms in Ericsson's income statement	Terms in Nokia's income statement	Harmonised income statement
Net sales	Net sales	Sales revenue
Cost of sales	Cost of sales	Cost of sales
Gross income	**Gross profit**	**Gross profit**
R&D expenses	R&D expenses	R&D expenses
Selling and administrative expenses	Selling, general and administrative expenses	Selling and administrative expenses
Impairment losses on trade receivables	Other operating expense	Other operating income (expenses)
Other operating expense		
Other operating income	Other operating income	
Share in earnings of joint ventures and associated companies	Share of results of associated companies and joint ventures	
Operating income	**Operating profit/(loss)**	**Operating profit/(loss)**
		Interest expense
Financial income and expenses, net	Financial income	Other financial income/(expense)
	Financial expenses	
Income after financial items (loss)	**Profit/(loss) before tax**	**Net profit/(loss) before tax**
Income tax	Income tax expense	Income tax expense
Net income (loss)	(Loss)/profit for the year from discontinuing operations	**Net profit (loss)**
	(Loss)/profit for the year	

Source: Compiled by author according to Ericsson and Nokia annual reports 2018–2020

Appendix 2. Balance sheet harmonisation

Terms in Ericsson's balance sheet	Terms in Nokia's balance sheet	Harmonised balance sheet
Assets	**Assets**	**Assets**
Capitalised development expenses	Intangible assets	Intangible assets
Goodwill		
Intellectual property rights, brands and other intangible assets		
Property, plant and equipment	Property, plant and equipment	Property, plant and equipment
Right-of-use assets	Right-of-use assets	Other non-current assets
Equity in joint ventures and associated companies	Investments in associated companies and joint ventures	
Other investments in shares and participations	Non-current financial assets	
Customer finance, non-current	Other non-current assets	
Interest-bearing securities, non-current	Other financial assets, non-current	
Other financial assets, non-current	Defined benefit pension assets	
Deferred tax assets	Deferred tax assets	Deferred tax assets
Total of non-current assets	**Total non-current assets**	**Total of non-current assets**
Inventories	Inventories	Inventories
Contract assets	Contract assets	Trade receivables
Trade receivables	Trade receivables	
Customer finance, current	Prepaid expenses and accrued income	Other current assets
Other current receivables	Current income tax asset	
	Other current financial assets	
Interest-bearing securities, current	Current financial investments	
	Assets held for sale	
Cash and cash equivalents	Cash and cash equivalents	Cash and cash equivalents
Total current assets	**Total current assets**	**Total current assets**
Total assets	**Total assets**	**Total assets**
Equity and liabilities	**Equity and liabilities**	**Total equity**
Capital stock	Share capital	
Additionally paid in capital	Share issue premium	

Other reserves	Fair value and other reserves	
	Reserve for invested unrestricted equity	
Retained earnings	Accumulated deficit	
	Translation differences	
	Treasury shares	
Equity attributable to owners of the parent company **(removed)**	Total capital and reserves attributable to equity holders of the parent **(removed)**	
Non-controlling interests	Non-controlling interests	
Total equity	**Total equity**	
Liabilities	**Liabilities**	**Liabilities**
Post-employment benefits	Defined benefit pension and post-employment liabilities	Provisions, non-current
Provisions, non-current	Provisions	
Borrowings, non-current	Long-term interest-bearing liabilities	Borrowings, non-current
Lease liabilities, non-current	Long-term lease liabilities	Other non-current liabilities
Deferred tax liabilities	Deferred tax liabilities	
Other non-current liabilities	Contact liabilities	
	Deferred revenue and other long-term liabilities	
Total non-current liabilities	**Total non-current liabilities**	**Total non-current liabilities**
Borrowings, current	Short-term interest-bearing liabilities	Borrowings, current
Contract liabilities	Contract liabilities	Trade payables
Trade payables	Trade payables	
Provisions, current	Provisions, current	Other current liabilities
Lease liabilities, current	Short-term lease liabilities	
Other current liabilities	Other financial liabilities	
	Current income tax liabilities	
	Accrued expenses, deferred revenue and other liabilities	
Total short-term liabilities	**Total short-term liabilities**	**Total short-term liabilities**
Total current liabilities	**Total liabilities**	**Total liabilities**
Total equity and liabilities	**Total equity and liabilities**	**Total equity and liabilities**

Source: Compiled by author according to Ericsson and Nokia annual reports 2018–2020

Appendix 3. Ericsson's adjusted balance sheet 2018–2020

In million euros			
Assets	**31.12.2020**	**31.12.2019**	**31.12.2018**
Intangible assets	4,346	3,612	3,681
Property, plant and equipment	1,334	1,326	1,253
Other non-current assets	3,832	3,802	3,301
Deferred tax assets	2,621	2,984	2,258
Total of non-current assets	**12,132**	**11,723**	**10,492**
Inventories	2,800	2,954	2,853
Trade receivables	5,315	5,288	6,275
Other current assets	2,467	2,176	2,845
Cash and cash equivalents	4,346	4,315	3,744
Total current assets	**14,928**	**14,733**	**15,716**
Total assets	**27,060**	**26,456**	**26,208**
Equity and liabilities			
Total equity	**8,489**	**7,838**	**8,559**
Liabilities			
Provisions, non-current	4,010	3,685	3,334
Borrowings, non-current	2,214	2,705	3,010
Other non-current liabilities	954	1,047	489
Total non-current liabilities	**7,179**	**7,436**	**6,834**
Borrowings, current	791	904	220
Trade payables	5,823	5,690	5,776
Other current liabilities	4,779	4,589	4,820
Total short-term liabilities	**11,393**	**11,182**	**10,816**
Total liabilities	**18,572**	**18,619**	**17,649**
Total equity and liabilities	**27,060**	**26,456**	**26,208**

Source: Ericsson annual reports 2018–2020. Harmonised by author according to Appendix 2

NOTE: Originally income statement original currency is SEK which is converted to EUR using following conversion rates:

31.12.2018 1 EUR = 10.2548 SEK

31.12.2019 1 EUR = 10.4468 SEK

31.12.2020 1 EUR = 10.0343 SEK

Conversion rates have been taken from European Central Bank Statistical Data Warehouse (https://sdw.ecb.europa.eu/curConverter.do?sourceAmount=1.0&sourceCurrency=EUR&targetCurrency=SEK&inputDate=31-12-2018&submitConvert.x=115&submitConvert.y=11).

Appendix 4. Nokia's adjusted balance sheet 2018–2020

In million euros			
Assets	**31.12.2020**	**31.12.2019**	**31.12.2018**
Intangible assets	7,027	7,956	8,805
Property, plant and equipment	1,783	1,856	1,790
Other non-current assets	3,298	3,041	1,516
Deferred tax assets	1,822	5,124	4,911
Total of non-current assets	**13,930**	**17,977**	**17,022**
Inventories	2,242	2,936	3,168
Trade receivables	6,583	6,514	6,731
Other current assets	2,450	1,448	2,111
Cash and cash equivalents	6,940	5,910	6,261
Total current assets	**18,215**	**16,808**	**18,271**
Total assets	**32,145**	**34,785**	**35,293**
Equity and liabilities			
Total equity	**12,545**	**15,401**	**15,371**
Liabilities			
Provisions, non-current	736	556	675
Borrowings, non-current	5,015	3,985	2,826
Other non-current liabilities	2,088	2,788	2,317
Total non-current liabilities	**7,839**	**7,329**	**5,818**
Borrowings, current	561	292	994
Trade payables	5,568	6,538	7,156
Other current liabilities	5,632	5,225	5,954
Total short-term liabilities	**11,761**	**12,055**	**14,104**
Total liabilities	**19,600**	**19,384**	**19,922**
Total equity and liabilities	**32,145**	**34,785**	**35,293**

Source: Nokia annual reports 2018–2020. Harmonised by author according to Appendix 2

Appendix 5. Ericsson's harmonised income statement 2018–2020

In million euros	2020	2019	2018
Sales revenue	23,160	21,750	20,560
Cost of sales	(13,819)	(13,630)	(13,909)
Gross profit	**9,340**	**8,120**	**6,651**
R&D expenses	(3,958)	(3,715)	(3,794)
Selling and administrative expenses	(2,659)	(2,502)	(2,684)
Other operating income/(expense)	48	(891)	(52)
Operating profit/(loss)	**2,771**	**1,011**	**121**
Interest expense	(159)	(186)	(139)
Other financial income/(expense)	100	14	(125)
Profit/(loss) before tax	**2,712**	**839**	**(143)**
Income tax expense	(956)	(663)	(469)
Net profit/(loss)	**1,756**	**176**	**(612)**

Source: Ericsson annual reports 2018–2020. Harmonised by author according to Appendix 1

NOTE: Author has modified vocabulary to make income statements comparable.

Originally income statement original currency is SEK which is converted to EUR using following conversion rates:

31.12.2018 1 EUR = 10.2548 SEK

31.12.2019 1 EUR = 10.4468 SEK

31.12.2020 1 EUR = 10.0343 SEK

Conversion rates have been taken from European Central Bank Statistical Data Warehouse (https://sdw.ecb.europa.eu/curConverter.do?sourceAmount=1.0&sourceCurrency=EUR&targetCurrency=SEK&inputDate=31-12-2018&submitConvert.x=115&submitConvert.y=11)

Appendix 6. Nokia's harmonised income statement 2018–2020

In million euros	2020	2019	2018
Sales revenue	21,852	23,315	22,563
Cost of sales	(13,659)	(15,051)	(14,251)
Gross profit	**8,193**	**8,264**	**8,312**
R&D expenses	(4,087)	(4,532)	(4,777)
Selling and administrative expenses	(2,898)	(3,219)	(3,549)
Other operating income/(expense)	(301)	(16)	(33)
Operating profit/(loss)	**907**	**497**	**(47)**
Interest expense	(235)	(299)	(267)
Other financial income/(expense)	71	(42)	(46)
Profit/(loss) before tax	**743**	**156**	**(360)**
Income tax expense	(3,256)	(138)	(189)
Net profit/(loss)	**(2,513)**	**11**	**(335)**

Source: Nokia annual reports 2018–2020. Harmonised by author according to Appendix 1

NOTE: Author has modified vocabulary to make income statements comparable.

Appendix 7. Ericsson and Nokia balance sheet structure

Balance sheet item	Ericsson			Nokia		
	31.12. 2020	**31.12. 2019**	**31.12. 2018**	**31.12. 2020**	**31.12. 2019**	**31.12. 2018**
Assets						
Intangible assets	16.1 %	13.7 %	14.0 %	21.9 %	22.9 %	24.9 %
Property, plant and equipment	4.9 %	5.0 %	4.8 %	5.5 %	5.3 %	5.1 %
Other non-current assets	14.2 %	14.4 %	12.6 %	10.3 %	8.7 %	4.3 %
Deferred tax assets	9.7 %	11.3 %	8.6 %	5.7 %	14.7 %	13.9 %
Total of non-current assets	**44.8 %**	**44.3 %**	**40.0 %**	**43.3 %**	**51.7 %**	**48.2 %**
Inventories	10.3 %	11.2 %	10.9 %	7.0 %	8.4 %	9.0 %
Trade receivables	19.6 %	20.0 %	23.9 %	20.5 %	18.7 %	19.1 %
Other current assets	9.1 %	8.2 %	10.9 %	7.6 %	4.2 %	6.0 %
Cash and cash equivalents	16.1 %	16.3 %	14.3 %	21.6 %	17.0 %	17.7 %
Total current assets	**55.2 %**	**55.7 %**	**60.0 %**	**56.7 %**	**48.3 %**	**51.8 %**
Total assets	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**
Equity and liabilities						
Total equity	**31.4 %**	**29.6 %**	**32.7 %**	**39.0 %**	**44.3 %**	**43.6 %**
Liabilities						
Provisions, non-current	14.8 %	13.9 %	12.7 %	2.3 %	1.6 %	1.9 %
Borrowings, non-current	8.2 %	10.2 %	11.5 %	15.6 %	11.5 %	8.0 %
Other non-current liabilities	3.5 %	4.0 %	1.9 %	6.5 %	8.0 %	6.6 %
Total non-current liabilities	**26.5 %**	**28.1 %**	**26.1 %**	**24.4 %**	**21.1 %**	**16.5 %**
Borrowings, current	2.9 %	3.4 %	0.8 %	1.7 %	0.8 %	2.8 %
Trade payables	21.5 %	21.5 %	22.0 %	17.3 %	18.8 %	20.3 %
Other current liabilities	17.7 %	17.3 %	18.4 %	17.5 %	15.0 %	16.9 %
Total short-term liabilities	**42.1 %**	**42.3 %**	**41.3 %**	**36.6 %**	**34.7 %**	**40.0 %**
Total liabilities	**68.6 %**	**70.4 %**	**67.3 %**	**61.0 %**	**55.7 %**	**56.4 %**
Total equity and liabilities	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**	**100.0 %**

Source: Compiled by author by using Appendices 3–4.

Appendix 8. Calculations of financial ratios

Financial ratio	Numerator	Denominator
Current ratio	Total current assets	Total current liabilities
Quick ratio	(Cash + Short-term marketable investments + Trade receivables)	Total current liabilities
Debt-to-assets ratio	(Borrowings, non-current + Borrowings, current)	Total assets
Financial leverage ratio	Average total assets	Average total equity
Interest coverage	Operating profit	Interest expense
Inventory turnover	Cost of sales	Average inventory
Receivables turnover	Sales revenue	Average trade receivables
Payable turnover	(Cost of sales + Ending inventory – Beginning inventory)	Average trade payables
Working capital turnover	Sales revenue	(Average current assets – Average current liabilities)
Intangible asset turnover	Sales revenue	Average intangible assets
Total asset turnover	Sales revenue	Average total assets
ROCE	Operating profit x 100 %	(Average total equity + Borrowings, non-current + Borrowings, current)
Assets to total capital	Average total assets	(Average total equity + Borrowings, non-current + Borrowings, current)
Operating profit per employees	Operating profit	Average number of employees
Sales revenue per employees	Sales revenue	Average number of employees

Source: (Robinson, Henry, Pirie, & Broihahn, 2015) pp 313–349, compiled by author

Appendix 9. Ericsson and Nokia financial ratios

Financial ratio	Ericsson			Nokia		
	2020	2019	2018	2020	2019	2018
Current ratio	1.31	1.32	1.45	1.55	1.39	1.30
Quick ratio	1.06	1.05	1.19	1.36	1.15	1.07
Debt-to-assets ratio	0.11	0.14	0.12	0.17	0.12	0.11
Financial leverage ratio	3.28	3.21	2.85	2.39	2.28	2.29
Interest coverage	17.45	5.44	0.87	3.86	1.66	-0.18
Inventory turnover	4.80	4.69	5.11	8.44	7.64	7.76
Receivables turnover	4.37	3.76	3.29	3.34	3.52	3.32
Payable turnover	2.37	2.40	2.48	2.14	2.16	2.65
Working capital turnover	6.54	5.15	3.96	3.90	5.23	4.00
Intangible asset turnover	5.82	5.96	5.56	2.92	2.78	2.50
Total asset turnover	0.87	0.83	0.78	0.65	0.67	0.62
ROCE	0.24	0.09	0.01	0.05	0.03	0.00
Assets to total capital	2.33	2.27	2.10	1.77	1.80	1.85
Operating profit/(loss) per employees, thousand euros	27.68	10.38	1.24	9.85	5.05	(0.46)
Sales revenue per employees, thousand euros	231.32	223.33	209.69	237.42	237.13	218.88

Source: Compiled by author by using Appendices 3–6 and Ericsson and Nokia annual reports 2018 - 2020

Appendix 10. Ericsson's ROCE decomposition

Financial ratio		**2020**	**2019**	**2018**			
Operating profit margin	O	0.12	0.05	0.01			
Assets turnover	T	0.87	0.83	0.78			
Assets to total capital	A	2.33	2.27	2.10			
ROCE, %	**R**	**24.2 %**	**8.7 %**	**1.0 %**			
2020/2019	ΔR	15.5 %	**Absolute change**			**Relative impact**	
O_{2019} x T_{2019} x A_{2019} = R_{2019}	R_{2019}	8.7 %					
O_{2020} x T_{2019} x A_{2019} = R'	R'	22.4 %	$\Delta R(O)=R'-R_{2019}$	13.7 %	$\Delta R(O)/\Delta R$	88.6 %	
O_{2020} x T_{2020} x A_{2019} = R''	R''	23.5 %	$\Delta R(T)=R''-R'$	1.1 %	$\Delta R(T)/\Delta R$	6.9 %	
O_{2020} x T_{2020} x A_{2020} = R_{2020}	R_{2020}	24.2 %	$\Delta R(A)=R_{2020}-R''$	0.7 %	$\Delta R(A)/\Delta R$	4.4 %	
2019/2018	ΔR	7.7 %	**Absolute change**			**Relative impact**	
O_{2018} x T_{2018} x A_{2018} = R_{2018}	R_{2018}	1.0 %					
O_{2019} x T_{2018} x A_{2018} = R'	R'	7.6 %	$\Delta R(O)=R'-R_{2018}$	6.7 %	$\Delta R(O)/\Delta R$	86 %	
O_{2019} x T_{2019} x A_{2018} = R''	R''	8.1 %	$\Delta R(T)=R''-R'$	0.4 %	$\Delta R(T)/\Delta R$	6 %	
O_{2019} x T_{2019} x A_{2019} = R_{2019}	R_{2019}	8.7 %	$\Delta R(A)=R_{2019}-R''$	0.6 %	$\Delta R(A)/\Delta R$	8 %	

Source: Calculated by author according to Appendix 9

Appendix 11. Nokia's ROCE decomposition

Financial ratio		2020	2019	2018
Operating profit margin	O	0.04	0.02	0.00
Assets turnover	T	0.65	0.67	0.62
Assets to total capital	A	1.77	1.80	1.85
ROCE, %	**R**	**4.8 %**	**2.6 %**	**-0.2 %**

2020/2019	ΔR	2.2 %				
O_{2019} x T_{2019} x A_{2019} = R_{2019}	R_{2019}	2.6 %	**Absolute change**		**Relative impact**	
O_{2020} x T_{2019} x A_{2019} = R'	R'	5.0 %	$\Delta R(O)=R'-R_{2019}$	2.4 %	$\Delta R(O)/\Delta R$	108.0 %
O_{2020} x T_{2020} x A_{2019} = R''	R''	4.9 %	$\Delta R(T)=R''-R'$	-0.1 %	$\Delta R(T)/\Delta R$	-4.1 %
O_{2020} x T_{2020} x A_{2020} = R_{2020}	R_{2020}	4.8 %	$\Delta R(A)=R_{2020}-R''$	-0.1 %	$\Delta R(A)/\Delta R$	-3.9 %
2019/2018	ΔR	2.8 %				
O_{2018} x T_{2018} x A_{2018} = R_{2018}	R_{2018}	-0.2 %	**Absolute change**		**Relative impact**	
O_{2019} x T_{2018} x A_{2018} = R'	R'	2.5 %	$\Delta R(O)=R'-R_{2018}$	2.7 %	$\Delta R(O)/\Delta R$	96.4 %
O_{2019} x T_{2019} x A_{2018} = R''	R''	2.6 %	$\Delta R(T)=R''-R'$	0.2 %	$\Delta R(T)/\Delta R$	5.9 %
O_{2019} x T_{2019} x A_{2019} = R_{2019}	R_{2019}	2.6 %	$\Delta R(A)=R_{2019}-R''$	0.1 %	$\Delta R(A)/\Delta R$	-2.2 %

Source: Calculated by author according to Appendix 9

Appendix 12. Ericsson's cash flow statement 2018–2020

Cash flow statement item	**2020**	**2019**	**2018**
Net profit (loss)	1,756	176	(612)
Adjustments to reconcile net profit to cash	1,486	1,170	764
Inventories	38	25	(469)
Customer finance, current and non-current	37	(82)	106
Trade receivables and contract assets	(317)	1,052	(200)
Trade payables	429	(36)	238
Provisions and post-employment benefits	(266)	(357)	653
Contract liabilities	(56)	(151)	(79)
Other current-assets and current-liabilities, net	(224)	(183)	510
Cash flow from operating activities	**2,883**	**1,615**	**911**
Investments in property, plant and equipment	(448)	(490)	(388)
Sales of property, plant and equipment	25	71	33
Acquisitions of subsidiaries and other operations	(962)	(168)	(158)
Divestments of subsidiaries and other operations	6	24	32
Product development	(81)	(148)	(90)
Other investing activities	80	(32)	(51)
Interest-bearing securities	(134)	403	219
Cash flow from investing activities	**(1,515)**	**(339)**	**(403)**
Proceeds from issuance of loans	438	464	89
Repayment of borrowings	(861)	(428)	(170)
Sale of own shares	16	19	10
Dividends paid	(598)	(426)	(334)
Repayment of lease liabilities	(241)	(286)	-
Other financing activities	0	(3)	8
Cash flow from financing activities	**(1,245)**	**(660)**	**(398)**
Effect of exchange rate changes on cash	(270)	25	134
Net change in cash and cash equivalents	**(146)**	**640**	**244**
Cash and cash equivalents, beginning of period	**4,492**	**3,675**	**3,499**
Cash and cash equivalents, end of period	**4,346**	**4,315**	**3,744**

Source: Ericsson annual reports 2018–2020

NOTE: Author has modified vocabulary to make income statements comparable.

Originally income statement original currency is SEK which is converted to EUR using following conversion rates:

31.12.2018 1 EUR = 10.2548 SEK

31.12.2019 1 EUR = 10.4468 SEK

31.12.2020 1 EUR = 10.0343 SEK

Conversion rates have been taken from European Central Bank Statistical Data Warehouse (https://sdw.ecb.europa.eu/curConverter.do?sourceAmount=1.0&sourceCurrency=EUR&targetCurrency=SEK&inputDate=31-12-2018&submitConvert.x=115&submitConvert.y=11)

Appendix 13. Nokia's cash flow statement 2018–2020

Cash flow statement item	**2020**	**2019**	**2018**
(Loss)/profit for the year	(2,516)	11	(335)
Adjustments' total	5,267	2,627	2,093
(Increase)/decrease in receivables	(418)	159	246
Decrease/(increase) in inventories	553	285	(544)
Decrease in non-interests-bearing liabilities	(845)	(2,232)	(645)
Operating cash flow	**2,041**	**850**	**815**
Interest received	33	57	68
Interest paid	(35)	(1)	(159)
Income taxes paid, net	(280)	(516)	(364)
Net cash flow from operating activities	**1,759**	**390**	**360**
Purchase of property, plant and equipment and intangible assets	(479)	(690)	(672)
Proceeds from sale of property, plant and equipment and intangible assets	13	39	88
Acquisition of businesses, net of cash acquired	(104)	-	(31)
Proceeds from disposal of businesses, net of disposed cash	11	19	(18)
Purchase of current financial investments	(1,154)	(473)	(2,104)
Proceeds from maturities and sale of current financial investments	123	991	2,397
Purchase of non-current financial investments	(59)	(180)	(145)
Proceeds from sale of non-current financial investments	122	144	170
Other	10	(17)	-
Net cash used in investing activities	**(1,517)**	**(167)**	**(315)**
Proceeds from stock option exercises	-	-	1
(Purchase of)/proceeds from sale of equity/instruments of subsidiaries	(1)	(1)	1
Proceeds from long-term boworings	1,595	1,039	139
Repayment of long-term borrowings	(246)	(766)	(29)
(Repayment of)/proceeds from short-term borrowings	(83)	40	2
Payment of principal portion of lease liabilities	(234)	(221)	(2)
Dividends paid	(148)	(570)	(1,081)
Net cash from/(used) in financing activities	**883**	**(479)**	**(969)**
Translation differences	(95)	(95)	(184)
Net increase/(decrease) in cash and cash equivalents	**1,030**	**(351)**	**(1,108)**
Cash and cash equivalents as of January 1	**5,910**	**6,261**	**7,369**
Cash and cash equivalents as of December 31	**6,940**	**5,910**	**6,261**

Source: Nokia annual reports 2018–2020

Appendix 14. Input data for Ericsson's overall efficiency matrix

	O	G	S	R	E	A
2020	2,883	9,340	23,160	3,958	100,121	26,758
2019	1,615	8,120	21,750	3,715	97,388	26,332
2018	911	6,651	20,560	3,794	98,047	26,304
2020/2019	1.79	1.15	1.06	1.07	1.03	1.02
2019/2018	1.77	1.22	1.06	**0.98**	**0.99**	1.00
CGAR 2020/2018	1.78	1.19	1.06	1.02	1.01	1.01

Source: Compiled by author by using Appendices 3, 5, 12 and Ericsson annual reports 2018–2020

NOTE:

O – Operating cash flow, million euros

G – Gross profit, million euros

S – Sales revenue, million euros

R – R&D expenses, million euros

E – Average number of employees, count

A – Average total assets, million euros

Appendix 15. Input data for Nokia's overall efficiency matrix

	O	G	S	R	E	A
2020	1,761	8,193	21,852	4,087	95,180	33,465
2019	334	8,264	23,315	4,532	100,702	35,039
2018	451	8,312	22,563	4,777	102,407	36,169
2020/2019	5.27	**0.99**	**0.94**	**0.90**	**0.95**	**0.96**
2019/2018	0.74	**0.99**	1.03	**0.95**	**0.98**	**0.97**
CGAR 2020/2018	1.98	**0.99**	**0.98**	**0.92**	**0.96**	**0.96**

Source: Compiled by author by using Appendices 4, 6, 13 and Nokia annual reports 2018–2020

NOTE:

O – Net o1761perating cash flow, million euros

G – Gross profit, million euros

S – Sales revenue, million euros

R – R&D expenses, million euros

E – Average number of employees, count

A – Average total assets, million euros

Appendix 16. Ericsson's efficiency matrix

		O	G	S	R	E	A
O		1					
G	2020	0,31	1				
	2019	0.20					
	2018	0.14					
	2020/2019	1.55					
	2019/2018	1.45					
	CAGR (2020/2018)	1.50					
S	2020	0.12	0.40	1			
	2019	0.07	0.37				
	2018	0.04	0.32				
	2020/2019	1.68	1.08				
	2019/2018	1.68	1.15				
	CAGR (2020/2018)	1.68	1.12				
R	2020	0.73	2.36	5.85	1		
	2019	0.43	2.19	5.85			
	2018	0.24	1.75	5.42			
	2020/2019	1.68	1.08	**1.00**			
	2019/2018	1.81	1.25	1.08			
	CAGR (2020/2018)	1.74	1.16	1.04			
E	2020	0.03	0.09	0.23	0.04	1	
	2019	0.02	0.08	0.22	0.04		
	2018	0.01	0.07	0.21	0.04		
	2020/2019	1.74	1.12	1.04	1.04		
	2019/2018	1.78	1.23	1.07	**0.99**		
	CAGR (2020/2018)	1.76	1.17	1.05	1.01		
A	2020	0.11	0.35	0.87	0.15	3.74	1
	2019	0.06	0.31	0.83	0.14	3.70	
	2018	0.03	0.25	0.78	0.14	3.73	
	2020/2019	1.76	1.13	1.05	1.05	1.01	
	2019/2018	1.77	1.22	1.06	**0.98**	**0.99**	
	CAGR (2020/2018)	1.76	1.17	1.05	1.01	1.00	

Source: Compiled by author by using Appendix 14

NOTE:

O – Operating cash flow, million euros

G – Gross profit, million euros

S – Sales revenue, million euros

R – R&D expenses, million euros

E – Average number of employees, count

A – Average total assets, million euros

Appendix 17. Nokia's efficiency matrix

		O	G	S	R	E	A
O		1					
G	2020	0.21	1				
	2019	0.04					
	2018	0.05					
	2020/2019	5.32					
	2019/2018	0.74					
	CAGR (2020/2018)	1.99					
S	2020	0.08	0.37	1			
	2019	0.01	0.35				
	2018	0.02	0.37				
	2020/2019	5.63	1.06				
	2019/2018	0.72	**0.96**				
	CAGR (2020/2018)	1.99	1.01				
R	2020	0.43	2.00	5.35	1		
	2019	0.07	1.82	5.14			
	2018	0.09	1.74	4.72			
	2020/2019	5.85	1.10	1.04			
	2019/2018	0.78	1.05	1.09			
	CAGR (2020/2018)	2.14	1.07	1.06			
E	2020	0.02	0.09	0.23	0.04	1	
	2019	0.00	0.08	0.23	0.05		
	2018	0.00	0.08	0.22	0.05		
	2020/2019	5.58	1.05	**0.99**	**0.95**		
	2019/2018	0.75	1.01	1.05	**0.96**		
	CAGR (2020/2018)	2.05	1.03	1.02	**0.96**		
A	2020	0.05	0.24	0.65	0.12	2.84	1
	2019	0.01	0.24	0.67	0.13	2.87	
	2018	0.01	0.23	0.62	0.13	2.83	
	2020/2019	5.52	1.04	**0.98**	**0.94**	**0.99**	
	2019/2018	0.76	1.03	1.07	**0.98**	1.02	
	CAGR (2020/2018)	2.05	1.03	1.02	**0.96**	1.00	

Source: Compiled by author Appendix 15

NOTE:

O – Operating cash flow, million euros

G – Gross profit, million euros

S – Sales revenue, million euros

R – R&D expenses, million euros

E – Average number of employees, count

A – Average total assets, million euros

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