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Comparative Analysis of the Financial Statements of US Telecommunication Companies on the Example of AT&T Inc. and Verizon Communications Inc. in the Years 2016–2018

Master's thesis
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Supervisor: Paavo Siimann, PhD

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.

The document length is 16,499 words from the introduction to the end of conclusion.

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TABLE OF CONTENTS

ABSTRACT 5
INTRODUCTION 6
1. Overview of the telecommunication industry and companies background 9
1.1. Industry overview 9
1.2. Introduction of the companies in scope 11
1.3. Overview of previous research and theoretical background of the thesis 13
2. Comparative analysis of the financial statements 19
2.1. Companies accounting principles comparison and authors modifications to financial statements of the companies 19
2.2. Vertical analysis of the companies' financial statements 21
2.2.1. Vertical analysis of the balance sheets 21
2.2.2. Vertical analysis of the income statements 23
2.3. Horizontal analysis of the companies' financial statements 26
2.3.1. Horizontal analysis of companies' balance sheets 26
2.3.2. Horizontal analysis of companies' income statements 30
2.4. Analysis of long- and short-term liquidity, earnings quality and cash flow sufficiency of the companies 33
2.4.1. Analysis of long- and short-term liquidity of the companies 33
2.4.2. Analysis of earnings quality and cash flow sufficiency of the companies 36
2.5. Analysis of return on capital employed 39
3. Analysis of companies' asset usage efficiency 42
3.1. Telecom company efficiency matrix indicator specifics 42
3.2. Telecommunication companies' field-specific asset usage efficiency matrix 45
3.3. Conclusion on companies' strengths and weaknesses 54
CONCLUSION 57
LIST OF REFERENCES 62
APPENDICES 66
Appendix 1. AT&T Balance sheets 2016–2018 67
Appendix 2. Verizon Balance sheets 2016–2018 68
Appendix 3. AT&T Income Statements 2016–2018 69
Appendix 4. Verizon Income Statements 2016–2018 70

Appendix 5. AT&T Balance Sheet, Vertical and Horizontal Analysis 2016–2018 71
Appendix 6. Verizon Balance Sheet Vertical and Horizontal Analysis 2016–2018 73
Appendix 7. AT&T Income Statement Vertical and Horizontal Analysis 2016–2018 75
Appendix 8. Verizon Income Statement Vertical and Horizontal Analysis 2016–2018 76
Appendix 9. AT&T, Statements of Cash Flows 77
Appendix 10. Verizon, Statements of Cash Flows 78
Appendix 11. Financial ratio formulas 79
Appendix 12. Financial ratio values for AT&T and Verizon, 2016–2018 80
Appendix 13. ROCE decomposition AT&T 2016–2018 81
Appendix 14. ROCE decomposition, ROCE Verizon 2016–2018 82
Appendix 15. Initial data for efficiency matrices 83
Appendix 16. Initial data for efficiency matrices, AT&T 84
Appendix 17. Initial data for efficiency matrices, Verizon 85
Appendix 18. Telecom Field-specific Efficiency Matrix, AT&T 86
Appendix 19. Telecom Field-specific Efficiency Matrix, Verizon 87
Appendix 20. Comparative Efficiency Matrix, AT&T and Verizon 88
Appendix 21. Revenue breakdown by segment, AT&T and Verizon 89
Appendix 22. Financial Ratios by Industry 90
Appendix 23. Border Gateway Protocol carried information example 91
Appendix 24. Non-exclusive licence 92

ABSTRACT

In the thesis at hand, author analyses financial performance of two major United States telecommunication companies – AT&T and Verizon, using companies' financial statements from the period of 2016–2018. Aim of the thesis is to determine weak and strong areas of the companies, with author employing horizontal and vertical analysis of the primary financial statements, financial ratio and financial ratio decomposition analysis, as well as is employing overall efficiency matrix compilation and efficiency growth and benchmark indices compilation approach.

In the period in scope, companies have been favourably impacted by Tax Cuts and Jobs Act, enacted in US in 2017, as well as have reported various acquisitions and divestments commencing, most notable being Time Warner acquisition by AT&T. These changes have had sound effect on companies' balance sheets, and income statements. Additionally, companies have been plagued by decline in revenues in 2017, having found reflection on income statements of the companies. Apart from goodwill impairments reported in 2018, Verizon reports allowed to make conclusions on better expense control overall, capturing higher proportion of revenues into net profit.

Being higher leveraged, Verizon has been observed to be superior to AT&T from the perspective of returns on investments into equity, with decompositions of return on equity as well as return on capital employed ratios additionally revealing its higher assets turnover, implying higher efficiency of assets usage.

The latter has been further found to be supported by analysis involving efficiency matrices compilation, which author has conducted along with introduction of industry-specific quantitative indicators in the form of non-financial measures of subscriber base, taken from annual reports as well as amount of network prefixes advertised, employed by author as a proxy metric for network load, derived from global Border Gateway Protocol table dumps. Overall efficiency matrices compiled by author revealed significant inferiority of AT&T compared to its peer – Verizon, with latter outperforming AT&T by 28–41% from returns on assets perspective, having 16–29% higher asset usage intensity and 21–30% higher asset turnover.

Keywords: financial statement analysis, financial ratios, DuPont, comparative analysis, efficiency matrix, telecommunications, BGP

INTRODUCTION

Contemporary telecommunication sector of the economy is extremely important in the development of any country, being one of the key enablers for productivity in economy and society. This is largely due to communication itself being vital to the society, being one of the key factors that allows individuals to assemble into organized groups corporations essentially are. Telecommunication infrastructure is also extremely important from the state point of view, as it is not just enabler for globalized market of tangible and intangible goods, but also an important asset when it comes to natural disaster recovery other national security topics. Telecom accounts for 46% of GDP output of Information industry in 2019 (Bureau of Economic Analysis) and is major employer in the tertiary economy sector, employing more than 700 thousand people in 2019 (U.S. Department of Labor), which is 25% of all employment in the Information industries in U.S. However, the very same data offered by U.S. Department of Labor also clearly indicated that the amount of employees in the sector has declined significantly, having fallen from roughly a million people employed in 2009, which is a reverse of the previous pattern of stable growth.

Telecom industry has been considered growth business, as companies engaged in the industry have been striving to connect ever higher number of customers to the network, growing their infrastructure either themselves or via series of mergers and acquisitions. Starting in fixed wireline connectivity offerings to the customers, the industry had been further expanding due to technological advancements allowing to offer mobile wireless connectivity and especially, mobile broadband. With more and more devices connected to the Internet through cellular networks, one could expect that the industry would continue to grow, however U.S. mobile broadband industry valuations figures indicate a reverse trend (Marketline, 2015).

Together with the expansion, there is a battle for retention of customer base and strive to add new customers where possible. But more importantly, there is pressure on companies' growth and profit margins. And where is competition, there are leaders and followers and there is a place for comparison and analysis of the financial position of the company and perhaps even more importantly, the operating performance of the companies engaged in the industry. In the end, external parties, whether investors or creditors, are interested whether the company is well-positioned to pay dividends and can afford paying principals and interests on the debt. Or whether telecommunication company, engaged in very capital-intensive industry, can be trusted shipping hardware purchased, or services rendered on a credit (Gibson, 2009). From the internal

perspective, company's financial performance is directly linked with company's long-term goals and, thus, measuring financial indicators provides overview of company's performance. Besides, management team would need to assess company's strong and weak points in comparison with the competitors to ensure that resources are expensed efficiently enough to obtain results comparable to that of the peers in the industry.

Therefore, the thesis will be aimed at testing the applicability of financial statement analysis approach to determine the strong and weak points of first and second-largest U.S. telecommunication companies, that control more than 34% of subscription market each and more than 2/3 of the subscription market combined (Statista, 2018). Beside close-to-equal market share, both companies report similar revenue figures with services revenue representing 89% and 83% of total operating revenues.

In order to achieve the aim defined above, the author conducts comparative analysis of financial results of the companies and as much as companies in scope can be considered 'asset-heavy', author is also compiling industry-specific efficiency matrices by introducing different set of quantitative indicators compared to commonly used efficiency matrix layout.

Hereby author defines following research questions to achieve the aim of the thesis:

1. What are the main differences in the structure and the dynamics of the financial statements of the companies? And in case applicable, what could be the reasons behind differences?
2. Which company has better the long- and short-term liquidity, earnings quality and cash flow sufficiency?
3. How do companies differ from the perspective of profitability of capital employed and what could be the reasons behind differences?
4. How do companies differ from the asset usage efficiency perspective and how do companies rank compared to each other?
5. What are the strong and weak points of the companies compared?

Author considers following research tasks require fulfilment to find answers to afore-set research questions:

1. Investigation of financial analysis methods commonly employed
2. Investigation of efficiency matrix concept
3. Application of financial analysis methods to address research questions 1 through 3

4. Proposition of quantitative indicators available from publicly available sources for providing industry-specific measure of company asset usage efficiency
5. Incorporation of industry-specific quantitative indicators into overall efficiency matrix concept and demonstration of applicability of the asset usage efficiency matrix to address research question 4.

Thesis is composed of three chapters with first devoted to introducing the reader to telecommunication industry challenges and companies' background as well as provides overview of previous research and theoretical framework employed in the thesis. Second chapter, divided into 5 subchapters, is dedicated to comparative analysis of the companies' financial statements and third chapter is devoted to compilation of industry-specific asset usage efficiency matrix on the example of the companies and definition of companies' strong and weak areas.

Author considers thesis useful for management of the companies in telecommunication industry, potential investors and public, interested in telecommunication industry in general.

Hereby, author would like to express his gratitude to his supervisor, Paavo Siimann, for invaluable help in the form of his professional advice, feedback, and patience.

1. Overview of the telecommunication industry and companies background

1.1. Industry overview

According to Marketline (2019), from 2014 through 2018, the wireless telecommunication industry revenues have indicated negative compounded annual growth rate (CAGR) of 2.2%, having fallen from 205 to 188 billion USD.

At the same time, amount of subscriptions has been on the rise from 2014 through 2018, indicating compounded annual growth rate of 4.9%. Analysts estimates provide various estimates in their industry outlooks through 2023, with revenue CAGR varying from 0.1% (Research and Markets) through 2.8% (Marketline), with amount of subscriptions CAGR projected to remain at 5.6% level. Where analysts' projections differ in assessing revenue growth potential, analysts commonly describe industry as being highly competitive, with MarketLine regarding to competition in between U.S. carriers as being highest in the world.

In fact, term "highly-competitive" is also acknowledged by U.S. carriers themselves. For instance, this is the term used by both Verizon as well as AT&T, both of which quite support the accuracy of predictions set out in the Marketline report. Market maturity and saturation as a result of high penetration of smartphones is acknowledged by the companies, with future growth expected to be provided by expansion of existing customer relationships, driven by increase in ways of customers can be connected through the adoption of wearables and Internet of Things (IoT) devices (Verizon, 2019). Well inline with expectations arising from 5G technology adoption in further years, increase in connected devices also leads to wider adoption of long-term device payment plans, essentially device leasing agreements, which partially explains subscription pricing aggressiveness.

Yet companies also face challenge in wireline business, where telecommunication and integrated service providers with global presence are competing with companies based on US soil to obtain contracts to render connectivity services to global enterprises, resulting in further intensification of competition (Verizon, 2019), with US companies viewing response measures being enhancements in network quality and coverage via transformation of legacy networks through even wider adoption of IP (Internet Protocol) underlay.

Although legacy circuit switched underlays have retained reasons to exist in Mobile backhaul environment and optical networks, contemporary networks report vast majority of the traffic carried being IP, with no exclusion longer made for mobile voice due to adoption of VoLTE-like technologies, which further implies that continued upkeep of legacy technologies is becoming nothing but extra CAPEX and OPEX. Moreover, increasing bandwidth demands as an outcome of higher amount of services carried over converged network infrastructure, coupled with CAPEX control levels on the background of increasing competition, pose additional challenge in deploying additional capacity (Sanchez-Monge & Szarkowicz, 2015). Previous neglect towards intelligent management of network resources and operation, administration and maintenance task automation previously is becoming a subject to change, with companies additionally attempting to transition their monolithic hardware-based network technologies to more robust, efficient and less-expensive (AT&T, 2019).

Enhancements in network quality also bring benefit to the customers with effects long studied with conclusions that such transformations lowered fees and provided for simplicity in network design (McGarty, 1999). Corporate customers also grasp the opportunities offered by transitioning their existing infrastructure to IP underlay, in the form of up to 70% reduction in mean-time-to-repair and 34% lower equipment maintenance through elimination of maintenance charges associated with maintaining legacy equipment (Gareiss, 2017), which explains why telecommunication companies report continued decline in legacy services revenues in wireline segments, as customers shift to contemporary alternatives offered by contemporary underlay technologies (Verizon, 2019).

Yet decline in legacy services provides opportunities for growth in broadband and entertainment offerings due to contemporary technologies offering robust service provisioning and higher variety of services offered, which brings increased capacity demands. Rather just offering higher capacity services, telecommunication companies are also looking into distributing video content of their own, which, beside increasing subscriber base, provides for additional growth via enhancements in programmatic advertisements (AT&T, 2019), yet this revenue source also being subject to competition from search engines and social networks.

Conclusively, telecommunication industry faces significant competitive pressure, which is expected to bring companies focus on cost savings as well as transformation of their networks and

services offerings, coupled with addressing increasing demand towards enhanced user experience and higher pace of introduction of entertainment services.

1.2. Introduction of the companies in scope

AT&T and Verizon remain first- and second-largest US telecommunication companies, engaged in offering wireless and wireline communication services to the customer base, including both private individuals as well as enterprise and other licenced operators. Service offerings by the companies can be considered similar, except for AT&T reports revealing higher amount of video service subscriptions.

AT&T is a company with exceptionally long history, having grown out of Bell Telephone Company, founded by Alexander Graham Bell in 1877, and carries American Telephone and Telegraph Company name from 1885. Verizon is a much younger company, having grown out of AT&T post US Department of Justice requiring AT&T breakup in 1984, leading to formation of seven Bell Operating Companies, one of which, Bell Atlantic, has been further rebranded to Verizon in 2000 post acquisition of General Telephone and Electronics Corporation.

Both companies are traded on New York Stock Exchange with tickers being T (AT&T) and VZ (Verizon) and are S&P 500 stock market index components.

Table 1. Key statistics for AT&T and Verizon 2016–2018

Indicator, in USD millions	AT&T			Verizon		
	2018	2017	2016	2018	2017	2016
Total operating revenue	170,756	160,546	163,786	130,863	126,034	125,980
Operating expenses	144,660	140,576	140,243	108,585	98,609	96,731
Net profit	19,953	29,847	13,333	16,039	30,550	13,608
Total assets (end of year)	531,864	444,097	403,821	264,829	257,143	244,180
Employees, count, (end of year)	268,220	254,000	268,540	144,500	155,400	160,900

Source: Compiled by author based on appendices 1–4, employment data from annual reports

Summary of companies' financials, presented in table 1, highlights the size of the companies in scope. It is immediately visible that AT&T remains twice larger than Verizon from the perspective

of employee headcount and total assets, whereas this superiority is diminishing when viewed from total operating revenue and net profit perspective.

Major external factors companies must consider in their field of activity are reported similarly, with major reported threats being competition from other industry players, domestic and international, exerting pressure on customer base, especially in residential segment, where customers are reported to be price sensitive. Nevertheless, companies address competition differently, with Verizon reporting increased attention towards service quality and maintaining relations with existing customers, focusing more on data services and introducing new types of customer equipment, with company also acquiring wireless spectrum licences to address wireless network density. AT&T reported acquisitions allow to conclude that focus is being made on expanding into (video) content delivery and production.

Competition reported is an outcome of US Telecommunications Act of 1996, that has opened US telecom market to enhance customer welfare, which also means that industry is subject to US federal and state-level regulatory authority. Companies do report certain regulatory changes they are subject to, in the form of privacy legislation enacted in some states as well as mention state-initiated lawsuits, challenging Federal Communication Commission orders, yet these mentions do not carry financial impact assessment.

Major legislative factor reported remains Tax Cuts and Jobs Act enacted in 2017, which has had positive effect on companies' net profits post statutory tax rate decrease. It is worth noticing that companies have shared benefits said act introduced with employees through discretionary benefit plans contributions as well.

Under economic conditions, reported is turmoil in stock market in US, causing lesser enterprise investment spending, negatively impacting telecom companies' business services. Given this turmoil has been primarily caused by China–US tensions in trade, it is positive that companies do not report any significant direct impact of tariffs imposition on China-manufactured goods (AT&T, 2019). Companies report significant amount of workforce unionized (40% and 24%), and Verizon report of 2016 contains mention of union work stoppage, lasting around 1.5 months and negatively impacting revenues.

Out of significant events reported, most noteworthy remain acquisitions undertaken by both companies, with most notable being AT&T acquiring Time Warner in 2018, despite delays induced by legislative actions earlier, inline the strive to expand in content business. Verizon acquired Straight Path in 2018 that held spectrum usable further for 5G offerings and undertook Yahoo and XO Holdings acquisitions in 2017 and 2016. Some divestments are also reported, with AT&T discarding copper network assets in 2018, and Verizon selling 23 datacentres in US to Equinix in 2017.

1.3. Overview of previous research and theoretical background of the thesis

Previous research review by the author suggests that studies attributing to financial analysis of the telecommunication companies are rather scarce in recent years. Most works either shed light on technical questions, which is understandable considering that industry requires significant capital expenditures for deployment and maintaining equipment and other key pieces of infrastructure used to provide services to the customers.

In the field of financial analysis, there are not a lot of contemporary works identifiable, with select works being very specific, employing linear programming in the form of data envelopment analysis (DEA) for performance benchmarking and efficiency management evaluation of used for comparative studies of European telecommunication companies (Pentzaropoulos & Giokas, 2002). More recent study, employing similar DEA methodology, has been devoted to telecommunication companies operating in G8 countries and Turkey (Diskaya, Emir, & Orhan, 2011), with authors concluding that telecom companies efficiency has not been highly undermined by financial crisis occurring in the period in scope of their study.

DEA and discriminant analysis have had applicability further tested to study financial performance of 41 telecom companies across the world, with an attempt to build ranking, based on Altman's Z-score metrics in addition (Goto, M. 2010). This study further attempted to benchmark AT&T with Japanese telecommunication company, NTT, with conclusion drawn that AT&T has visibly overperformed NTT due to consolidating IT and communication businesses.

Other works reviewed were found to remain quite surface-level, providing ranking of companies based on select indicators and financial ratios derived from outdated figures without any attempt

to identify factors behind (Magliozzi D., 2017), or focus primarily on APAC region, covering companies from India or China (Muthusamy, 2012) with select works focusing on studying specific factors contributing to telecommunication companies' revenues (Venkatram R., Zhu X., 2012).

Within-industry research, conducted and published by UStelecom.org, focuses on very narrow fields, mainly attributing to studying carrier spending trends. Author can thus conclude that U.S. Telecommunication industry has escaped researchers' attention in recent years, which is further supported by US National Academy of Sciences study report, stating that researchers contribution has declined in 2000s (National Research Council, 2006).

The author is aiming to identify the strong and weak points of companies from the financial results as well as asset usage efficiency perspective and thus considers employing a set of techniques and methods referred to as financial analysis. Through the process of financial analysis, data, contained in the financial statements, is given a meaning providing for measuring profitability, solvency, or other indicators of the company (Sherman, 2015; Fabozzi, 2003).

According to (Ravinder, 2013), two main types of analysis are undertaken to interpret financial position of the company – Vertical and Horizontal analysis of primary financial statements.

Vertical analysis is aimed at understanding the relationship between individual items through comparison of financial item amount to some total present on the financial statement for same year, with the aim to assess the assess the structure of specific item category on the company's financial statements, like that of an assets or liabilities.

Horizontal analysis in principle a form of ratio analysis, used to determine changes in individual financial statement items over different periods. Horizontal analysis provides for studying periodic changes in different items present on the financial statements. In case of horizontal analysis, items can be expressed relative to the same item in single period or relative to the prior period. Latter is also referred as trend analysis.

Another type of ratio analysis, commonly referred to as financial ratio analysis, provides for comparing one or more elements within one type of financial statement to one or more items within same or different type of financial statements with the goal of evaluating different context of

company's activities over period of time, and, most notably, provides for comparing financial ratio values of one company to another or the industry in whole (Sherman, 2015; Barnes, P. 1987).

Considering that major purpose behind company maintaining assets on its books is to generate revenues from them, the author considers important to measure how effective are both companies in earning returns from investments into assets, employing decomposition of financial ratio referred to as Return on Capital Employed (ROCE). Choice of ROCE over Return on Assets (ROA) is primarily driven by author considering that ROA represents a measure of company performance independent of financing, whereas both companies report significant amount of interest-bearing liabilities in addition to indicating shares issuance in most recent period in scope. Author therefore considers ROCE indicator being more precise measure of how well company's management is putting resources to use (Wright, 1975). Although typically, decomposition of Return on Equity ratio (ROE), referred to as DuPont analysis (Elaine Henry et al. 2011) is undertaken as well for the generally accepted reason for the company existence is to ensure maximization of wealth of the owners (Liesz, Maranville, 2008), author omits this, reasoning that ROE ratio essentially encompasses same assets turnover as ROCE with added component ratio of financial leverage. In case either the company will be found demonstrating higher assets turnover, same will be expected to remain superior from ROE perspective as well (Mubin, et al. 2014). Additionally, given three-step ROE decomposition employed typically, it must be noted that in 2017, ROE values are expected to be most significantly impacted by changes in Net Margin, as ROE is expected to increase with companies retaining proportionally higher amount of pre-tax earnings due to contraction in effective tax rate (Kijewska A., 2016).

When it comes to ROCE or ROE decomposition, a parallel might also be drawn to an efficiency matrix. Efficiency refers to how well company can utilize resources (assets, inventories, etc.) in order to obtain the resulting produce (products, services, sales, profit, etc). Efficiency matrix is a methodology first developed in Tallinn Polytechnical Institute by Mereste in the end of 1970s with the overall aim to analyse the efficiency level of company's main business activities. Compared to previously reviewed traditional methods, efficiency matrix has several advantages with most notable being presentation form's compactness, resulting in higher clarity of financial information; aggregation of financial ratios with clear expression of interrelations between the ratios; possibility to employ different methods and approaches used in financial analysis; comprehensiveness of the model to potential users lacking business education. But most importantly, matrix-based approach to analysing company efficiency addresses the issues, attributing to traditional ratio-based

analysis, where ratio expressed as one indicator over the other does not provide for sufficient evaluation of factors attributing to company's efficiency (Siimann, 2018).

Given the above statement that efficiency cannot be measured using single ratio indicator, a combination of different input and output indicators are thus required to be selected to provide for adequate measure of company efficiency. Further, it is important to arrange the quantitative indicators based on the finality level, matching company's business activities (Siimann, 2018). And, considering indicator's finality and intensity development principle, indicator arrangement order is typically following:

Capital => Resources => Expenses => Revenue => Profit => Cash Flow.

Such arrangement describes business activity of the company in sequential order with the assumption that company first raises capital to obtain resources that will be further expensed to earn revenues, profit, and cash flows. Increasing intensity principle is not violated with such sequencing of the quantitative indicators, as companies are expected to yield more assets than capital employed, revenues growth has to outpace that of expenses for the company to remain efficient, which also implies that profit, being balance of revenues and expenses, is expected to grow faster than revenues of the company (Siimann, 2018).

Considering the afore-mentioned arrangement order, typically, following eight quantitative indicators are chosen to yield company's overall efficiency matrix (Figure 4), which comprises of 28 efficiency elements as a result:

- Average capital (C)
- Average number of employees (E)
- Average assets (A)
- Operating expenses (O)
- Sales revenue (S)
- Earnings before interest and tax expense (EBIT) (P)
- Net operating cash flow (R)
- Free cash flow (F).

Figure 1. 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, p.82)

Nevertheless, despite clear representational format provided by the matrix arrangement, overall efficiency matrix does not provide for single figure as a measure of company's efficiency, a problem growing in complexity in situations where ranking or benchmarking is required, as matrix compiled for one company might result in company showing higher results in select fields, whereas another company might indicate better performance in other elements. Therefore, two overall indicators are calculated, encompassing all the relevant matrix indicators, with first expressing change in efficiency levels (dynamic ranking problem), and second one expressing efficiency level overall (static ranking problem) (Mereste, 1987, p. 248).

Dynamic ranking problem is addressed with calculation of Growth index of company's overall efficiency (GICOE), which involves several steps (Siimann, 2018, p.100):

a) Compiling overall efficiency matrix based on financial information for the period analysed, including period, chosen as base
b) Dividing all the efficiency field elements in the period by the efficiency field elements of the basic year
c) Calculating the GICOE through the application of following formula:

$$GICOE = \sqrt[\frac{n^2-n}{2}]{\prod i_{ij}^{t_{k/t0}}}$$

Where: n – number of quantitative indicators

$i_{ij}^{t_{k/t0}}$ – all index matrix efficiency field elements

Static ranking problem is solved with computation of Benchmark index of company's overall efficiency (BICOE), which requires following steps (Siimann, 2018, p.98):

a) Compiling overall efficiency matrices for all the companies to be analysed for the same period
b) Dividing all the efficiency field elements of company by corresponding field element of the company adopted as a benchmark (typically a market leader or a competitor), yielding comparative matrix
c) Computing BICOE using following formula:

$$BICOE = \sqrt[\frac{n^2-n}{2}]{\prod C_{ij}^{A/0}}$$

Where: n – number of quantitative indicators

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

Computation of GICOE and BICOE indices post initial data arrangement in the matrix layout thus provides for efficiency growth analysis of the companies as well as allows for conducting benchmark analysis of the companies.

From the review of commonly employed financial analysis methods, author concludes that financial performance of the companies and changes therein is primarily analysed through application of methods referred to as vertical and horizontal analysis, financial ratio analysis, as well as component analysis. Nevertheless, these methods do not provide for clear expression of the efficiency level of the company, thus requiring application of efficiency matrix methodology to analyse change in efficiency levels of the companies as well as to analyse efficiency level overall.

2. Comparative analysis of the financial statements

Following thesis sections are dedicated to application of vertical and horizontal analysis of primary financial statements of the companies. Author applies select financial ratios to analyse liquidity, solvency, earnings quality and cash flow sufficiency of the companies as well decomposition of return on capital employed financial ratio to analyse factors affecting returns on employed capital.

2.1. Companies accounting principles comparison and authors modifications to financial statements of the companies

Author analyses companies incorporated in the USA and operating primarily in the USA and adhering to US Generally Accepted Accounting Principles (GAAP).

1. Accounting Standards Updates (ASU) and dataset selection

Author limits dataset to 3–year period to avoid comparability issues arising from ASU implementation by the companies. In the period in scope, several ASUs, issued by Financial Accounting Standards Board, have been retrospectively adopted by both companies. ASUs include Topic 320, affecting cash flow statements in terms of classification of certain cash receipts and payments, Topic 715, applicable to retirement compensations, Topic 220, attributing to comprehensive income on income statements, and Topic 606, applicable to revenue recognition from contracts with customers. Both companies applied ASUs retrospectively in 2018, which results in differences attributing to 2017 figures contained in 2018 report compared to previous year financial statements. Author uses financial data for 2018 and 2017 from 2018 annual report, with 2016 financial data derived from 2016 annual report.

2. PPE and Depreciation accounting method

Companies report property, plant and equipment at cost, and both companies generally use straight-line depreciation methods over assets estimated economic lives. Estimated economic lives reported by the companies is largely the same, with majority of non-current assets having estimated lifetime of 3 to 50 years in case of Verizon and 2 to 50 years in case AT&T. Primary differences in reported values are related to central office equipment lifetime estimates, with AT&T estimate being 3 to 10 years, whereas Verizon estimate reported as 3 to 50 years. Additionally, AT&T, possessing orbital slots and satellites, reports satellite estimated lifetime of 14–17 years.

3. Inventories accounting method

Verizon balance sheets contain inventories as a dedicated item, whereas AT&T reports inventories as a component of Other current assets. Given majority of inventory for both companies comprises of wireless (or wireline) equipment held for sale, the author further amends AT&T balance sheet via expanding current assets group of the balance with the introduction of Inventories position and lowering the other current assets reported values by relevant amount.

4. Intangible assets accounting method

AT&T balance sheets in annual report of 2018 differ from 2017 and 2016 reporting period in relation to intangible assets, with difference being that 2018 reports contain trademarks and trade names as separate item, yet customer lists and relationships are reported as part of other intangible assets item. Reports for 2017 and 2016 periods contain reverse picture. Therefore, author is making amendments with stating trademarks and trade names as well customer lists and relationships items separately out of other intangible assets item.

5. Accounts payable accounting method

Both companies report accounts payable combined with accrued liabilities (accrued payroll, expenses, current employee benefit obligations, accrued taxes, etc). Given that accounts payable figures are required for activity ratio calculations, author is making amendments to accounts payable and accrued liabilities position of the balance with including accounts payable separately and balance added to other current liabilities position.

6. Dividends payable accounting method

Verizon balance sheets contain dividends payable included in other current liabilities position, where as AT&T states these separately. Author modifies Verizon balance sheets in a way where dividends payable is moved to a separate position, with other current liabilities adjusted by subtracting dividends payable amount.

7. Operating revenues accounting method

Operating revenues reported by companies include other revenues incorporated in the service revenues reported.

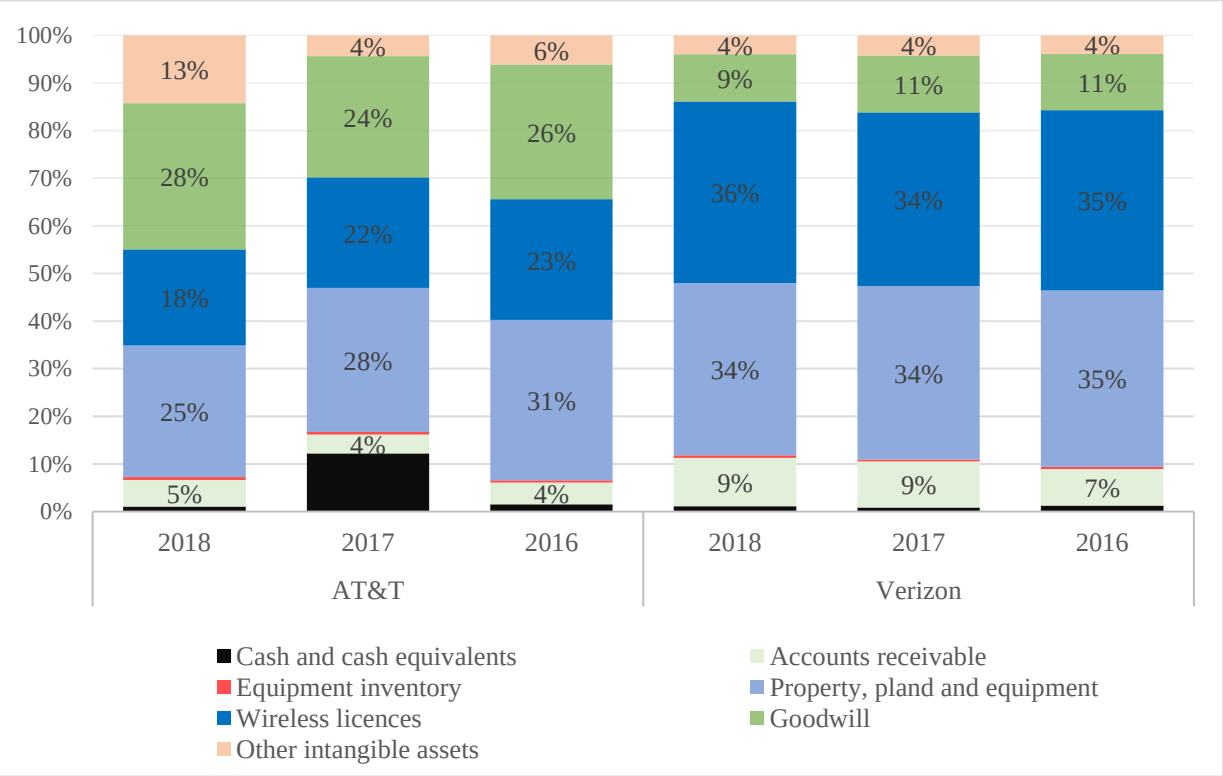
Author concludes that despite smaller initial differences in the company annual reports, employed amendments allow to make companies' financial statements usable for comparative analysis.

2.2. Vertical analysis of the companies' financial statements

2.2.1. Vertical analysis of the balance sheets

Vertical analysis of companies' balance sheets reveals that the assets structure of both the companies is comparable in general. AT&T current assets represented 9–18% and Verizon current assets represented 9-13% of total assets. Non-current assets represented 82–91% and 87–91% of the total companies' assets (Appendix 5 and 6). Assets structure, leaning in the favour of non-current assets is understandable, given both companies need to maintain specialized infrastructure comprising of network equipment and data processing facilities. Property, Plant and Equipment (PPE) of the companies represents 25–31% and 34–35%, as well as licenses representing 18–23% and 34–36% of total assets of AT&T and Verizon (Figure 2).

Figure 2. AT&T and Verizon assets structure 2016–2018, end of year data

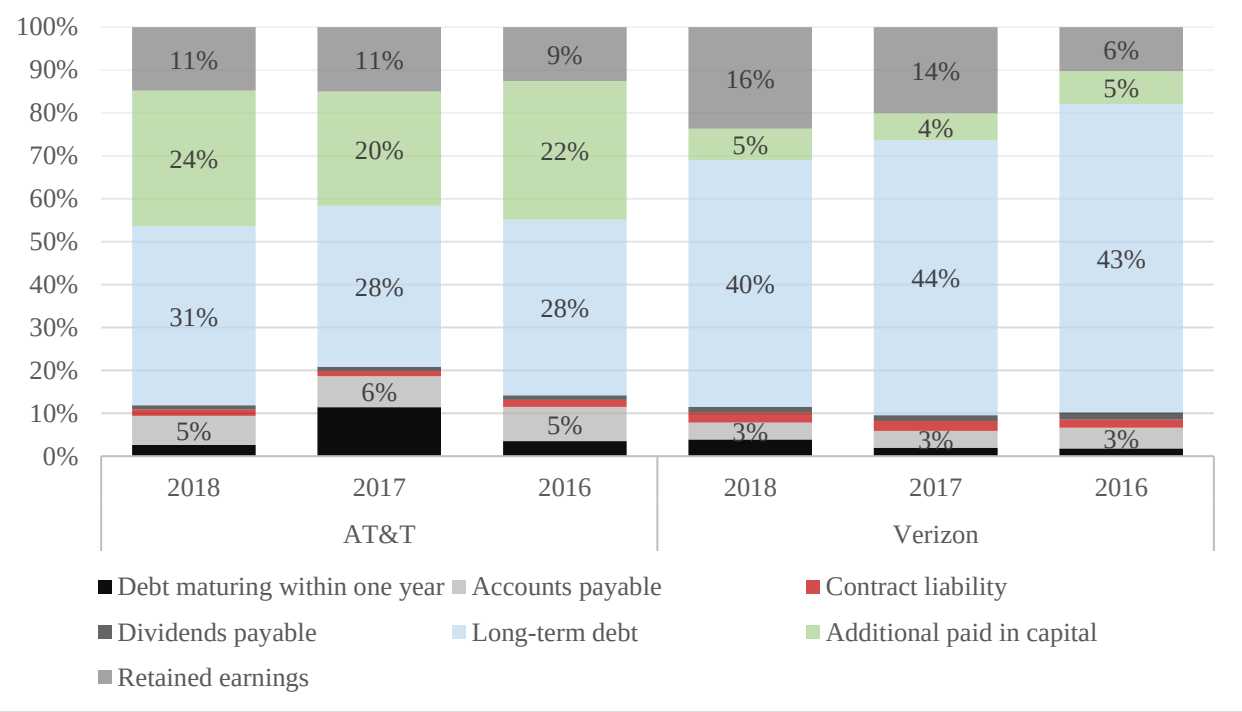


Source: Compiled by author based on data in appendix 1 and 2

AT&T carries roughly two times higher amount in goodwill, compared to its peer – Verizon (Figure 2). 2018 increase in goodwill item to 28% of total assets in the case of AT&T is caused by acquisition of Time Warner Cable. Acquisition also explains the cash item rise of AT&T. Apart from this one-timer, cash and cash equivalent holdings of either the company has remained around one percent of total assets. Verizon balance sheet reveals that accounts receivable represents a higher proportion of the current assets of 5%–9% compared to 4%–5% of AT&T (Appendix 5 and 6), growing throughout observed period due to changes to device payment plan enacted in 2016.

AT&T more conservative approach to debt financing, and Verizon using higher proportion of debt financing, where equity represented 31–36% of liabilities and equity total on the AT&T books throughout the period, compared to just 7–21% percent in the case of Verizon (Figure 3). The latter suggests risks, though higher returns on equity through amplification offered by leverage.

Figure 3. AT&T and Verizon Liabilities and Equity structure 2016–2018, end of year data



Source: Compiled by author based on data in appendix 1 and 2

Rapid decrease in liabilities proportion in the case of Verizon is enactment of the 2017 tax reform, resulted in deferred income tax position decrease from 19% to 12% relative to the total liabilities

and equity of Verizon. AT&T being favourably affected by same act, reported deferred tax obligations decline from 15% to 10%, and total deferred credits and long-term obligations have contracted from 27% to 21% for AT&T in 2017 and 35% to 26% in case of Verizon (Appendix 5 and 6). Issuance of long-term debt and recognition of Time Warner debt in 2018 did not decrease long-term liabilities for AT&T in 2018. Another reason behind liabilities proportion decrease (Figure 3), is discretionary financing of postemployment benefits by both AT&T and Verizon.

With either the company reporting higher proportion of revenues translated into net profit, retained earnings item is another significant contributor behind equity proportion of the balance growth. Both companies issued shares in 2018 to finance acquisitions, explaining growth in equity item group (Figure 3).

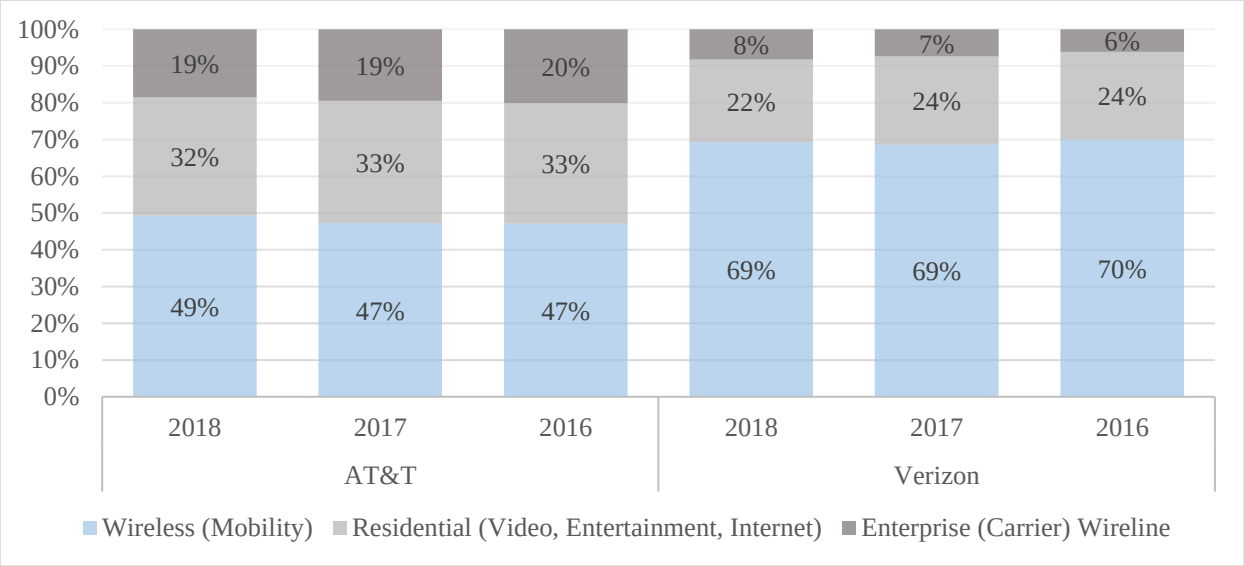
Conclusively, the author would claim that companies balance sheets are similar in the structure of assets as well as both companies report similar changes to balance sheets post federal tax reform. Differences lie within higher valued goodwill in case of AT&T in comparison to Verizon, as well as attributing to companies financing policies, with Verizon liabilities constituting up 93% in the period (Appendix 5 and 6). Higher financial leverage implied from common size balance sheets should also signal higher returns on investments into equity, yet higher return amplification is, higher is the loss, thus making Verizon more attractive to investors possessing higher risk-tolerance (Nissim, Penman, 2003).

2.2.2. Vertical analysis of the income statements

Majority of revenue recognized is coming from services rendered to the customers (Appendix 3 and 4). Where AT&T revenue figures split between services and equipment remains quite constant, Verizon revenue proportions indicate noticeable changes in the period observed, with equipment revenue being 17% in 2018, while remaining at 14% mark in 2016 (Appendix 7 and 8). This is explained by higher priced units share increase in devices sold mix.

Figure 4 shows revenue by segment and reveals proportions remain stable. AT&T proportion of residential video, Internet and entertainment segment is significantly larger compared to Verizon, which is explained by AT&T offering satellite video services with 19.2 million subscribers (AT&T, 2019), on the contrary to Verizon.

Figure 4. AT&T and Verizon, Revenue by segment 2016–2018, end of year data



Source: Appendix 21, compiled by author

AT&T total operating expenses have remained 83–88% of total revenue and that of Verizon remained 75–83% throughout the period. In case of AT&T, changes in operating expenses item have been caused primarily due to increase of broadcast and programming expenses position attributing to DIRECTV acquisition in 2015 and higher content costs in subsequent years. Additionally, operating expenses totals represented a higher value proportionally to the revenues in 2017 (Appendix 7 and 8) due revenues decline, with cause being reported as continued decline in legacy wireline and lower wireless revenue caused by increase in unlimited plans. As for the 2018 values, retrospective application of accounting standard update (ASU 2017-07, topic 715), causing reclassification of certain expenses no longer as a part of operating expenses, but other income (expense), being one of the major factors behind operating expenses proportion contraction from 87% to 85% of revenues (Appendix 7).

Total operating expenses of Verizon remained stable in 2017, yet in 2018 Verizon reported goodwill impairment charge in the magnitude of 4.6 billion USD, which brought total operating expenses to 83% of the total operating revenues (Appendix 8).

Interest expenses item for Verizon remained stable at around 3.4–3.7% of total revenues, where as AT&T reported interest expenses in the range of 3–5% of total revenues (Appendix 7 and 8), with higher values in 2017 and 2018 associated with debt financing of Time Warner acquisition.

Finally, tax reform resulted in massive gains with income tax provisions for 2018 staying below 3% for both companies compared to 4% and 6% percent of revenues in 2016.

Conclusively, it can be claimed that Verizon reports significantly lower operating expenses proportionally to revenues, translated into proportionally higher net profit, implying better expense control and higher returns on investments, especially considering amplification due to financial leverage. AT&T strength remains higher diversity of the service segments, with Verizon indicating strong dependency on wireless segment revenues.

2.3. Horizontal analysis of the companies' financial statements

2.3.1. Horizontal analysis of companies' balance sheets

AT&T balance has been most impacted by Time Warner deal and delays due to legal action, causing changes to assets item group, as well as liabilities. 2017 cash position prior the acquisition appears eight times higher than in 2016 with acquisition further explaining 60.2% increase in accounts receivable (Table 2).

Table 2. AT&T and Verizon, change in current assets (items in USD million):

	AT&T			Verizon		
	December 31,			December 31,		
	2018	2017	2016	2018	2017	2016
Cash and cash equivalents	5,204	50,498	5,788	2,745	2,079	2,880
Growth, %	-89.7%	772.5%	-	32.0%	-27.8%	-
Accounts receivable	26,472	16,522	16,794	25,102	23,493	17,513
Growth, %	60.2%	-1.6%	-	6.8%	34.1%	-
Total current assets	51,427	79,146	38,369	34,636	29,913	26,395
Growth, %	-35.0%	106.3%	-	15.8%	13.3%	-

Source: Appendix 1 and 2, compiled by author

Verizon's cash position has decreased in 2017, primarily due to higher cash outflows related with Yahoo and XO acquisitions and higher volume of long-term debt repayments made. 2018 brought cash position increase of 32%, which has been caused by earnings growth, decline in income tax as well as lower discretionary contributions to employee benefit program (Table 2).

Verizon device payment plans enacted in 2016 is the primary factor behind accounts receivable position growing 34.1% 2017, with 2018 reports indicating further 6.8% growth. With this being not favourable sign, Verizon implements controls in relation to device payment plans, transferring receivables under the program to special purpose remote entities and selling these further under special receivables purchase agreements with banks. Similar control is also implemented by AT&T.

Table 3. AT&T and Verizon, change in non-current assets (items in USD million):

	AT&T			Verizon		
	December 31,			December 31,		
	2018	2017	2016	2018	2017	2016
PPE	131,473	125,222	124,899	89,286	88,568	84,751
Growth, %	5.0%	0.3%	-	0.8%	4.5%	-
Goodwill	146,370	105,449	105,207	24,614	29,172	27,205
Growth, %	38.8%	0.2%	-	-15.6%	7.2%	-
Total non-current assets	480,437	364,951	365,452	230,193	227,230	217,785
Growth, %	31.6%	-0.1%	-	1.3%	4.3%	-

Source: Appendix 1 and 2, compiled by author

Time Warner deal explains 38.8% growth in goodwill and 5% growth in PPE of AT&T in 2018 and primarily explains 31.6% increase in total assets through recognition of intangibles (Table 3).

Verizon did not undertake acquisitions in the amount comparable to AT&T, yet it is still acquisitions and also divestures explaining changes in non-current assets related items of the balance, occurred in 2017 with total non-current assets increasing 4.3% and PPE with goodwill positions growing 4.5% and 7.2% due to Yahoo and XO acquisitions (Table 3). In 2018 Straight Path acquisition caused wireless licenses position 6.5% increase. At the same time, goodwill impairment of Verizon Media, bringing goodwill down 16%, offset licences-caused increase, causing 1.3% growth of total non-current assets (Table 3).

Acquisitions had effect on items in liabilities items of AT&T in 2017 and 2018. Total current liabilities have decreased 21% in 2018, whereas 2017 total current liabilities grew 60.9% (Table 4). Both changes are primarily caused by issuance of debt for Time Warner, which resulted in debt, maturing in one year, item to surge 290% and mandatory redemption of same debt in 2018 due to delay in closing the deal, explaining the decline of 21% in 2018 (Appendix 5). Said deal explains long-term debt item increasing 32%.

Table 4. AT&T and Verizon, change in liabilities (items in USD million):

	AT&T			Verizon		
	December 31,			December 31,		
	2018	2017	2016	2018	2017	2016
Total current liabilities	64,420	81,389	50,576	37,930	33,037	30,340
Growth, %	-20.8%	60.9%	-	14.8%	8.9%	-
Total liabilities	337,980	302,090	279,711	210,119	212,466	220,148
Growth, %	11.9%	8.0%	-	-1.1%	-3.5%	-

Source: Appendix 1 and 2, compiled by author

Number of outstanding shares increase due to TimeWarner deal is behind the dividends payable increase of 26% (Appendix 5). Further, balance sheet has been favourably impacted by tax reform in 2017, with deferred tax obligations falling 28%, yet 2018 acquisition brought increase in same position of 34%, with higher asset base, subject to depreciation, being the reason behind (Appendix 5).

Total current liabilities of Verizon growth of 8.9% is driven by increase in customer prepayments in 2017 (Appendix 6). Further, Verizon raised 32 billion USD in long-term debt in 2017, with 24 billion of these proceeds having been used to redeem prior long-term obligations, thus total long-term debt position has grown 8%. Remaining total non-current liabilities have contracted 22% (Appendix 6) due to deferred tax remeasurement, which also allowed company to make higher discretionary payments related to employment benefit obligations. These factors explain the total liabilities decrease of 3.5% in 2017 (Table 4).

In 2018, Verizon focused on debt repayments, with long-term borrowings proceeds, directed at making repayments of prior long-term borrowings, bringing long-term indebtedness decrease of 7%. Less long-term debt, total non-current liabilities increased by less than one percent, due to Verizon continuing funding of employment benefit obligations. Nevertheless, total current liabilities increased 15%, with has been almost solely driven by 108% increase in debt, maturing within one year (Appendix 6).

Tax reform has found its reflection in equity items, with both companies growing retained earnings – 45.4% and 16.3% growth in case of AT&T and 136.6% and 22.2% growth for Verizon (Table 5).

Table 5. AT&T and Verizon, change in Common Shareholder's equity (items in USD million):

	AT&T			Verizon		
	December 31,			December 31,		
	2018	2017	2016	2018	2017	2016
Additional paid-in capital	125,525	89,563	89,604	13,437	11,101	11,182
Growth, %	40.2%	0.0%	-	21.0%	-0.7%	-
Retained earnings	58,753	50,500	34,734	43,542	35,635	15,059
Growth, %	16.3%	45.4%	-	22.2%	136.6%	-

Source: Appendix 1 and 2, compiled by author

Settlement of acquisitions required issuance of shares, increasing additional paid-in capital item by 36.5% for AT&T and 21% in case of Verizon in 2018.

To conclude, companies' reports indicate dynamics, mainly arising from tax reform resulting in substantial deferred tax position re-estimation as well as retained earnings growth, which has been one of the primary factors behind liabilities contraction and equity share increase in the balance sheets. This also implies Verizon's financial leverage declined. Considering company's previous financing policy, resulting in equity representing 7% of total item group and thus being quite risky, such dynamics are rather positive. This strongpoint is however offset by faster growth in accounts receivable item, primarily through handset payment plan offerings by Verizon.

Debt financing of Time Warner acquisition, which resulted in 38.8% increase in goodwill (Table 3), would make one eager to read company's management forecasts and expectations towards Time Warner acquisition, as such significant increase in assets will certainly find it's reflection in returns on assets ratio, potentially making this rather an underperforming investment, something typical for companies reporting high asset growth (Mauldin, 2008).

2.3.2. Horizontal analysis of companies' income statements

Companies' performance pattern remains similar from changes in total operating revenues perspective.

Table 6. AT&T and Verizon, change in total operating revenues (item in USD million):

	AT&T			Verizon		
	2018	**2017**	**2016**	**2018**	**2017**	**2016**
Total operating revenues	170,756	160,546	163,786	130,863	126,034	125,980
Growth, %	6.4%	-2.0%	-	3.8%	0.0%	-

Source: Appendix 3 and 4, compiled by author

In 2017, 2% decrease in total operating revenues of AT&T (Table 6) is explained through contraction in legacy wireline services as well as increased adoption of unlimited cellular plans and decline in amount of satellite video connections, that could not be offset by increases in other revenue sources. 2018 brought 6.4% increase in total operating revenues primarily due to the acquisition of Time Warner, followed by increase in advertising segment due to increased political advertising. These two factors offset decrease offered by mobile, entertainment and business segments, where causes behind were different – decrease in mobile segment being caused by adoption of new accounting policy of not including universal service fees in revenues, whereas entertainment as well as business segments continued to be haunted by lower demand towards legacy service offerings.

In case of Verizon, 2017 brought stand-still in total operating revenues (Table 6), which is explained by contraction in service revenues, with position falling 1%, as an outcome of introducing unlimited wireless pricing plans earlier and continued customer migration. Rising equipment revenues, growing around 8% (Appendix 8) due to increase in wireless device pricing in the sales mix, more than compensated for this decline. Unlimited wireless pricing plans were additionally offset by increase in revenues from wireline segment due contribution by acquired XO business.

Table 7. AT&T and Verizon, change in total operating expenses (item in USD million):

	AT&T			Verizon		
	2018	**2017**	**2016**	**2018**	**2017**	**2016**
Total operating expenses	144,660	140,576	140,243	108,585	98,609	96,731
Growth, %	2.9%	0.2%	-	10.1%	1.9%	-

Source: Appendix 3 and 4, compiled by author

Operating expenses in 2018 period have grown compared to 2016 for both companies (Table 7). Dynamics year-to-year have been different, with AT&T reports showing increase in total operating expenses of 0.2% and 2.9%, respectively. 2017 increase of 0.2% is primarily due to management attention towards cost management and lower marketing costs explaining other cost of services and SGA decrease of 1.7% and 3.7% (Appendix 7), as well as depreciation and amortisation expenses declining 5.6% following re-estimation of useful lives as well as some assets becoming fully depreciated. Decreases have been offset by growth in broadcast and operations expenses position of 6.6% as well as several times higher asset abandonment expense (Appendix 7) in 2017 due to abandonment of copper network infrastructure segments. Acquisition of Time Warner is the major factor behind the expenses increase in 2018, as well as equipment costs increase, attributing to wireless devices, also contributed to overall expenses increase. In total, operating expenses have grown 2.9% in the 2018 period.

Verizon total operating expenses increased 1.9% in 2017 (Table 7), caused by decline in SGA expenses, due lower pension charges recorded and recognition of gain on divesture of datacentres not compensating 6.4% increase in depreciation expenses (Appendix 8) introduced by acquisitions of Yahoo and X.O businesses. 2018 reporting period, however, brought 10.1% increase total operating expenses. Primary factor behind is goodwill impairment recognition, (Appendix 8), yet all the remaining operating expenses items increased as well – 4.1% growth in cost of services, following higher rental costs in wireless network and acquisition of Yahoo, 5.3% growth in equipment costs due to higher priced handheld devices sales and 2.6% increase in amortisation expenses due to growth in the assets base.

Changes in revenues and expenses brought operating profit changes for AT&T – revenue contraction of two percent explaining the 15.2% decline in 2017 (Table 8), and increase in revenue as well as retrospective application of accounting standard update (ASU 2017-07, topic 715), causing reclassification of certain expenses no longer as a part of operating, but other expense,

explaining 30.7% growth in operating profit in 2018. AT&T interest expenses grew steadily 2016–2018, having grown 28% and 26%, due issuance of debt for Time Warner acquisition along with overall financing costs and recognition of higher interest expense on notes, issued by Time Warner.

Table 8. AT&T and Verizon, change in Operating and Net profit (items in USD million):

	AT&T			Verizon		
	2018	**2017**	**2016**	**2018**	**2017**	**2016**
Operating profit	26,096	19,970	23,543	22,278	27,425	29,249
Growth, %	30.7%	-15.2%	-	-18.8%	-6.2%	-
EBT	24,873	15,139	19,812	19,623	20,594	20,986
Growth, %	64.3%	-23.6%	-	-4.7%	-1.9%	-
Net profit	19,953	29,847	13,333	16,039	30,550	13,608
Growth, %	-33.1%	123.9%	-	-47.5%	124.5%	-

Source: Appendix 3 and 4, compiled by author

AT&T earnings before the income taxes has been most significantly impacted in 2018 by changes in net other income position, with half attributing to actuarial gains recorded. Applied to operating profit, interest expenses as well tax reform explain the substantial changes observed in AT&T net profit, occurring in between 2018 and 2017 versus 2017 and 2016 reporting periods (Table 8).

Verizon 2017 revenues staying on par with 2016, higher total operating expenses caused 6.2% decline in operating profit (Table 8). Goodwill impairment almost fully offset growing revenues in 2018, and, followed by growth in overall operating expenses, caused total operating profit decline of 18.8%. Pre-tax earnings have been further affected by changes in other income throughout the period, where Verizon recorded losses associated with early debt redemptions. Redemptions being 0.7 and 2.0 billion USD in 2018 and 2017, as well as 2.1 billion USD worth of pension benefit credits recorded in 2018 (Appendix 8), explain the dynamics in this item as well as changes in pre-tax income item, with latter declining 1.9% and 4.7 % in 2017 and 2018.

Verizon reported income tax benefit in 2017 compared to provisions seen in 2016 and 2018 reporting periods (Appendix 8). Lower (21%, starting from 2017) statutory tax rate explains the lower tax provision compared to prior periods as well as changes in net profit reported by Verizon (Table 8).

Conclusively, based on observing dynamics throughout the period, AT&T has been beaten by Verizon in terms of expenses control, however based on dynamics in revenues and net profit,

AT&T looks stronger, with revenue and net profit items showing stronger upward trend compared to Verizon.

2.4. Analysis of long- and short-term liquidity, earnings quality and cash flow sufficiency of the companies

In this section of thesis, author is analysing financial strength of the companies with application of conventional as well as cash based financial ratios.

2.4.1. Analysis of long- and short-term liquidity of the companies

Liquidity refers to capability of the company to maintain its outstanding liabilities, i.e. capability of the company to generate enough cash inflows to meet cash outflows (Elaine Henry et al. 2011). Companies must maintain adequate buffers or reserves in case cash, generated by the company, can no longer cover outflows, thus liquidity also refers to company's capability to realise current assets, obtaining cash to maintain short-term liabilities. Liquidity analysis is typically done employing a system of liquidity financial ratios. Author further employs current ratio and quick (acid-test) ratios to evaluate short-term liquidity of the companies and using equity-to-assets as well debt-to-equity ratios to assess long-term solvency.

Current ratio is widely accepted measure of liquidity due to its simplicity and immediate availability of input data, measuring capability of the company to cover its current liabilities. Considering formula uses total current assets, this ratio can also provide for estimating adequacy of reserves in case non-cash assets must be disposed following cash inflows getting impaired, forcing company to utilize reserves.

Total current assets also include inventories in the case of the companies in scope. Inventories, however, are generally considered less-liquid assets with uncertainties in valuation – in fact, either the company takes a note that inventories are values at either the lower of cost or net realizable value. To counter for inventory valuation uncertainties, another type of ratio, that excludes less liquid current assets, can be used, referred to as quick or acid-test ratio (Gibson, 2009).

Current ratios of the companies have grown from their 2016 values – from 0.76 to 0.80 and 0.87 to 0.91 in case of AT&T and Verizon (Table 9).

Table 9. AT&T and Verizon, current and quick ratios:

	AT&T			Verizon			Industry average		
Solvency ratio	**2018**	**2017**	**2016**	**2018**	**2017**	**2016**	**2018**	**2017**	**2016**
Current ratio	0.80	0.97	0.76	0.91	0.91	0.87	1.02	1.05	1.01
Quick ratio	0.76	0.95	0.72	0.88	0.87	0.83	0.77	0.90	1.00

Source: Appendix 12 and 22, compiled by author

AT&T current ratio increased to 0.97 in 2017 due to almost eight-fold increase in cash position in anticipation of Time Warner acquisition. With merger commencing in 2018, company held 80% less cash, which, although partially offset by reduction in current liabilities, caused ratio contraction to 0.80. Verizon current ratio improved in 2017 due to current assets growth outpacing growth in liabilities, yet 2018 ratio staying on par with 2017 should be taken with some degree of salt due Topic 606 update resulting in adjustment in prepaid expenses position, causing current assets to outpace growth in current liabilities. Compared to industry peers (Table 9), both companies' current ratios stayed below industry average in the range of 1.01–1.05, signifying that either the company may have difficulties meetings its current obligations, with Verizon having a higher and more favourable ratio value compared to AT&T.

Less inventories, same pattern is visible through changes in quick ratio values for the period with quick ratios changing on the background of above-mentioned input factors from 0.72 to 0.76 and from 0.83 to 0.88 in 2016 and 2018 for AT&T and Verizon (Table 9). In comparison with industry peer's perspective, quick ratios are more in line with industry average in the range of 1.00-0.77. With generally 0.80-1.00 being considered favourable or optimal figures, it can also be concluded that companies' acid test ratios remain either optimal or close to optimal values.

Equity to assets ratio shows the proportion of company's assets that are financed by equity shareholders to the total assets of the company. Higher values signify more conservative funding of the company assets, with higher amount of assets being financed with shareholders equity compared to debt financing. Both AT&T and Verizon equity to assets ratio immediately indicate that companies rely primarily on debt financing to finance assets, with shareholders owning 0.31–0.36 and 0.10–0.21 stake in assets of AT&T and Verizon (Table 10).

Table 10. AT&T and Verizon, solvency ratios:

Solvency ratio	AT&T			Verizon			Industry average		
	2018	2017	2016	2018	2017	2016	2018	2017	2016
Equity to assets	0.36	0.32	0.31	0.21	0.17	0.10	0.31	0.26	0.20
Debt to equity	1.62	1.87	1.93	3.64	5.46	9.32	1.15	1.1	0.94
Interest coverage	4.13	3.40	5.04	5.06	5.35	5.80	1.66	0.51	1.22

Source: Appendix 12 and 22, compiled by author

Judging by 0.10 equity to assets ratio in 2016, Verizon's asset financing has been especially loose, though it has also significantly improved in the period under study (Table 10). Both companies' ratio has grown, with growth rate in equity items outpacing that of the liabilities (Appendix 5 and 6). The latter is primarily explained by higher retained earnings following 2017 federal tax reform, shares issuance for acquisitions, and not due to debt repayments, thus allowing to conclude that both companies signal risks due to significant reliance on debt financing.

Debt to equity is another liquidity ratio, comparing debt of the company to company's shareholder equity, with higher values of this ratio having reverse meaning compared to equity to assets ratio values, as higher values in debt to equity signifying lower reliance on investor financing in the company. Here, same primary factors mentioned above have also found reflection on ratio values (Table 10). Compared to industry average, companies represent heightened risks to investors, with Verizon ratio values being significantly higher than industry averages.

Author additionally considers interest coverage ratio as a measure of capability of the companies to ensure interest payments. For both companies, this ratio has contracted in the observed period, from 5.04 to 4.13 and 5.80 to 5.06 (Table 10), yet with different factors behind – AT&T reporting higher debt balance related to Time Warner acquisition, whereas Verizon 2018 decline being largely induced by goodwill impairment. Nevertheless, decrease in interest coverage is generally not considered to be favourable, being an indicator of weaker solvency. Comparing companies to industry average (Appendix 22), both companies are close or overperforming their industry peers, and it can be concluded that companies can afford interest payments, having funds left to maintain repayment of principle on the debt.

To conclude, author has arrived at rather unexpected results. Where balance sheets indicated rather loose financing policy in Verizon's case, financial ratio analysis revealed the contrary picture, with Verizon showing higher solvency, suggesting that company financing policy is rooted in

amplifying investors gains. AT&T on the contrary, seems to be underperforming despite having previously expected stricter financing policy, showing weaker short-term liquidity than its peer.

2.4.2. Analysis of earnings quality and cash flow sufficiency of the companies

Earnings quality reflects the proportion of earnings that has been actualized in cash and provides a measure of earnings quality from the perspective of being consistent, i.e. sustainable and occurring repeatedly rather one being offset by one-time events and controllable, i.e. stemming from application of conservative accounting policies (Gullett et al. 2018). Author is further using cash flow margin and earnings quality ratios to assess companies' earnings quality.

Table 11. AT&T and Verizon, Earnings quality and Cash Flow margin

	AT&T			Verizon		
Ratio	**2018**	**2017**	**2016**	**2018**	**2017**	**2016**
Earnings quality	1.67	1.90	1.63	1.54	0.89	0.74
Cash flow margin	25.5%	23.7%	23.5%	26.2%	19.3%	17.2%

Source: Appendix 12, compiled by author

AT&T indicated higher earnings quality than Verizon (Table 11), signifying more conservative and consistent revenue recognition, with noticeable fluctuation in value occurring in 2017, an outcome of decrease in deferred fulfilment costs, whereas ratio values for Verizon reveal that only 89% and 74% of operating profit in 2017 and 2016 actualized in net cash from operating activities. This is primarily explained by changes in device payment plan receivables reports in 2016, whereas 2017 brought discretionary employment benefit payment by Verizon (Appendix 10). Lower statutory tax rate and lower discretionary contributions to employment benefit program in 2018, however, have caused earnings quality increase to the level on par with AT&T.

From the perspective of cash flow margin, the situation is no better for Verizon – one-time actions mentioned above have found their reflection in lower cash flow margins (Table 11), with Verizon indicating lower than 20% margin compared to 23.5–25.5% that of AT&T. Beside one-timers, Verizon reports similar to AT&T amount of cash tied in accounts receivable (Appendix 1 and 2), which, coupled with lower sales revenue, suggests longer payment terms granted to customers, and, thus lower efficiency in the form of less cash dollars generated in operations per sales dollars (Kajananthan, Velnampy, 2014). Higher cash flow margin in 2018 is, unfortunately, also primarily explained by goodwill impairment and less so by decrease in pace of growth in accounts receivable in 2018, allowing to make conclusion that Verizon is less efficient in cash collection from sales.

Cash flow sufficiency refers to company's ability to maintain adequate cash flows, required to meeting company's demands in relation to primary obligations in form making repayments of long-term debt, dividend payments as well maintaining operations through acquiring long-term assets (Güleç, Bektaş, 2019). Author further employs several financial ratios to analyse cash flow sufficiency of the companies, starting with cash flow sufficiency ratio, which is essentially a measure of amount of cash, provided by operating activities, available for company's discretionary use (Koen, Oberholster, 1999). Additionally, author compares cash flow provided by operating activities with long-term debt repayments, dividend payments as well as capital assets acquisitions undertaken by companies separately.

Table 12. AT&T and Verizon, cash flow sufficiency ratio:

Ratio	AT&T			Verizon		
	2018	2017	2016	2018	2017	2016
Cash flow sufficiency	0.50	0.84	0.87	0.84	0.48	0.48
Long-term debt repayments	1.21	0.32	0.28	0.42	1.00	0.88
Dividend pay-out	0.31	0.32	0.31	0.28	0.39	0.43
Reinvestment	0.48	0.54	0.56	0.49	0.71	0.79
Depreciation write-off	0.74	0.72	0.68	0.64	0.70	0.73

Source: Appendix 12, compiled by author

Based on cash flow sufficiency ratio value being below 1.0 (Table 12), neither the company can generate cash flows, sufficient enough for making debt repayments as well purchase long-term assets and make dividend payments combined.

Reasons for this is quite common for both companies – significant long-term debt repayments in case of Verizon – constituting 88–100% of cash provided by operating activities in 2017 and 2016 (Table 12). With no cash provided by financing activities in either the year, Verizon has been diverting majority of proceeds from long-term borrowings to repay long-term debt outstanding. AT&T standing has been better in 2017 and 2016, with long-term debt repayments representing 28–32% of cash, provided by operating activities (Table 12). Abrupt increase to 121% in 2018 is due to Time Warner deal, with more 21 billion USD out of 52.6 billion USD in long-term debt repayments (Appendix 9) being mandatory redemption of notes due to delays in said deal.
Another major driver for cash flow sufficiency ratio values staying below 1.0, is significant cash, diverted for capital expenditures remaining in the range of 48–56% for AT&T and 49–79% of cash flow, provided by operating activities in case of Verizon (Table 12). 2018 values improved as an

outcome of higher revenues contributed by Time Warner in case of AT&T, coupled with easing tax burden. Verizon, favourably affected by tax reform, additionally reported working capital improvements as well as reduction in discretionary payments to benefit programs, allowing it to report higher cash flows, provided by operations (Appendix 10). Additional impact to reinvestment ratio has been caused by application of "Business Excellence" initiative by Verizon, being the major reason of more than 500 million USD decline of capital expenditures, primarily in wireless segment.

Nevertheless, despite continuous significant spending on capital assets, depreciation write-off ratio values stay higher than reinvestment ratio values in case of AT&T (Table 12), implying that better cash flow sufficiency in 2017 and 2016 has not been rooted in AT&T performance superiority over Verizon, but in fact in lower pace of asset replacement, as in the case of company, aiming to maintain its asset structure, reinvestment ratio has to continuously beat depreciation write-off ratio (Koen, Oberholster, 1999).

Conclusively, it can be claimed that AT&T has higher earnings quality as well as higher cash flow margins compared to its peer, that has been affected by various one-time events in the period under study. However, AT&T financial performance cannot be claimed being superior to its peer based on cash flow sufficiency metrics, as judging by more specific cash flow sufficiency ratios, author considers this to be a product of longer term debt payments as well as lower reinvestment compared to Verizon.

2.5. Analysis of return on capital employed

Author is decomposing ROCE into following component ratios – Assets to capital employed, Assets turnover and EBIT margin (Appendix 11).

Verizon is earning higher returns on capital employed, with ROCE staying in the range of 14.8–19.5%, compared to AT&T's 7.7–9.9% in the period observed (Table 13). Nevertheless, Verizon's ROCE value has contracted throughout the period.

Table 13. AT&T and Verizon, ROCE decomposition:

				Absolute Change		**Relative Impact**	
AT&T	**2018**	**2017**	**2016**	**2018/2017**	**2017/2016**	**2018/2017**	**2017/2016**
Assets to capital	1.44	1.53	1.62	-0.45%	-0.6%	-22.8%	25.3%
Assets turnover	0.35	0.38	0.41	-0.55%	-0.6%	-28.2%	28.9%
EBIT margin	0.19	0.13	0.15	2.96%	-1.0%	151%	45.8%
ROCE	9.7%	7.7%	9.9%	2.0%	-2.2%	100%	100%
Verizon	**2018**	**2017**	**2016**	**2018/2017**	**2017/2016**	**2018/2017**	**2017/2016**
Assets to capital	1.58	1.71	1.88	-1.23%	-1.82%	51.5%	79.0%
Assets turnover	0.50	0.50	0.52	-0.04%	-0.45%	1.8%	19.6%
EBIT margin	0.19	0.20	0.20	-1.12%	-0.03%	46.7%	1.4%
ROCE	14.8%	17.2%	19.5%	-2.4%	-2.3%	100%	100%

Source: Appendix 13 and 14, compiled by author

AT&T ROCE has contracted by 2.2% in 2017 and then has grown 2% in 2018, with major relative impact of 45.8% and 151% being changes in EBIT margin – 1% decline and 3% increase in 2017 and 2018. EBIT margin decline in 2017 is primarily explained via 2% decline in total operating revenues, caused by decrease in legacy wireline and voice, as well as satellite video services not being offset by increases in other services rendered. 2018 increase is primarily an outcome of Time Warner starting to contribute revenue.

Second to EBIT margin in relative impact size, decline in assets turnover ratio, impacting ROCE by 0.6% and 0.55% in 2017 and 2018 resulted in 28.9% and 28.2% relative impact on ROCE of AT&T (Table 13). Revenue declining 2% in 2017 reflected in assets turnover ratio, with effect further amplified by almost eight-fold increase in cash item in anticipation of closing the Time Warner merger. Deal commenced in 2018, with AT&T recognizing property and intangibles causing total assets growth of almost 20% (Appendix 5), which could not have been offset by

revenues growth of 6% (Appendix 7), causing continued decrease in assets turnover ratio – from 0.38 to 0.35.

Decline in Assets to Average capital employed had the least impact on AT&T's ROCE, with relative impact being 25.3% and 22.8% in 2017 and 2018 (Table 13). Where in both years share of liability and equity item groups in assets financing increased, causing decline in the ratio value, reasons for changes are different – in 2017, it is primarily abrupt increase in interest-bearing liabilities, where AT&T reported almost three-fold increase in short-term debt due to notes having mandatory redemption date in 2018, as well as increase in long-term debt. In 2018, major effect on said is caused by recognition of carry-over debt from Time Warner deal as well as growth in total shareholders' equity item group (Appendix 5), primarily due to issuance of shares in connection to acquisition deal.

Changes in ROCE have been driven differently in case of Verizon. EBIT margin change had lowest relative impact of 1.4% in 2017 (Table 13), with major relative impact of 79% on ROCE or ROCE decline by 1.82%, caused by decrease in Assets to Average capital ratio. Cause is primarily growth in retained earnings item on the balance post deferred tax obligations remeasurement. Relative impact on ROCE of around 20% or decline by 0.45% has been caused by decrease in assets turnover ratio from 0.52 to 0.50 (Table 13). Primary cause are revenues staying on par with previous year due to equipment revenue increase outpacing contraction in service revenues, followed by growth in device payment plan receivables and various tangible and intangible non-current assets recognized from acquisitions in the period.

In 2018, Verizon's ROCE continued to contract, declining 2.4% (Table 13). Assets to capital remained major reason, declining from 1.71 to 1.58 and causing ROCE decline of 1.23%, representing 51.5% relative impact. This is caused by continued growth in retained earnings item as well as shares issuance in relation to Straight Path acquisition (Appendix 6). In 2018, contraction in EBIT margin from 0.20 to 0.19 rose as a second major contributor to ROCE, causing ROCE to decline by 1.12% and representing 46.7% relative impact on total change in ROCE, with primary reason being goodwill impairment.

Conclusively, AT&T remains weaker than Verizon from the perspective of ROCE being lower than that of its peer. Verizon ROCE declined in the period, which has been driven by external factors primarily – tax reform and goodwill impairment. Higher asset turnover ratio values demonstrated by Verizon provide grounds to consider Verizon outperforming AT&T from the perspective of asset usage efficiency.

3. Analysis of companies' asset usage efficiency

Acknowledging the problem of financial ratios providing limited measure of companies' overall efficiency, author is further applying the efficiency matrix methodology to compile growth and benchmark indices of companies' asset usage efficiency, with quantitative indicator selection modified by author in an attempt to better match the specifics of telecommunication companies through introduction of non-financial indicators specific to the industry.

3.1. Telecom company efficiency matrix indicator specifics

In the case of companies in scope, sees the need to making modifications to the overall efficiency matrix, in terms of first taking a different set of quantitative indicators, and secondly, arranging them in meaningful order based on same finality level as well intensity development levels.

The reason for such decision is desire to attempt constructing field-specific matrix, applicable to what can be referred as 'asset heavy' telecommunication companies. Significant balance in assets has been observed in prior sections of the thesis, yet what has been left out is the field specific efficiency of assets usage. Assets form the infrastructure required to render services, thus expensing assets yields subscriber base, that put the provided access to communication infrastructure to use for data transmission or to make calls. Subscribers are further billed by telecommunication company for resulting network usage.

In author's view there is a need for additional non-financial metrics, specific to telecommunication companies, that could shed light on company's assets subscriber base generating and network load generating efficiency, leaving capital and cash flow-related fields out of scope. Additionally, author attempts to avoid impact of tax legislation changes, considering using EBIT indicator as a measure of profit. Where it comes to non-financial indicators as a measure of subscriber base, author considers using **average amount of subscribers**, derived from companies' annual reports.

Author expects companies with significant value of the network infrastructure to expense their assets in a way, allowing them to maximize the capability to attach on-net subscribers, as these are subscribers company is rendering services to, with expanding subscriber base further is expected to increase companies' revenues, and, ultimately profits. Yet in addition to revenue, stemming from

subscriber contracts, subscribers also consume the network infrastructure of the telecommunication company, thus generating traffic flows (in case of Internet services) or calls (in case of voice services), resulting in what can be referred to as “network externality” (Norton, 2011).

Network externality effect, with higher amount of directly reachable subscribers, results in network infrastructure technically more appealing and valuable to other network operators as well as enterprises and consumers. Naturally, the higher the number of subscribers reachable through infrastructure of the company, the higher the amount of traffic flows (or calls) as well volume generated by (or destined to) these parties. In addition to number of subscribers and their generated traffic volumes, there is also another traffic volume offered to the network of said companies, attributing to the fact that both companies being what is referred to – a Tier-1 network.

Namely, global telecom is hierarchical in nature, with commonly three type of networks distinguishable, referred to as Tier-1 through Tier-3 networks (Colombier, M’Chirgui, & Pénard, 2010). Such classification is not technical but is based on type of relations between the networks, with relation type characterized by being either settlement-free or not. Where Tier-3 would solely rely on purchased connectivity to the rest of the world and Tier-2 having some (or even most) connectivity settlement-free, Tier-1 networks can reach any other network via settlement-free connections to either another Tier-1 network or via Tier-2 networks it has as a customer.

Thus, network hierarchy implies that where in case of smallish company rendering services only to consumers, only the amount of subscribers could be sufficient as quantitative metric, the companies in scope would also be carrying traffic, originated by their respective downstream networks – ones purchasing network transit services from them, mandating for additional metric to capture the volume of such service somehow.

Therefore, author considers important to accommodate for inclusion of additional indicator, **average amount of network prefixes advertised**.

Here, network prefixes advertised refers to Border Gateway Protocol (BGP) terminology, as network reachability information exchange in between network operators around the world performs via means of BGP sessions, with sessions established to advertise and receive network reachability information in between the network equipment (Herrero & Van Der Ven, 2010).

For network service to function, each subscriber is assigned an IP number by network operator. Telecommunication equipment has technical limits, and in order to make destination IP number lookup more efficient, IP numbers are logically structured with certain portion of number representing network prefix and remaining bits being end-host identifier. Such representation simplifies tail-end lookup by equipment in transit and network prefix is one type of network reachability information exchanged in between the networks globally. Thus, AT&T would advertise networks reachable via AT&T to Verizon and vice-a-versa, allowing for either of them to reach other's customers and same process would be repeated on any BGP session of said companies with other telecoms.

Thus, being a global exchange between the networks, advertisement of prefixes is acknowledged by other networks. Of course, network is free to choose to use new advertisement as forwarding path or stick to previously existing one, depending on BGP path selection constrains, yet given such process is global, changes in advertisements still remain visible to outside observer (Appendix 23) with sufficient amount of data collection points. One example is Route Views Project by University of Oregon, which collects BGP information in real-time, having around the globe collector equipment and retains this information for professional public use (RouteViews). BGP information collected by Route-Views is further processed by various parties, like CAIDA (Centre for Applied Internet Data Analysis), dealing with research on network economics and policy as well as network ranking as an outcome of BGP topology analysis (CAIDA, 2020).

In addition to CAIDA, there are also professional individuals dealing with Route-Views data analysis and hereby, author would like to give credit to one of such individuals – Pavel Gulchouck, who has implemented somewhat more precise network ranking algorithm. Said algorithm addresses irregularities of network interrelations, where one network might be having settlement-free connectivity in some and settled connectivity in certain regions. For example, purchasing transit services from significant local operators in non-domestic regions of presence. (Gulchouck, 2009). Compared to CAIDA ranking tool (CAIDA, 2020) compiling rank based on amount of downstream networks in decreasing order, Pavel Gulchouck's algorithm additionally allows to rank networks based on amount of network prefixes or what is referred to as amount of C-class network prefixes advertised, using same underlying source – RouteViews collected BGP data. Amount of C-class network prefixes advertised into global BGP is exactly what author is further employing as additional quantitative indicator representing the volume of transit services rendered by companies in scope. Given that traffic is originated by equipment with IP numbers assigned to

it (exactly as in case of conventional shipment, sender and recipient information is required) and also due to amount of network prefixes advertised including network information originated by companies themselves, author considers this metric being usable as a proxy metric for overall network load potentially served by companies in scope. However, author stresses that IP number can have varying amount of traffic flows associated with, yet exactly as in case of shipment of goods, higher number of potential senders/recipients should result in higher amount of shipments overall.

One major note is that whereas author refers specifically to amount of C-class network prefixes advertised when stating number of prefixes advertised further for the sake of brevity, whereas technically these are different measures, as network prefix might vary in length, covering one or several C-class prefixes.

Introduction of such indicators allows for creating of field-specific matrix with element arrangement order of:

Assets => Expenses => Subscribers => Network load => Revenue => Profit

which is read as assets being expensed to yield subscribers, with activity of subscribers resulting in network load, and also revenues, as an outcome of billing the customer for the services rendered, which is further captured in the form of profit to the company.

3.2. Telecommunication companies' field-specific asset usage efficiency matrix

Compared to company's overall efficiency matrix mentioned previously, author is using different number of indicators, with two of them being non-financial field specific. Introduction of field-specific indicators results in following matrix elements, with interpretation of the elements being as follows:

- EBIT to Average amount of prefixes advertised – indication of EBIT earned per unit of network load, latter expressed via number of advertised prefixes or network load profitability indicator

- Sales to Average amount of prefixes advertised – demonstrates sales revenue obtained per unit of network load, latter expressed via number of advertised prefixes or network load profitability indicator
- EBIT to Average amount of subscribers – indication of EBIT earned per subscriber or subscriber profitability indicator
- Sales to Average amount of subscribers – indication of revenue per subscriber
- Average amount of prefixes advertised to Average amount of subscribers – demonstrates network load offered per subscriber, captured via number of prefixes advertised
- Average amount of prefixes advertised to Operating expenses – indication of how much network load is achieved per unit in operating expenses
- Average amount of subscribers to Operating expenses – demonstrates how many subscribers are obtained per unit in operating expenses.

Combining company's overall efficiency matrix structure depicted on figure 1 with initial data for AT&T, author can construct following efficiency matrices.

Table 14. AT&T, asset usage efficiency matrix

		P	S	N	SC	O
P		**1**				
S	2018	0.19	**1**			
	2017	0.13				
	2016	0.15				
	2018/2017	1.44				
	2017/2016	**0.88**				
	CAGR(2018/2016)	1.13				
N	2018	0.04	0.19	**1**		
	2017	0.02	0.16			
	2016	0.02	0.13			
	2018/2017	1.71	1.18			
	2017/2016	1.07	1.21			
	CAGR(2018/2016)	1.35	1.20			
SC	2018	0.17	0.88	4.72	**1**	
	2017	0.11	0.85	5.38		
	2016	0.13	0.89	6.81		
	2018/2017	1.49	1.04	**0.88**		
	2017/2016	**0.84**	**0.95**	**0.79**		
	CAGR(2018/2016)	1.12	**0.99**	**0.83**		
O	2018	0.23	1.18	6.30	1.34	**1**
	2017	0.15	1.15	7.27	1.35	
	2016	0.18	1.17	8.95	1.31	
	2018/2017	1.48	1.03	**0.87**	**0.99**	
	2017/2016	**0.87**	**0.98**	**0.81**	1.03	
	CAGR(2018/2016)	1.13	1.00	**0.84**	1.01	
A	2018	0.07	0.35	1.87	0.40	0.30
	2017	0.05	0.38	2.39	0.44	0.33
	2016	0.06	0.41	3.10	0.45	0.35
	2018/2017	1.33	**0.92**	**0.78**	**0.89**	**0.90**
	2017/2016	**0.82**	**0.93**	**0.77**	**0.98**	**0.95**
	CAGR(2018/2016)	1.05	**0.93**	**0.78**	**0.93**	**0.93**

Source: Appendix 18, compiled by author

Table 15. AT&T, Growth indices of company's overall efficiency

GICOE 2018/2017	110%
GICOE 2017/2016	92%
GICOE 2018/2016	100%

Source: Appendix 18, compiled by author

Table 16 indicates AT&T efficiency has declined 8% in 2017, yet it has been able to compensate for this decline, with efficiency growing 10% in 2018.

In 2017, 12 out of 15 fields indicate decrease (Table 14) with drivers being mainly decline in revenues following decrease in demand for legacy service and satellite video, resulting in EBIT-related indicators decline despite AT&T attention towards cost management. This decline in revenues and EBIT, as higher finality-level indicator, explains decrease in EBIT to Average assets of 18%. 13% decrease in EBIT to Operating expenses, demonstrates decline in efficiency of putting expenses to profit-generating use and 16% contraction in EBIT to Average number of subscribers, indicates lower profit-generating ability of customer base.

Delays with Time Warner acquisition resulted in AT&T sitting with cash and 5% lower asset usage intensity in the form of operating expenses to average assets as well as 2% lower subscriber generation ability of average assets (Table 14).

At the same time, average number of subscribers increased, with company demonstrating 3% increase in number of subscribers earned per operating expense dollar, further indicating adequateness of cost management methods applied. Further, less-loaded network, in the form of significantly lower average amount of prefixes advertised lead to higher revenues and EBIT compared to network load – 21% and 7% percent gains, respectively (Table 14).

Reverse of 2018 is visible in the form of increases in 8 elements out of 15 on the matrix (Table 14). Here, Time Warner acquisition has brought higher revenues and EBIT post merging, resulting in 33% growth in EBIT over Average assets, 48% higher profit generating efficiency of expenses, 49% higher EBIT per subscriber, and 44% higher EBIT compared to revenues. Assets acquired, however, were used with 10% lower intensity however, and merged company yielding also 1% lower subscriptions per dollar expense dollars.

Yet also network load in the form of average amount of advertised prefixes continued decline, resulting in further 13% decrease in amount of network load per expense dollars, and 12% lower load per subscriber, with this lower load further contributing to 18% and 71% increases in revenue and EBIT obtained and earned per load unit (Table 14).

Table 16. Verizon, asset usage efficiency matrix

		P	S	N	SC	O
P		**1**				
S	2018	0.19	**1**			
	2017	0.20				
	2016	0.20				
	2018/2017	**0.93**				
	2017/2016	1.00				
	CAGR(2018/2016)	**0.96**				
N	2018	0.01	0.07	**1**		
	2017	0.01	0.06			
	2016	0.01	0.07			
	2018/2017	1.11	1.20			
	2017/2016	**0.83**	**0.83**			
	CAGR(2018/2016)	**0.96**	1.00			
SC	2018	0.17	0.89	12.48	**1**	
	2017	0.17	0.86	14.49		
	2016	0.18	0.87	12.16		
	2018/2017	**0.96**	1.03	**0.86**		
	2017/2016	**0.99**	**0.99**	1.19		
	CAGR(2018/2016)	**0.98**	1.01	1.01		
O	2018	0.23	1.21	16.88	1.35	**1**
	2017	0.26	1.28	21.45	1.48	
	2016	0.26	1.27	17.81	1.47	
	2018/2017	**0.88**	**0.94**	**0.79**	**0.91**	
	2017/2016	1.00	1.00	1.20	1.01	
	CAGR(2018/2016)	**0.94**	**0.97**	**0.97**	**0.96**	
A	2018	0.09	0.50	7.02	0.56	0.42
	2017	0.10	0.50	8.44	0.58	0.39
	2016	0.10	0.52	7.22	0.59	0.41
	2018/2017	**0.93**	1.00	**0.83**	**0.97**	1.06
	2017/2016	**0.97**	**0.97**	1.17	**0.98**	**0.97**
	CAGR(2018/2016)	**0.95**	**0.99**	**0.99**	**0.97**	1.01

Source: Appendix 19, compiled by author

Table 16 is a result of combining company's overall efficiency matrix structure depicted on figure 1 with initial data for Verizon, which, in its turn allows to compute following GICOE indices, with immediate conclusion that Verizon's efficiency has decreased by 2% in the period 2018 through 2016 (Table 17).

Table 17. Verizon, Growth indices of company's overall efficiency

GICOE 2018/2017	95%
GICOE 2017/2016	100%
GICOE 2018/2016	98%

Source: Appendix 19, compiled by author

Verizon 2017 growth stall compared to 2016 has been influenced by declining services revenue, offset by equipment sales and decrease in total operating expenses being not enough to yield higher EBIT. Average assets base, increased through XO Holdings and Yahoo acquisitions, translated into 3% decline in profit generating power of assets and 3% decline in assets turnover as well as 3% lower asset usage intensity (Table 16).

Verizon's higher average number of subscribers coupled with decline in operating expenses increased number of subscribers served with expense dollars by 1% (Table 16). From the network load perspective, Verizon advertised higher number of prefixes in the period, increasing network utilization per expense dollar by 20% and demonstrating 19% higher network load per subscriber in 2017. Unfortunately, Verizon revenue did not keep the pace, bringing 17% decline in EBIT and revenue dollars compared to average amount of network prefixes advertised (Table 16).

In 2018 only 5 matrix fields increased (Table 16), yielding 5% overall decline in efficiency. This has been caused by impairment charge offsetting increase in revenues and translated into lower EBIT. Subsequently, further acquisition of wireless licences for anticipated 5G rollout in future, brought, 7% contraction in return on increased asset base, yet higher operating expenses brought 6% increase in asset usage intensity (Table 16). Nevertheless, average number of subscribers increased, resulting in 9% decline in subscriber base served over operating expenses reported.

Verizon faced decline in network load in the form of lower average amount of network prefixes advertised, resulting in network load to subscriber 14% decline, as well as 20% and 11% higher revenue per network load unit and EBIT earned from less loaded network (Table 16).

Interim conclusion can be drawn here – AT&T and Verizon differ from efficiency point of view, having moved in opposite directions. AT&T efficiency increased in 2018 with Time Warner acquisition, following decline in 2017, whereas Verizon efficiency stalled in 2017 and declined in 2018.

Where companies moved in different directions from efficiency point of view, when viewed alone, it is necessary to benchmark one to the other to answer question on how companies rank compared one to another. Further, author compiles benchmark matrix based on same initial data of AT&T and Verizon, with matrix elements expressing relation of AT&T matrix element over respective element of Verizon matrix.

Table 18. AT&T and Verizon, comparative efficiency matrix

Benchmark matrix AT&T over Verizon						
		P	**S**	**N**	**SC**	**O**
P		**1**				
S	2018	1.03	**1**			
	2017	**0.66**				
	2016	**0.75**				
N	2018	2.70	2.63	**1**		
	2017	1.76	2.66			
	2016	1.38	1.84			
SC	2018	1.02	**0.99**	**0.38**	**1**	
	2017	**0.66**	**0.99**	**0.37**		
	2016	**0.77**	1.03	**0.56**		
O	2018	1.01	**0.98**	**0.37**	**0.99**	**1**
	2017	**0.60**	**0.90**	**0.34**	**0.91**	
	2016	**0.69**	**0.92**	**0.50**	**0.90**	
A	2018	**0.72**	**0.70**	**0.27**	**0.70**	**0.71**
	2017	**0.50**	**0.75**	**0.28**	**0.76**	**0.84**
	2016	**0.59**	**0.79**	**0.43**	**0.77**	**0.85**

Source: Appendix 20, compiled by author

To solve the ranking problem, following benchmark indices of company's efficiency (BICOE) have been calculated.

Table 19. AT&T and Verizon, benchmark index of company's overall efficiency

BICOE (2018)	84%
BICOE (2017)	73%
BICOE (2016)	79%

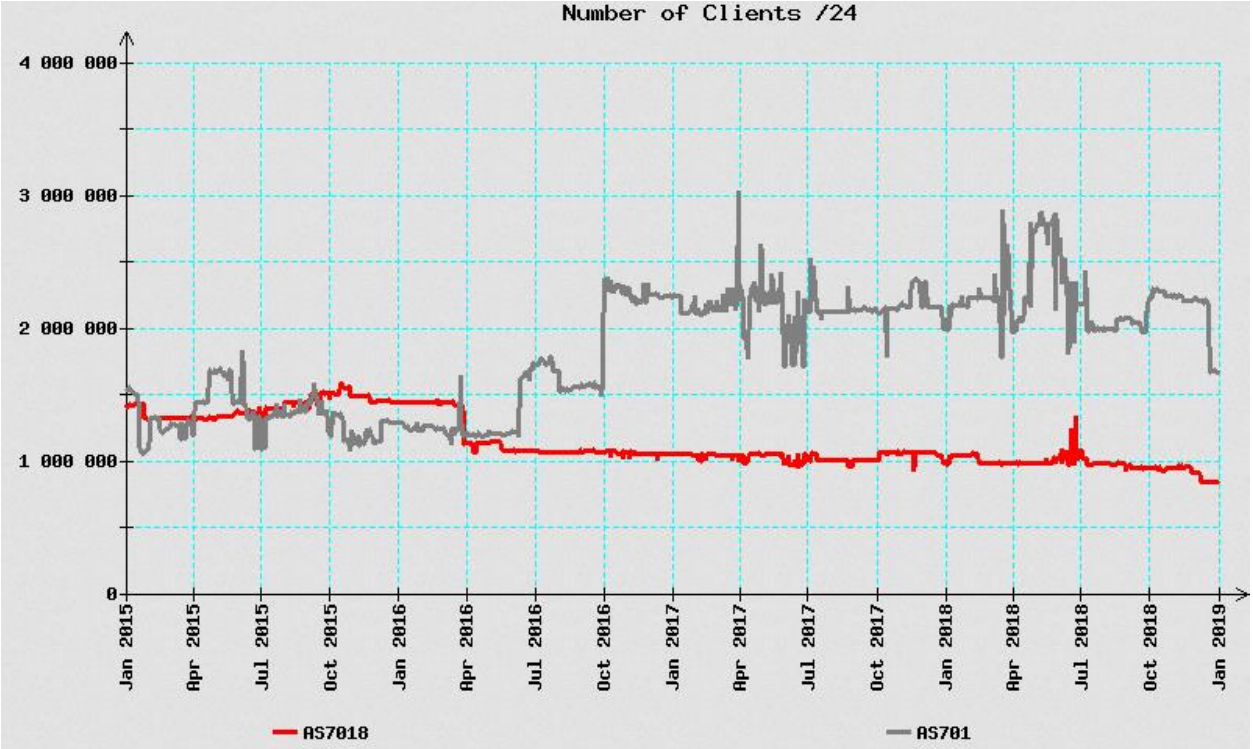
Source: Appendix 20, compiled by author

Table 19 allows for immediate conclusion that Verizon is superior to AT&T, with efficiency level remaining 16–27% higher. AT&T is seen more efficient only in select areas – earning higher EBIT and recording higher revenues from lesser network load implied from vastly lower amount of average network prefixes advertised. Time Warner acquisition allowed AT&T to indicate superior profitability of operating activities, judging by 3% higher EBIT to total operating revenues indicator as well as 1% higher efficiency in expenses usage in the form of higher EBIT compared to total operating expenses (Table 18).

Remaining elements further support findings in previous chapters, visible in form of inferiority in the fields of asset usage intensity being 16–29% lower than in case of Verizon, 28–41% lower ROA and 21–30% lower asset turnover (Table 18), followed by lower amount of subscribers served per expense dollars, which has been disproportioned in 2018 by Verizon goodwill impairment charge. AT&T's expense management efficiency is also 2–10% lower judging by operating revenues compared to operating expenses. Yet gap shortening from 10% in 2017 to 2% 2018 (Table 18) has been caused not only by impairment charge by Verizon, but also 3% higher revenues compared to operating expenses indicated by AT&T.

Importantly, purely technical conclusion can be drawn here – AT&T is visibly inferior to Verizon based on field-specific metrics. This is seen on 50–63% lower network load carried compared to expense dollars (Table 18), implied from significantly lower average amount of prefixes advertised – one is to expect lower amount of traffic egressing towards AT&T, should one connect to both Verizon and AT&T, as an outcome of smaller customer cone of the latter (Figure 5).

Figure 5. Amount of C-class (/24) prefixes advertised by AT&T (AS7018) and Verizon (AS701):



Source: Figure plotted using web utility, reachable via http://asrank.happy.kiev.ua

It is unfortunate that annual reports contain no reasoning behind of contracting customer cone, though, as judging by AT&T acquisitions of DIRECTV in 2015 as well as Time Warner in 2018, such decline could as well be at least partially explained by company focus on expanding into video segment to grasp additional revenue from entertainment services.

3.3. Conclusion on companies' strengths and weaknesses

In this section, author is summarizing companies' strengths and weakness, revealed in previous sections of the thesis (Table 20).

Table 20. Summary of companies' strong and weak areas

	AT&T	Verizon
Strengths	Larger subscriber base Higher service segment diversity Financing approach more conservative Asset usage efficiency maintained Time Warner deal commenced and company contributing revenues	Better operating expenses control Higher returns for risk-open investors Liabilities growth significantly lower compared to assets Better and improving short-term liquidity and solvency Higher pace of asset replacement Higher returns on capital employed Higher asset turnover Higher investments into assets compared to capital employed Higher asset usage efficiency Higher revenues and EBIT earned from customer base
Weaknesses	Unionized workforce Acquisitions struggle generating returns Liquidity and solvency weaker than industry peers Lower pace of asset replacement and higher depreciation impact Lower returns on capital employed Lower revenues earned from assets Lower asset usage efficiency	Unionized workforce High dependency on wireless segment revenue Device payment plans offered grow accounts receivables faster Liquidity and solvency weaker than industry peers Lower earnings quality Asset usage efficiency declining

Source: Compiled based on author's conclusions from previous sections of the thesis

From the analysis of companies' balance sheets, author concludes, that compared to its peer, AT&T has accumulated twice higher proportion of goodwill on its books (Section 2.2.1), a sign of acquisitions, that, unfortunately, do not help AT&T to report higher returns compared to Verizon (Section 2.5). Verizon balance sheets revealed signs of being weaker than its peer, carrying twice higher proportion of accounts receivables, which has been growing throughout the period (Section 2.3.1), being an outcome of cellular device payment plans offered to the customers. Both companies have been favourably impacted by tax legislation changes in 2017, yet Verizon's reports, previously showing proportionally higher amount in deferred income tax, revealed more sound changes to liabilities and shareholders' equity item groups of the balance, leaning less so towards debt financing in 2018 (Section 2.3.1).

Verizon has been found to indicate signs of better expenses control, with total operating expenses being proportionally lower compared to AT&T (Section 2.2.2), as well as being able to capture higher portion of revenues as net profit, which also suggests higher returns due to financial leverage of the company. Unfortunately, Verizon's initial superiority has been bleached by one-time goodwill impairment in last reporting period in scope and in the same period, AT&T profit has been further boosted by Time Warner starting to contribute to revenues post acquisition (Section 2.3.2). Revenue segmentation revealed Verizon having proportionally less revenues from enterprise wireline and significant dependency on wireless segment, which poses further risks due to high pace of device credit sales (Section 2.3.1).

Companies' short-term liquidity and long-term solvency are underperforming compared to industry peers in addition to companies' inability to cover for current liabilities (Section 2.4.1). Both companies, relying heavily on creditor financing, pose risks for investors, especially in case of Verizon, which is higher leveraged with long-term debt repaid using proceeds from issuing further debt. Verizon is better posed to maintaining interest payments and with profits increase, post tax reform, company is expected to be able to repay long-term debt principals in the longer run.

Verizon has lower earnings quality and lower cash flow margin (Section 2.4.2), although 2018 brought improvements to said indicators in Verizon's case. Analysing cash flow sufficiency, author has found further evidence that companies are unable to pay out their debts in cash, provided by operating activities alone, taking into consideration significant outlays made in the form of capital expenditures and dividends paid to shareholders at the same time (Section 2.4.2). Further analysis

based on reinvestment ratio and depreciation write-off ratio revealed that superiority is achieved at the cost of lower pace of capital assets replacement beside lower long-term debt repayments made (Section 2.4.2).

Analysing returns earned on capital invested (Section 2.5), author has arrived at conclusion that AT&T remains inferior to AT&T, demonstrating significantly lower returns. In addition to explaining dynamics, ROCE decomposition revealed AT&T is earning less sales revenues from its assets base compared to Verizon. ROCE decomposition also confirmed claim of lower asset replacement pace based on lower investments into assets compared to capital employed (Section 2.5).

Employing efficiency matrix method to analyse asset usage efficiency, author has arrived to conclusion that viewed individually, AT&T has outperformed Verizon (Section 3.2), due to latter showing signs of declining efficiency within the period in scope, judging by contraction in GICOE index value. Nevertheless, compiled benchmark matrix and computed BICOE index revealed AT&T significant inferiority to Verizon (Section 3.2) in all but very few select indicators – EBIT and revenue generated from network load, which is in author's view an artifact of network load proxy metric, being built from outside observers point of view, not capturing AT&T's increased revenue streams from acquiring entertainment and video business. Nevertheless, AT&T remains inferior from revenues and EBIT earned per subscriber position compared to Verizon (Section 3.2). AT&T asset usage intensity was found to be 16–29% lower than for Verizon, with AT&T ROA been found to remain 28–41% compared to Verizon, with AT&T serving 23–30% less subscribers through its asset base (Section 3.2).

CONCLUSION

Author has analysed US telecommunication companies based on AT&T and Verizon financial statements in the period of 2016–2018. The aim of the thesis has been previously defined as determining strong and weak points of the telecommunication industry companies. In order to reach the aim of the thesis, author has previously defined five research questions that have been addressed through solving five research tasks set out in introduction.

Having investigated and applied commonly employed financial analysis methods, author can provide following answers to research questions set out previously:

1. What are the differences in the structure and the dynamics of the financial statements of the companies? And in case applicable, what could be the reasons behind differences?

Vertical analysis of the balance sheets revealed that companies are similar in the structure of their non-current assets, with capital tangible assets representing major share of non-current assets. Differences exist in proportion of certain items to total balance sheets item groups – AT&T is reporting higher (24–28% vs 9–11%) proportion of goodwill on its books and Verizon has been found to indicate financing approach, leaning towards debt financing (liabilities 79–90% of liabilities and shareholders' equity). Compared to AT&T, Verizon reports twice higher amounts in accounts receivable (7.0–9.5% of total assets), an outcome of device payment plans enacted.

Companies' income statement vertical analysis revealed that companies report similar proportions of service and equipment revenues compared to total operating revenues, yet Verizon has been found to report lower total operating expenses proportionally to operating revenues (78–83% vs 85–87%).

Horizontal analysis revealed companies have reported changes in all primary balance sheet items, with factors behind identified as tax legislation change, resulting in Verizon's liabilities proportion decline. Additionally, Verizon (as well as AT&T) has made significant discretionary contributions to employment benefit plans in conjunction with tax reform of 2017, further decreasing non-current liabilities item's proportion. Changes in case of AT&T have been also caused by Time Warner acquisition, being major factor behind changes in asset structure in 2017 with company stockpiling cash and recognizing significant amounts in non-current assets post closure in 2018. Financing this deal required issuance of debt, which had to be redeemed prematurely in 2018, due

to deal getting challenged through legal action, and this explains changes in current and non-current liabilities items in 2017 and 2018. Same acquisition deal also required issuance of shares in case of AT&T, further increasing amounts in shareholders' equity side of the balance.

Biggest changes to the income statements of the companies have been caused by tax reform, impacting net profit of both companies. Verizon has in addition reported goodwill impairment in 2018, explaining more than half of 10.1% increase in operating expenses. AT&T reported fluctuations in service revenues, with revenues contracting in 2017 due to decrease in linear video as well as legacy wireline services and growing in 2018 with Time Warner revenue contribution. Verizon, offering more attractive device payment plans to the customers, has reported steady increase in equipment revenue.

2. Which company has better the long- and short-term liquidity, earnings quality and cash flow sufficiency?

Although companies are mostly underperforming their industry peers, Verizon has been found to report better short-term liquidity values based on current and quick financial ratio values. From the perspective of long-term solvency, both companies are weak, yet Verizon remained better from interest coverage ratio perspective. Cash flow sufficiency ratios revealed that both companies are struggling with making repayments of long-term debt, with Verizon admitting partial redemption of long-term debt at the cost of proceeds from issuance of further debt in annual reports. AT&T employed similar strategy in 2018 in connection to delays in Time Warner acquisition.

Additionally, cash flow sufficiency ratios revealed inferiority of AT&T to Verizon due to latter reinvestment and depreciation write-off ratio values suggesting that AT&T is revamping capital assets at lower than write-off rate.

From the earnings quality perspective, AT&T remained superior to Verizon, with latter earnings quality and cash flow ratios frequently impacted by one-time events as well as generous device payment plans resulting in less cash dollars generated from sales.

3. How do companies differ from the perspective of profitability of capital employed and what could be the reasons behind differences?

Demonstrating higher assets turnover (0.50–0.52 vs 0.35–0.41), and better control over expenses traced to EBIT margin, Verizon has maintained higher returns on capital employed than AT&T

(15–20% vs 8–10%). Return on capital employed decomposition provided further support for statement that AT&T has lower pace of asset refreshment, investing less into assets compared to capital employed (1.44–1.62 vs 1.58–1.88). Nevertheless, Time Warner acquisition, contributing to increased revenues traced to EBIT margin, has allowed AT&T to demonstrate improvements in ROCE in 2018.

To address further research question, author has further investigated overall efficiency matrix concept, which lead to author to conclusion that this method is best suited to analyse the changes in company efficiency. Author has further attempt to enhance the efficiency matrix through introduction of non-financial quantitative indicators, derived both from company annual reports and from publicly available BGP protocol data. Author has further demonstrated applicability of the concept through analysing asset usage efficiency levels of the companies compared to previous periods and through benchmarking one company over the other. Fulfilling this task allowed to provide following answer to research question

4. How do companies differ from the asset usage efficiency point of view and how do companies rank compared to each other?

In the period in scope, companies' asset usage efficiency changes have been opposite. AT&T efficiency declined 8% in 2017, and in 2018, company has been able to reverse the pattern and acquiring Time Warner, has been able to demonstrate 10% higher efficiency.

On the contrary, Verizon has been able to maintain efficiency levels in 2017, primarily through increase in network load implied. Nevertheless, in 2018, Verizon has been unable to sufficiently expand customer base despite increased intensity of asset usage, which has been further amplified by decline in network load and further impacted by decline in EBIT post recognizing goodwill impairment. Verizon efficiency thus declined 2% based on GICOE index.

Nevertheless, applying benchmark matrix method revealed that despite decline in efficiency of Verizon, it still remained vastly superior to AT&T, with latter being able to beat Verizon only on select indicator values – namely, AT&T is able to demonstrate higher revenues and EBIT on the background of lower network load implied from declining amount of network prefixes advertised. This can be explained by a result of AT&T having significantly higher amount of video service subscribers, that network load indicator, being constructed from outsider view, is unable to capture, due to video content being most probably consumed by AT&T subscribers themselves. Despite

video content business, AT&T remains inferior from revenues and EBIT earned per subscriber position compared to Verizon.

Input collected through addressing the previous research points allows author to provide following answer to last research question outstanding.

5. What are the strong and weak points of the companies compared?

Companies have been found to have no common strong points, with Verizon outperforming its peer in virtually all the areas covered in the thesis.

Verizon has been found to demonstrate better expenses control, better liquidity and reporting significantly higher returns on capital employed and higher asset turnover. Applying asset usage efficiency matrix revealed Verizon demonstrating significantly higher asset usage intensity, returns on assets and serving substantially more customers from its asset base, demonstrating also higher profits and revenues earned from subscriber mass. Verizon remained superior from the perspective of pace of asset refreshment, with capital employed yielding more assets than its peer.

AT&T has been found to outperform Verizon only from the perspective of more conservative financing employed and has been able to maintain its efficiency levels in the period, what could not be concluded in case of its peer.

Companies report few common weaknesses, with both underperforming industry from liquidity and solvency perspective. Differences lie within Verizon having higher dependency on single revenue segment and is showing lower earnings quality. Dependency on wireless segment revenues further opens another weakness – high pace of accounts receivables growth. Besides, Verizon's efficiency has declined in the period, yet this is again caused by one-time event.

AT&T has been found struggling with previous acquisitions growing goodwill and not providing increased returns from acquired assets.

Autor considers following steps could be undertaken to address companies' weaknesses:

1. AT&T, demonstrating significant deficiency in putting assets to good use, should consider divestments of ill-performing assets.

2. AT&T should investigate reasons behind lower customer mass served with its asset base and expedite infrastructure revamp or attempt handover of legacy infrastructure to captives for further disposal.
3. Verizon could evaluate opportunities for lowering dependency on single revenue segment. Higher implied network load, relative to the subscriber base, suggests company could expand in enterprise and carrier wireline segment due to higher destination coverage of its network.
4. Companies could consider maintaining lower amounts in deferred taxes to lessen the impact of tax reforms and improving solvency
5. Companies, underperforming industry from short-term liquidity and long-term solvency point of view, should stop practicing socialism in the form of employment benefit plans, unless required by law

Author considers thesis aim to be fulfilled. Thesis could be developed further with analysing companies' revenue segments separately to analyse business segments contribution in greater detail. In addition, author considers field-specific efficiency matrix compiled could be further enhanced through inclusion of further BGP protocol attributes (e.g. communities) to analyse contribution of specific areas of telecommunication companies' infrastructure and network interrelations.

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APPENDICES

Appendix 1. AT&T Balance sheets 2016–2018

	December 31,		
Balance sheet item, in million USD	**2018**	**2017**	**2016**
Cash and cash equivalents	5,204	50,498	5,788
Accounts receivable	26,472	16,522	16,794
Prepaid expenses	2,047	1,369	1,555
Equipment inventory	2,771	2,225	1,951
Other current assets	14,933	8,532	12,281
Total current assets	**51,427**	**79,146**	**38,369**
Noncurrent inventories	7,713	-	-
Property, Plant and Equipment - Net	131,473	125,222	124,899
Goodwill	146,370	105,449	105,207
Licences	96,144	96,136	94,176
Trademarks and trade names	24,345	7,021	8,020
Distribution networks	17,069	-	-
Customer lists and relationships	7,751	10,676	14,243
Other Intangible assets - Net	18,518	443	421
Investments in and advances	6,245	1,560	1,674
Other assets	24,809	18,444	16,812
Total non-current assets	**480,437**	**364,951**	**365,452**
Total assets	**531,864**	**444,097**	**403,821**
Debt maturing within one year	10,255	38,374	9,832
Accounts payable	27,018	24,439	22,027
Advance billings and customer deposits	5,948	4,213	4,519
Accrued taxes	1,179	1,262	2,079
Dividends payable	3,854	3,070	3,008
Other current liabilities	**16,166**	**10,031**	**9,111**
Total current liabilities	**64,420**	**81,389**	**50,576**
Long-term debt	166,250	125,972	113,681
Deferred income taxes	57,859	43,207	60,128
Postemployment benefit obligation	19,218	31,775	33,578
Other noncurrent liabilities	30,233	19,747	21,748
Total deferred credits and other noncurrent liabilities	**107,310**	**94,729**	**115,454**
Total liabilities	**337,980**	**302,090**	**279,711**
Common stock at par value	7,621	6,495	6,495
Additional paid-in capital	125,525	89,563	89,604
Retained earnings	58,753	50,500	34,734
Common stock in treasury	(12,059)	(12,714)	(12,659)
Accumulated other comprehensive income	4,249	7,017	4,961
Noncontrolling interest	9,795	1,146	975
Total stockholders' equity	**193,884**	**142,007**	**124,110**
Total liabilities and stockholders' equity	**531,864**	**444,097**	**403,821**

Source: AT&T Annual reports 2016–2018

Appendix 2. Verizon Balance sheets 2016–2018

	December 31,		
Balance sheet item, in million USD	**2018**	**2017**	**2016**
Cash and cash equivalents	2,745	2,079	2,880
Accounts receivable	25,102	23,493	17,513
Inventories	1,336	1,034	1,202
Prepaid expenses and other	5,453	3,307	4,800
Total current assets	**34,636**	**29,913**	**26,395**
Property, Plant and Equipment, net	89,286	88,568	84,751
Goodwill	24,614	29,172	27,205
Wireless licences	94,130	88,417	86,673
Other intangible assets, net	9,775	10,247	8,897
Investments and advances	671	1,039	1,110
Other assets	11,717	9,787	9,149
Total non-current assets	**230,193**	**227,230**	**217,785**
Total assets	**264,829**	**257,143**	**244,180**
Debt maturing within one year	7,190	3,453	2,645
Accounts payable	7,232	7,063	7,084
Contract liability	4,207	4,050	2,914
Taxes payable	1,483	1,483	1,516
Dividends payable	2,512	2,429	2,375
Other current liabilities	15,306	14,559	13,806
Total current liabilities	**37,930**	**33,037**	**30,340**
Long-term debt	**105,873**	**113,642**	**105,433**
Deferred income taxes	33,795	31,232	45,964
Employee benefit obligations	18,599	22,122	26,166
Other noncurrent liabilities	13,922	12,433	12,245
Total long-term liabilities	**66,316**	**65,787**	**84,375**
Total liabilities	**210,119**	**212,466**	**220,148**
Common stock at par value	429	424	424
Additional paid-in capital	13,437	11,101	11,182
Retained earnings	43,542	35,635	15,059
Common stock in treasury	(6,986)	(7,139)	(7,263)
Deferred compensation	353	416	449
Accumulated other comprehensive income	2,370	2,659	2,673
Noncontrolling interest	1,565	1,591	1,508
Total stockholders' equity	**54,710**	**44,687**	**24,032**
Total liabilities and stockholders' equity	**264,829**	**257,153**	**244,180**

Source: Verizon annual reports 2016–2018

Appendix 3. AT&T Income Statements 2016–2018

Income Statement Item, in million USD	**2018**	**2017**	**2016**
Service revenues	152,345	145,597	148,884
Equipment revenues	18,411	14,949	14,902
Total operating revenues	**170,756**	**160,546**	**163,786**
Cost of equipment	19,786	18,709	18,757
Cost of broadcast, programming and operations	26,727	21,159	19,851
Other cost of revenues, exclusive of items below	32,906	37,942	38,582
Selling, general and administrative expense	36,765	35,465	36,845
Asset abandonments and impairments expense	46	2,914	361
Depreciation and amortisation expense	28,430	24,387	25,847
Total operating expenses	**144,660**	**140,576**	**140,243**
Operating profit	**26,096**	**19,970**	**23,543**
Interest expense	(7,957)	(6,300)	(4,910)
Equity in net profit (loss) of affiliates	(48)	(128)	98
Other income (expense)	6,782	1,597	1,081
Total other income	(1,223)	(4,831)	(3,731)
Profit before taxation	**24,873**	**15,139**	**19,812**
Income tax (benefit) expense	4,920	(14,708)	6,479
Net profit	**19,953**	**29,847**	**13,333**
Less: Net profit attributable to noncontrolling interest	(583)	(397)	(357)
Net profit attributable to AT&T	**19,370**	**29,450**	**12,976**

Source: AT&T Annual reports 2016–2018

NOTE: Author has replaced “Income” in GAAP Statements of Income format used by AT&T with “Profit”, IFRS term, to match thesis text.

Appendix 4. Verizon Income Statements 2016–2018

Income Statement Item, in million USD	**2018**	**2017**	**2016**
Service revenues and other	108,605	107,145	108,468
Wireless equipment revenues	22,258	18,889	17,512
Total operating revenues	**130,863**	**126,034**	**125,980**
Cost of services, exclusive of items below	32,185	30,916	30,463
Wireless cost of equipment	23,323	22,147	22,238
Selling, general and administrative expense	31,083	28,592	28,102
Depreciation and amortisation expense	17,403	16,954	15,928
Asset abandonments and impairments expense	4,591	-	-
Total operating expenses	**108,585**	**98,609**	**96,731**
Operating profit	**22,278**	**27,425**	**29,249**
Equity in losses of unconsolidated businesses	(186)	(77)	(98)
Other income (expense)	2,364	(2,021)	(3,789)
Interest expense	(4,833)	(4,733)	(4,376)
Profit before (provision) benefit for income tax	**19,623**	**20,594**	**20,986**
(Provision) benefit for income tax	(3,584)	9,956	(7,378)
Net profit	**16,039**	**30,550**	**13,608**
Less: Net profit attributable to noncontrolling interest	511	449	481
Net profit attributable to Verizon	**15,528**	**30,101**	**13,127**

Source: Verizon annual reports 2016–2018

NOTE: Author has replaced “Income” in GAAP Statements of Income format used by Verizon with “Profit”, IFRS term, to match thesis text.

Appendix 5. AT&T Balance Sheet, Vertical and Horizontal Analysis 2016–2018

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Balance Sheet Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Cash and cash equivalents	1.0%	11.4%	1.4%	-89.7%	-45,294	772.5%	44,710
Accounts receivable	5.0%	3.7%	4.2%	60.2%	9,950	-1.6%	-272
Prepaid expenses	0.4%	0.3%	0.4%	49.5%	678	-12.0%	-186
Equipment inventory	0.5%	0.5%	0.5%	24.5%	546	14.0%	274
Other current assets	2.8%	1.9%	3.0%	75.0%	6,401	-30.5%	-3,749
Total current assets	**9.7%**	**17.8%**	**9.5%**	**-35.0%**	**-27,719**	**106.3%**	**40,777**
Noncurrent inventories	1.5%	0.0%	0.0%	-	7,713	-	0
Property, Plant and Equipment	24.7%	28.2%	30.9%	5.0%	6,251	0.3%	323
Goodwill	27.5%	23.7%	26.1%	38.8%	40,921	0.2%	242
Licences	18.1%	21.6%	23.3%	0.0%	8	2.1%	1,960
Trademarks and trade names	4.6%	1.6%	2.0%	246.7%	17,324	-12.5%	-999
Distribution networks	3.2%	0.0%	0.0%	-	17,069	-	0
Customer lists and relationships	1.5%	2.4%	3.5%	-27.4%	-2,925	-25.0%	-3,567
Other intangible assets	3.5%	0.1%	0.1%	4080.1%	18,075	5.2%	22
Investments in and advances	1.2%	0.4%	0.4%	300.3%	4,685	-6.8%	-114
Other assets	4.7%	4.2%	4.2%	34.5%	6,365	9.7%	1,632
Total non-current assets	**90.3%**	**82.2%**	**90.5%**	**31.6%**	**115,486**	**-0.1%**	**-501**
Total assets	**100.0%**	**100.0%**	**100.0%**	**19.8%**	**87,767**	**10.0%**	**40,276**

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Balance Sheet Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Debt maturing within one year	1.9%	8.6%	2.4%	-73.3%	-28,119	290.3%	28,542
Accounts payable	5.1%	5.5%	5.5%	10.6%	2,579	11.0%	2,412
Advance billings and customer deposits	1.1%	0.9%	1.1%	41.2%	1,735	-6.8%	-306
Accrued taxes	0.2%	0.3%	0.5%	-6.6%	-83	-39.3%	-817
Dividends payable	0.7%	0.7%	0.7%	25.5%	784	2.1%	62
Other current liabilities	3.0%	2.3%	2.3%	61.2%	6,135	10.1%	920
Total current liabilities	**12.1%**	**18.3%**	**12.5%**	**-20.8%**	**-16,969**	**60.9%**	**30,813**
Long-term debt	**31.3%**	**28.4%**	**28.2%**	**32.0%**	**40,278**	**10.8%**	**12,291**
Deferred income taxes	10.9%	9.7%	14.9%	33.9%	14,652	-28.1%	-16,921
Postemployment benefit obligation	3.6%	7.2%	8.3%	-39.5%	-12,557	-5.4%	-1,803
Other noncurrent liabilities	5.7%	4.4%	5.4%	53.1%	10,486	-9.2%	-2,001
Total deferred credits and other noncurrent liabilities	**20.2%**	**21.3%**	**28.6%**	**13.3%**	**12,581**	**-18.0%**	**-20,725**
Total liabilities	**63.5%**	**68.0%**	**69.3%**	**11.9%**	**35,890**	**8.0%**	**22,379**
Common stock at par value	1.4%	1.5%	1.6%	17.3%	1,126	0.0%	0
Additional paid-in capital	23.6%	20.2%	22.2%	40.2%	35,962	0.0%	-41
Retained earnings	11.0%	11.4%	8.6%	16.3%	8,253	45.4%	15,766
Common stock in treasury	2.3%	2.9%	3.1%	-5.2%	655	0.4%	-55
Accumulated other comprehensive income	0.8%	1.6%	1.2%	-39.4%	-2,768	41.4%	2,056
Noncontrolling interest	1.8%	0.3%	0.2%	754.7%	8,649	17.5%	171
Total stockholders' equity	**36.5%**	**32.0%**	**30.7%**	**36.5%**	**51,877**	**14.4%**	**17,897**
Total liabilities and stockholders' equity	**100.0%**	**100.0%**	**100.0%**	**19.8%**	**87,767**	**10.0%**	**40,276**

Source: Appendix 1, compiled by author

Appendix 6. Verizon Balance Sheet Vertical and Horizontal Analysis 2016–2018

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Balance Sheet Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Cash and cash equivalents	1.0%	0.8%	1.2%	32.0%	666	-27.8%	-801
Accounts receivable	9.5%	9.1%	7.2%	6.8%	1,609	34.1%	5,980
Inventories	0.5%	0.4%	0.5%	29.2%	302	-14.0%	-168
Prepaid expenses and other	2.1%	1.3%	2.0%	64.9%	2,146	-31.1%	-1,493
Total current assets	**13.1%**	**11.6%**	**10.8%**	**15.8%**	**4,723**	**13.3%**	**3,518**
Property, Plant and Equipment	33.7%	34.4%	34.7%	0.8%	718	4.5%	3,817
Goodwill	9.3%	11.3%	11.1%	-15.6%	-4,558	7.2%	1,967
Wireless licences	35.5%	34.4%	35.5%	6.5%	5,713	2.0%	1,744
Other Intangible assets, net	3.7%	4.0%	3.6%	-4.6%	-472	15.2%	1,350
Investments and advances	0.3%	0.4%	0.5%	-35.4%	-368	-6.4%	-71
Other assets	4.4%	3.8%	3.7%	19.7%	1,930	7.0%	638
Total non-current assets	**86.9%**	**88.4%**	**89.2%**	**1.3%**	**2,963**	**4.3%**	**9,445**
Total assets	**100.0%**	**100.0%**	**100.0%**	**3.0%**	**7,686**	**5.3%**	**12,963**

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Balance Sheet Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Debt maturing within one year	2.7%	1.3%	1.1%	108.2%	3,737	30.5%	808
Accounts payable	2.7%	2.7%	2.9%	2.4%	169	-0.3%	-21
Contract liability	1.6%	1.6%	1.2%	3.9%	157	39.0%	1,136
Taxes payable	0.6%	0.6%	0.6%	0.0%	0	-2.2%	-33
Dividends payable	0.9%	0.9%	1.0%	3.4%	83	2.3%	54
Other current liabilities	5.8%	5.7%	5.7%	5.1%	747	5.5%	753
Total current liabilities	**14.3%**	**12.8%**	**12.4%**	**14.8%**	**4,893**	**8.9%**	**2,697**
Long-term Debt	**40.0%**	**44.2%**	**43.2%**	**-6.8%**	**-7,769**	**7.8%**	**8,209**
Deferred income taxes	12.8%	12.1%	18.8%	8.2%	2,563	-32.1%	-14,732
Employee benefit obligations	7.0%	8.6%	10.7%	-15.9%	-3,523	-15.5%	-4,044
Other noncurrent liabilities	5.3%	4.8%	5.0%	12.0%	1,489	1.5%	188
Total long-term liabilities	**25.0%**	**25.6%**	**34.6%**	**0.8%**	**529**	**-22.0%**	**-18,588**
Total Liabilities	**79.3%**	**82.6%**	**90.2%**	**-1.1%**	**-2,347**	**-3.5%**	**-7,682**
Common stock at par value	0.2%	0.2%	0.2%	1.2%	5	0.0%	0
Additional paid-in capital	5.1%	4.3%	4.6%	21.0%	2,336	-0.7%	-81
Retained earnings	16.4%	13.9%	6.2%	22.2%	7,907	136.6%	20,576
Common stock in treasury	2.6%	2.8%	3.0%	-2.1%	153	-1.7%	124
Deferred compensation - stock ownership plans and other	0.1%	0.2%	0.2%	-15.1%	-63	-7.3%	-33
Accumulated other comprehensive income	0.9%	1.0%	1.1%	-10.9%	-289	-0.5%	-14
Noncontrolling interest	0.6%	0.6%	0.6%	-1.6%	-26	5.5%	83
Total stockholders' equity	**20.7%**	**17.4%**	**9.8%**	**22.4%**	**10,023**	**85.9%**	**20,655**
Total Liabilities and Stockholders' Equity	**100.0%**	**100.0%**	**100.0%**	**3.0%**	**7,676**	**5.3%**	**12,973**

Source: Appendix 2, compiled by author

Appendix 7. AT&T Income Statement Vertical and Horizontal Analysis 2016–2018

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Income Statement Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Service revenues	89.2%	90.7%	90.9%	4.6%	6,748	-2.2%	-3,287
Equipment revenues	10.8%	9.3%	9.1%	23.2%	3,462	0.3%	47
Total operating revenues	**100.0%**	**100.0%**	**100.0%**	**6.4%**	**10,210**	**-2.0%**	**-3,240**
Cost of equipment	11.6%	11.7%	11.5%	5.8%	1,077	-0.3%	-48
Cost of broadcast, programming and operations	15.7%	13.2%	12.1%	26.3%	5,568	6.6%	1,308
Other cost of revenues, exclusive of items below	19.3%	23.6%	23.6%	-13.3%	-5,036	-1.7%	-640
Selling, general and administrative expense	21.5%	22.1%	22.5%	3.7%	1,300	-3.7%	-1,380
Asset abandonments and impairments expense	0.0%	1.8%	0.2%	-98.4%	-2,868	707.2%	2,553
Depreciation and amortisation expense	16.6%	15.2%	15.8%	16.6%	4,043	-5.6%	-1,460
Total operating expenses	**84.7%**	**87.6%**	**85.6%**	**2.9%**	**4,084**	**0.2%**	**333**
Operating profit	**15.3%**	**12.4%**	**14.4%**	**30.7%**	**6,126**	**-15.2%**	**-3,573**
Interest expense	4.7%	3.9%	3.0%	26.3%	-1,657	28.3%	-1,390
Equity in net profit (loss) of affiliates	0.0%	0.1%	0.1%	-62.5%	80	-230.6%	-226
Other income (expense)	4.0%	1.0%	0.7%	324.7%	5,185	47.7%	516
Total other income	0.7%	3.0%	2.3%	74.7%	3,608	-29.5%	-1,100
Earnings before income tax	**14.6%**	**9.4%**	**12.1%**	**64.3%**	**9,734**	**-23.6%**	**-4,673**
Income tax (benefit) expense	2.9%	9.2%	4.0%	133.5%	19,628	-327.0%	-21,187
Net profit	**11.7%**	**18.6%**	**8.1%**	**-33.1%**	**-9,894**	**123.9%**	**16,514**
Less: Net profit attributable to noncontrolling interest	0.3%	0.2%	0.2%	46.9%	-186	11.2%	-40
Net profit attributable to AT&T	**11.3%**	**18.3%**	**7.9%**	**-34.2%**	**-10,080**	**127.0%**	**16,474**

Source: Appendix 3, compiled by author

Appendix 8. Verizon Income Statement Vertical and Horizontal Analysis 2016–2018

	Vertical Analysis			Horizontal Analysis			
				%	Δ	%	Δ
Income Statement Item	**2018**	**2017**	**2016**	**2018/2017**		**2017/2016**	
Service revenues and other	83.0%	85.0%	86.1%	1.4%	1,460	-1.2%	-1,323
Wireless equipment revenues	17.0%	15.0%	13.9%	17.8%	3,369	7.9%	1,377
Total operating revenues	**100.0%**	**100.0%**	**100.0%**	**3.8%**	**4,829**	**0.0%**	**54**
Cost of services, exclusive of items below	24.6%	24.5%	24.2%	4.1%	1,269	1.5%	453
Wireless cost of equipment	17.8%	17.6%	17.7%	5.3%	1,176	-0.4%	-91
Selling, general and administrative expense	23.8%	22.7%	22.3%	8.7%	2,491	1.7%	490
Depreciation and amortisation expense	13.3%	13.5%	12.6%	2.6%	449	6.4%	1,026
Asset abandonments and impairments	3.5%	-	-	100.0%	4,591	-	-
Total operating expenses	**83.0%**	**78.2%**	**76.8%**	**10.1%**	**9,976**	**1.9%**	**1,878**
Operating profit	**17.0%**	**21.8%**	**23.2%**	**-18.8%**	**-5,147**	**-6.2%**	**-1,824**
Equity in losses of unconsolidated businesses	0.1%	0.1%	0.1%	141.6%	-109	-21.4%	21
Other income (expense)	1.8%	1.6%	3.0%	-217.0%	4,385	-46.7%	1,768
Interest expense	3.7%	3.8%	3.5%	2.1%	-100	8.2%	-357
Profit before (provision) benefit for income tax	**15.0%**	**16.3%**	**16.7%**	**-4.7%**	**-971**	**-1.9%**	**-392**
(Provision) benefit for income tax	2.7%	7.9%	5.9%	-136.0%	-13,540	234.9%	17,334
Net profit	**12.3%**	**24.2%**	**10.8%**	**-47.5%**	**-14,511**	**124.5%**	**16,942**
Less: Net profit attributable to noncontrolling interest	0.4%	0.4%	0.4%	13.8%	62	-6.7%	-32
Net profit attributable to Verizon	**11.9%**	**23.9%**	**10.4%**	**-48.4%**	**-14,573**	**129.3%**	**16,974**

Source: Appendix 4, compiled by author

Appendix 9. AT&T, Statements of Cash Flows

Cash flow statement item, in million USD	2018	2017	2016
Net profit	**19,953**	**29,847**	**13,333**
Depreciation and amortization	28,430	24,387	25,847
Amortization of film and television costs	3,772	-	-
Undistributed earnings from investments into equity affiliates	292	174	(37)
Provision for uncollectible accounts	1,791	1,642	1,474
Deferred income tax expense (benefit)	610	(15,940)	2,947
Net (gain) loss from sale of investments, net of impairments	(739)	(282)	(169)
Actuarial (gain) loss on pension benefits	(3,412)	1,258	1,024
Asset abandonments and impairments	46	2,914	361
Accounts receivable	(1,244)	(986)	(1,003)
Other current assets	(6,442)	(778)	1,709
Accounts payable and other accrued liabilities	1,602	816	118
Equipment installment receivables	(490)	(1,239)	(1,307)
Deferred fulfillment costs	(3,458)	(1,422)	(2,359)
Retirement benefit funding	(500)	(1,066)	(910)
Other, net	3,391	(1,315)	(2,586)
Total adjustments	**23,649**	**8,163**	**25,109**
Net cash provided by operating activities	**43,602**	**38,010**	**38,442**
Purchase of property and equipment	(20,758)	(20,647)	(21,516)
Interest during construction	(493)	(903)	(892)
Acquisitions, net of cash acquired	(43,309)	1,123	(2,959)
Dispositions	2,148	59	646
(Purchases) sales of securities, net	(185)	449	672
Other	(548)	976	731
Net cash used in investing activities	**(63,145)**	**(18,943)**	**(23,318)**
Net change in short-term borrowings	(821)	(2)	-
Issuance of other short-term borrowings	4,898	-	-
Repayment of other short-term borrowings	(2,098)	-	-
Issuance of long-term debt	41,875	48,793	10,140
Repayment of long-term debt	(52,643)	(12,339)	(10,823)
Purchase of treasury stock	(609)	(463)	(512)
Issuance of treasury stock	745	33	146
Dividends payed	(13,410)	(12,038)	(11,797)
Other	(3,926)	1,946	(1,616)
Net cash (used in) provided by financing activities	**(25,989)**	**25,930**	**(14,462)**
Net (decrease) in cash and cash equivalents	(45,532)	44,997	662
Cash and cash equivalents at beginning of the year	50,932	5,935	5,273
Cash and cash equivalents at end of the year	**5,400**	**50,932**	**5,935**

Source: AT&T annual reports 2016–2018

Appendix 10. Verizon, Statements of Cash Flows

Cash flow statement item, in million USD	2018	2017	2016
Net profit	**16,039**	**30,550**	**13,608**
Depreciation and amortization expense	17,403	16,954	15,928
Employee retirement benefits	(2,657)	440	2,705
Deferred income taxes	389	(14,463)	(1,063)
Provision for uncollectible accounts	980	1,167	1,420
Equity in losses of unconsolidated businesses	231	117	138
Net gain on sale of divested business	-	(1,774)	(1,007)
Goodwill impairment	4,591	-	-
Accounts receivable	(2,667)	(5,674)	(5,067)
Inventories	(324)	168	61
Prepaid expenses and other assets	37	27	(660)
Accounts payable	1,777	(459)	(1,089)
Discretionary contributions to employee benefit plans	(1,679)	(3,411)	(186)
Other, net	219	676	(3,099)
Net cash provided by operating activities	**34,339**	**24,318**	**21,689**
Capital expenditures	(16,658)	(17,247)	(17,059)
Acquisitions of business, net of cash acquired	(230)	(5,880)	(3,765)
Acquisitions of wireless licences	(1,429)	(583)	(534)
Proceeds from dispositions of businesses	-	3,614	9,882
Other, net	383	1,640	1,602
Net cash used in investing activities	**(17,934)**	**(18,456)**	**(9,874)**
Proceeds from long-term borrowings	5,967	27,707	12,964
Proceeds from asset-backed long-term borrowings	4,810	4,290	4,986
Repayments of long-term borrowings	(10,923)	(23,837)	(19,159)
Repayments of asset-backed long-term borrowings	(3,635)	(400)	-
Dividends paid	(9,772)	(9,472)	(9,262)
Other, net	(1,824)	(4,439)	(2,905)
Net cash used in financing activities	**(15,377)**	**(6,151)**	**(13,376)**
Increase (decrease) in cash and cash equivalents	1,028	(289)	(1,561)
Cash and cash equivalents at beginning of the year	2,888	3,177	4,738
Cash and cash equivalents at the end of the year	**3,916**	**2,888**	**3,177**

Source: Verizon annual reports 2016–2018

Appendix 11. Financial ratio formulas

Financial ratio	Formula
Return on capital employed (ROCE), %	(Earnings before taxes + Interest expense) / (Average short-term debt + average long-term debt + average shareholders' equity) x 100%
Net margin, %	Net profit / Total operating revenues x 100%
EBIT margin	(Earnings before taxes + Interest expense) / Total operating revenues
Assets to capital	Average total assets / (Average short-term debt + average long-term debt + average shareholders' equity)
Assets turnover, (times)	Total operating revenues / Average total assets
Equity multiplier, (times)	Average total assets / Average shareholders' equity
Equity to assets, (times)	Total shareholders' equity / Total assets
Debt to equity, (times)	Average (short-term debt + long-term liabilities) / Average shareholders' equity
Interest coverage, (times)	(Earnings before taxes + Interest expense) / Interest expense
Current ratio, (times)	Total current assets / Total current liabilities
Quick ratio, (times)	(Total current assets – Inventories) / Total current liabilities
Earnings quality, (times)	Net cash flow from operating activities / Operating income
Cash flow margin, %	Net cash flow from operating activities / Total operating revenues x 100%
Cash flow sufficiency, (times)	Net cash flow from operating activities / (Capital expenditures + Dividends paid + Repayment of long-term debt)
Long-term debt repayments, (times)	Repayment of long-term debt / Net cash flow from operating activities
Dividend pay-out, (times)	Dividends paid / Net cash flow from operating activities
Reinvestment, (times)	Capital expenditures / Net cash flow from operating activities
Depreciation write-off, (times)	(Depreciation + amortisation + other write-off) / Net cash flow from operating activities

Sources:

Financial ratio formulas from Statistikaamet

Assets to Capital (Wahlen, Baginski, Bradshaw, 2011), modified to match Statistikaamet ROCE formula

Earnings quality (Güleç, Bektaş, 2019)

Cash flow Margin (Gullett, Kilgore, Geddie, 2018)

Cash flow sufficiency, Long-term debt repayments, Dividend pay-out, Reinvestment, Depreciation write-off (Koen, Oberholster, 1999)

Appendix 12. Financial ratio values for AT&T and Verizon, 2016–2018

Financial ratio	AT&T			Verizon		
	2018	2017	2016	2018	2017	2016
Return on capital employed (ROCE), %	9.7%	7.7%	9.9%	14.8%	17.2%	19.5%
Net margin, %	11.7%	18.6%	8.1%	12.3%	24.2%	10.8%
EBIT margin, (times)	0.19	0.13	0.15	0.19	0.20	0.20
Assets to capital, (times)	1.44	1.53	1.62	1.58	1.71	1.88
Assets turnover, (times)	0.35	0.38	0.41	0.50	0.50	0.52
Equity multiplier, (times)	2.91	3.19	3.26	5.25	7.30	11.66
Equity to assets, (times)	0.34	0.31	0.31	0.19	0.14	0.09
Debt to equity, (times)	1.62	1.87	1.93	3.64	5.46	9.32
Interest coverage, (times)	4.13	3.40	5.04	5.06	5.35	5.80
Current ratio, (times)	0.80	0.97	0.76	0.91	0.91	0.87
Quick ratio, (times)	0.76	0.95	0.72	0.88	0.87	0.83
Earnings quality, (times)	1.67	1.90	1.63	1.54	0.89	0.74
Cash flow margin, %	25.5%	23.7%	23.5%	26.2%	19.3%	17.2%
Cash flow sufficiency, (times)	0.50	0.84	0.87	0.84	0.48	0.48
Long-term debt repayments, (times)	1.21	0.32	0.28	0.42	1.00	0.88
Dividend pay-out, (times)	0.31	0.32	0.31	0.28	0.39	0.43
Reinvestment, (times)	0.48	0.54	0.56	0.49	0.71	0.79
Depreciation write-off, (times)	0.74	0.72	0.68	0.64	0.70	0.73

Source: Compiled by author, using formulas in Appendix 11 and Financial Statement data from appendices 1–4, 9 and 10

Appendix 13. ROCE decomposition AT&T 2016–2018

		2018	2017	2016		
Assets to capital	a	1.44	1.53	1.62		
Assets turnover	b	0.35	0.38	0.41		
EBIT margin	c	0.19	0.13	0.15		
ROCE	T	9.7%	7.7%	9.9%		
2017/2016	ΔT	-2.2%	**Absolute Change**		**Relative Impact**	
$a_0 \times b_0 \times c_0 = T_0$	T_0	9.9%				
$a_1 \times b_0 \times c_0 = T'$	T'	9.4%	$\Delta T(a)=T'-T_0$	-0.6%	$\Delta T(a)/\Delta T$	25.3%
$a_1 \times b_1 \times c_0 = T''$	T''	8.7%	$\Delta T(b)=T''-T'$	-0.6%	$\Delta T(b)/\Delta T$	28.9%
$a_1 \times b_1 \times c_1 = T_1$	T_1	7.7%	$\Delta T(c)=T_1-T''$	-1.0%	$\Delta T(c)/\Delta T$	45.8%
2018/2017	ΔT	2.0%	**Absolute Change**		**Relative Impact**	
$a_0 \times b_0 \times c_0 = T_0$	T_0	7.7%				
$a_1 \times b_0 \times c_0 = T'$	T'	7.3%	$\Delta T(a)=T'-T_0$	-0.45%	$\Delta T(a)/\Delta T$	-22.8%
$a_1 \times b_1 \times c_0 = T''$	T''	6.7%	$\Delta T(b)=T''-T'$	-0.55%	$\Delta T(b)/\Delta T$	-28.2%
$a_1 \times b_1 \times c_1 = T_1$	T_1	9.7%	$\Delta T(c)=T_1-T''$	2.96%	$\Delta T(c)/\Delta T$	151.0%

Source: Appendix 11 and 12, compiled by author

NOTE: ROCE formula sourced from Statistics Estonia, component ratios sourced from Financial Reporting, Financial Statement Analysis and Valuation (Wahlen, Baginski, Bradshaw, 2011), modified to match Statistics Estonia ROCE ratio

Appendix 14. ROCE decomposition, ROCE Verizon 2016–2018

		2018	2017	2016		
Assets to capital	a	1.58	1.71	1.88		
Assets turnover	b	0.50	0.50	0.52		
EBIT margin	c	0.19	0.20	0.20		
ROCE	T	14.8%	17.2%	19.5%		
2017/2016	ΔT	-2.3%	**Absolute Change**		**Relative Impact**	
$a_0 \times b_0 \times c_0 = T_0$	T_0	19.5%				
$a_1 \times b_0 \times c_0 = T'$	T'	17.7%	$\Delta T(a)=T'-T_0$	-1.82%	$\Delta T(a)/\Delta T$	79.0%
$a_1 \times b_1 \times c_0 = T''$	T''	17.3%	$\Delta T(b)=T''-T'$	-0.45%	$\Delta T(b)/\Delta T$	19.6%
$a_1 \times b_1 \times c_1 = T_1$	T_1	17.2%	$\Delta T(c)=T_1-T''$	-0.03%	$\Delta T(c)/\Delta T$	1.4%
2018/2017	ΔT	-2.4%	**Absolute Change**		**Relative Impact**	
$a_0 \times b_0 \times c_0 = T_0$	T_0	17.2%				
$a_1 \times b_0 \times c_0 = T'$	T'	16.0%	$\Delta T(a)=T'-T_0$	-1.23%	$\Delta T(a)/\Delta T$	51.5%
$a_1 \times b_1 \times c_0 = T''$	T''	16.0%	$\Delta T(b)=T''-T'$	-0.04%	$\Delta T(b)/\Delta T$	1.8%
$a_1 \times b_1 \times c_1 = T_1$	T_1	14.8%	$\Delta T(c)=T_1-T''$	-1.12%	$\Delta T(c)/\Delta T$	46.7%

Source: Appendix 11 and 12, compiled by author

NOTE: ROCE formula sourced from Statistics Estonia, component ratios sourced from Financial Reporting, Financial Statement Analysis and Valuation (Wahlen, Baginski, Bradshaw, 2011), modified to match Statistics Estonia ROCE ratio

Appendix 15. Initial data for efficiency matrices

Non-Financial indicator (count)	**AT&T**			**Verizon**		
	2018	**2017**	**2016**	**2018**	**2017**	**2016**
Average C-class prefixes (/24 IPv4) announced	910,924	1,014,838	1,248,078	1,832,814	2,115,413	1,761,844
Average prefixes (IPv4) announced	27,509	28,654	35,132	58,544	60,414	50,944
Average ASNs announced	3,376	3,524	4,166	5,236	5,255	4,775
Average subscribers	193,172	188,503	183,335	146,858	146,037	144,924
Financial indicator (in USD million)	**2018**	**2017**	**2016**	**2018**	**2017**	**2016**
Average assets	487,981	423,959	403,247	260,986	250,662	244,178
Revenue	170,756	160,546	163,786	130,863	126,034	125,980
Total operating expenses	144,660	140,576	140,243	108,585	98,609	96,731
EBIT	32,830	21,439	24,722	24,456	25,327	25,362

Sources:

Financial indicators derived from companies' annual reports

Data, attributing to amount of prefixes, prefixes with length of /24 (commonly referred to IPv4 C-class prefixes) and amount of Autonomous System Number(s) (ASN in the table above) is derived from http://asrank.happy.kiev.ua tool, developed by Pavel Gulchouck in 2009.

Average subscribers sourced from companies' annual reports and includes wireless, wireless business, wireline, wireline business, video, and voice subscriptions.

Appendix 16. Initial data for efficiency matrices, AT&T

	(P)	(S)	(N)	(SC)	(O)	(A)
2018	32,830	170,756	910,924	193,172	144,660	487,981
2017	21,439	160,546	1,014,838	188,503	140,576	423,959
2016	24,722	163,786	1,248,078	183,335	140,243	403,247
2018/2017	1.53	1.06	**0.90**	1.02	1.03	1.15
2017/2016	**0.87**	**0.98**	**0.81**	1.03	1.00	1.05
CAGR(2018/2016)	1.15	1.02	**0.85**	1.03	1.02	1.10

Source: Appendix 15, compiled by author

Notes:

(P) – EBIT, in USD millions

(S) – Sales / Revenue, in USD millions

(N) – Average Number of C-Class (/24) IPv4 networks announced (advertised), count

(SC) – Average Number of Subscribers, count

(O) – Operating Expenses, in USD millions

(A) – Average Total Assets, in USD millions

Appendix 17. Initial data for efficiency matrices, Verizon

	(P)	(S)	(N)	(SC)	(O)	(A)
2018	24,456	130,863	1,832,814	146,858	108,585	260,986
2017	25,327	126,034	2,115,413	146,037	98,620	250,662
2016	25,362	125,980	1,761,844	144,924	98,921	244,178
2018/2017	**0.97**	1.04	**0.87**	1.01	1.10	1.04
2017/2016	1.00	1.00	1.20	1.01	1.02	1.03
CAGR(2018/2016)	**0.98**	1.02	1.02	1.01	1.06	1.03

Source: Appendix 15, compiled by author

Notes:

(P) – EBIT, in USD millions

(S) – Sales / Revenue, in USD millions

(N) – Average Number of C-Class (/24) IPv4 networks announced (advertised), count

(SC) – Average Number of Subscribers, count

(O) – Operating Expenses, in USD millions

(A) – Average Total Assets, in USD millions

Appendix 18. Telecom Field-specific Efficiency Matrix, AT&T

AT&T						
		P	**S**	**N**	**SC**	**O**
P		**1**				
S	2018	0.19	**1**			
	2017	0.13				
	2016	0.15				
	2018/2017	1.44				
	2017/2016	**0.88**				
	CAGR(2018/2016)	1.13				
N	2018	0.04	0.19	**1**		
	2017	0.02	0.16			
	2016	0.02	0.13			
	2018/2017	1.71	1.18			
	2017/2016	1.07	1.21			
	CAGR(2018/2016)	1.35	1.20			
SC	2018	0.17	0.88	4.72	**1**	
	2017	0.11	0.85	5.38		
	2016	0.13	0.89	6.81		
	2018/2017	1.49	1.04	**0.88**		
	2017/2016	**0.84**	**0.95**	**0.79**		
	CAGR(2018/2016)	1.12	**0.99**	**0.83**		
O	2018	0.23	1.18	6.30	1.34	**1**
	2017	0.15	1.15	7.27	1.35	
	2016	0.18	1.17	8.95	1.31	
	2018/2017	1.48	1.03	**0.87**	**0.99**	
	2017/2016	**0.87**	**0.98**	**0.81**	1.03	
	CAGR(2018/2016)	1.13	1.00	**0.84**	1.01	
A	2018	0.07	0.35	1.87	0.40	0.30
	2017	0.05	0.38	2.39	0.44	0.33
	2016	0.06	0.41	3.10	0.45	0.35
	2018/2017	1.33	**0.92**	**0.78**	**0.89**	**0.90**
	2017/2016	**0.82**	**0.93**	**0.77**	**0.98**	**0.95**
	CAGR(2018/2016)	1.05	**0.93**	**0.78**	**0.93**	**0.93**

GICOE 2018/2017	110%
GICOE 2017/2016	92%
GICOE 2018/2016	100%

Source: Appendix 16, compiled by author

Appendix 19. Telecom Field-specific Efficiency Matrix, Verizon

Verizon						
		P	**S**	**N**	**SC**	**O**
P		**1**				
S	2018	0.19	**1**			
	2017	0.20				
	2016	0.20				
	2018/2017	**0.93**				
	2017/2016	1.00				
	CAGR(2018/2016)	**0.96**				
N	2018	0.01	0.07	**1**		
	2017	0.01	0.06			
	2016	0.01	0.07			
	2018/2017	1.11	1.20			
	2017/2016	**0.83**	**0.83**			
	CAGR(2018/2016)	**0.96**	1.00			
SC	2018	0.17	0.89	12.48	**1**	
	2017	0.17	0.86	14.49		
	2016	0.18	0.87	12.16		
	2018/2017	**0.96**	1.03	**0.86**		
	2017/2016	**0.99**	**0.99**	1.19		
	CAGR(2018/2016)	**0.98**	1.01	1.01		
O	2018	0.23	1.21	16.88	1.35	**1**
	2017	0.26	1.28	21.45	1.48	
	2016	0.26	1.27	17.81	1.47	
	2018/2017	**0.88**	**0.94**	**0.79**	**0.91**	
	2017/2016	1.00	1.00	1.20	1.01	
	CAGR(2018/2016)	**0.94**	**0.97**	**0.97**	**0.96**	
A	2018	0.09	0.50	7.02	0.56	0.42
	2017	0.10	0.50	8.44	0.58	0.39
	2016	0.10	0.52	7.22	0.59	0.41
	2018/2017	**0.93**	1.00	**0.83**	**0.97**	1.06
	2017/2016	**0.97**	**0.97**	1.17	**0.98**	**0.97**
	CAGR(2018/2016)	**0.95**	**0.99**	**0.99**	**0.97**	1.01

GICOE 2018/2017	95%
GICOE 2017/2016	100%
GICOE 2018/2016	98%

Source: Appendix 17, compiled by author

Appendix 20. Comparative Efficiency Matrix, AT&T and Verizon

Benchmark matrix AT&T over Verizon						
		P	**S**	**N**	**SC**	**O**
P		**1**				
S	2018	1.03	**1**			
	2017	**0.66**				
	2016	**0.75**				
N	2018	2.70	2.63	**1**		
	2017	1.76	2.66			
	2016	1.38	1.84			
SC	2018	1.02	**0.99**	**0.38**	**1**	
	2017	**0.66**	**0.99**	**0.37**		
	2016	**0.77**	1.03	**0.56**		
O	2018	1.01	**0.98**	**0.37**	**0.99**	**1**
	2017	**0.60**	**0.90**	**0.34**	**0.91**	
	2016	**0.69**	**0.92**	**0.50**	**0.90**	
A	2018	**0.72**	**0.70**	**0.27**	**0.70**	**0.71**
	2017	**0.50**	**0.75**	**0.28**	**0.76**	**0.84**
	2016	**0.59**	**0.79**	**0.43**	**0.77**	**0.85**

BICOE (2018)	84%
BICOE (2017)	73%
BICOE (2016)	79%

Source: Appendix 18 and 19, compiled by author

Appendix 21. Revenue breakdown by segment, AT&T and Verizon

	AT&T			Verizon		
	2018	**2017**	**2016**	**2018**	**2017**	**2016**
Wireless (Mobility)	71,344	71,090	72,587	91,734	87,511	89,186
Residential (Video, Internet)	46,460	49,995	50,660	29,760	30,680	30,510
Enterprise (Carrier) Wireline	26,827	29,283	30,985	10,942	9,387	7,778

Source: Companies annual reports, compiled by author

Note: In USD millions, table excludes Time Warner revenue by AT&T and equipment revenues for both companies

Appendix 22. Financial Ratios by Industry

Financial Ratio	2018	2017	2016
Current ratio	1.02	1.05	1.01
Quick ratio	0.77	0.90	1.00
Equity to assets	0.31	0.26	0.20
Debt to equity	1.15	1.1	0.94
Interest Coverage	1.66	0.51	1.22

Source: Retrieved from Ready Ratios via http://readyratios.com/sec/industry/48/

Financial Ratio	Industry Median (2019)
Current ratio	1.06
Quick ratio	1.01
Debt-to-Equity	0.59
Interest Coverage	4.93

Source: Retrieved from GuruFocus.com

Appendix 23. Border Gateway Protocol carried information example

Following example of BGP carried information, represented in human-readable form and is taken from one of the access network routers (stationed in Tallinn, running Juniper Networks JUNOS operating system) under author's control:

```
show route aspath-regex .*7018.*
...
4.23.88.0/24       *[BGP/170] 1w3d 00:59:35, MED 0, localpref 120, from x.x.122.10
                     AS path: 2914 7018 46164 I, validation-state: unverified
                   > to x.x.201.94 via ae7.0, label-switched-path WORKER
                     to x.x.201.96 via ae9.0, label-switched-path Bypass->x.x.201.94->x.x.201.107
…
```

This is interpreted as request to list all routes contained in routing table, having any times mentioning AT&T (AS7018, hence 7018 in request above) in any place in the AS-PATH attribute. Returned is Border Gateway Protocol-derived routing information ([BGP/170]), for network prefix 4.23.88.0/24 (/24 refers to C-class network prefix) considered best for 1 week 3 days and 59 minutes. AS-PATH attribute (read from right to left) shows that this network prefix has been originated within AS46164 (AT&T Mobility LLC), and has passed AS7018 (AT&T Services, Inc.) prior being advertised to author's network via AS2914 (NTT America, Inc), that is offering upstream services to network under author control.

The above output essentially shows that network reachability information is globally propagated and thus, available for analysis by any person interested.

NOTE: Author has replaced certain IP number portions with "x.x" to obscure IP numbering used in his own network, as well as replaced RSVP-TE LSP (label-switched-path) naming.

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