



Report

.. Advanced engineering economy..

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By

ENG. Renad Hajed Algethami

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1. INTRODUCTION:

Definition of the economy subject and its objectives

The engineering profession is defined as the design, development, implementation and improvement of processes and products, whether current or new, all with the aim of solving community problems at the lowest costs to achieve revenues for the organization .

From here comes the role of the engineering economics course on the effective engineer, as engineering economics is defined as: One of the branches of modern economics that is concerned with conducting scientific and analytical studies and calculations for financing, investment, operation, production and marketing. Engineering economics is based on studying the performance efficiency and profitability of existing institutions, companies and projects. The engineering economy evaluates the costs of products, services and systems, as it deals with the financial results of products, services and projects designed by efficient engineers. After they design, they solve engineering problems until a positive balance is achieved for long-term benefits over long-term costs. [1]

The engineering economics course has many objectives, including:

- 1- Facilitating the determination of economic, social and financial feasibility by analyzing these aspects in terms of specialized economic studies.
 - 2- The engineering economics course helps clarify how to use the resources available to the institution to be a strong competitor to other institutions.
 - 3- The engineering economics course explains where the institution's funds go and how much it has in stock, cash, and other important information.
 - 4- The engineering economics course helps with methods of raising funds to form a start-up company, and the course also explains the types of companies.
 - 5- The engineering economics course explains whether investing in a specific company is profitable or not, as this matter greatly benefits investors.
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Skills acquired from economics

The most important skills and knowledge expected to be acquired after completing the study of economics:

- 1 -Understand the four main financial statements produced by companies.
 - 2 -Understand the difference between the market value of shareholders 'equity and the book value of shareholders' equity
 - 3 -Understand the difference between earnings per share and diluted earnings per share.
 - 4 -Understand the difference between gross profit and net income.
 - 5 -Understand what are the assets and liabilities.
 - 6 -Knowing the sections of the cash flow statement.
 - 7 -Knowing how the company compares itself over time or compares it with other companies.
 - 8- Knowing the profitability ratios, liquidity ratios and interest coverage ratios.
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2. CONCEPT SUMMARY:

Determine the financial statement, its utility and uses

I have chosen to explain in this report the income statement, as it is one of the four financial statements that illustrate the financial performance of the company in the accounting reports that are issued annually or quarterly.

The income statement directly shows the company's revenues and expenses during a certain period of time and can be compared with another time period.

The benefit of preparing the income statement is informing company managers and also investors about whether the company has made profits or lost money during a certain period of time. The income statement is useful for dividing dividends among shareholders. Also, the income statement is useful in knowing where the company's money is wasted, whether it is on sales costs or operating expenses, and this problem of money waste is then addressed as much as possible. [2]

The company's division managers use the income statement to assess the efficiency of activities and operations throughout the year.

The management also uses the income statement to make fateful decisions. If the company's profits are high, they may take positive decisions, such as expanding into new markets or increasing production capacity, but if the company's profits are declining, the management will take negative decisions, such as closing a section of the company or suspending the production line .

Investors use the information contained in the income statement before investing in the company in order to predict the amount of the company's profits, its timing, and an estimate of the extent of profits they will obtain in the future.

Also, on the other hand, customers can use the statement of income until they know the company's ability to provide the services and products required .

Finally, the Government can use income statement of corporate to formulate tax and economic policies. [3]

Statement components and their meaning

The income statement consists of several basic items: [4]

1 -Total sales: It is the company's revenues from the sales of its goods or from the services it provides to customers, and the value of this revenue is in the first line of the income statement.

2 -Cost of sales: It is the direct costs associated with manufacturing the company's products and goods only or the expenses of services provided to customers. The cost of sales is on the second line of the income statement.

3 -Gross profit: It is the difference between total sales and costs. If the value of total sales is greater than its cost, then there will be a total profit. In the event of the opposite, there will be a total loss, and this value is placed on the third line of the income statement.

4 -Total operating expenses: they are after the gross profit item in the income statement. They are all other indirect costs that are related to running the business. Operating expenses include several items, including an item (selling, general and administrative expenses) and an item (research and development expenses).

5 -Operating Income: It is the total profit achieved by the company from normal operating expenses. It is profit before deducting non-operating revenues or expenses, and before deducting interest and taxes as well. Item operating income after operating expenses in the income statement.

6 -EBIT: The company's profit is after added any other income and discount any other expenses of the company has nothing to do with their work or products. It is also the company's earnings before the income tax and interest expenses are discounted. Be EBIT item after operational income item.

7 -pre-taxes income: It is the company's profit after deducting all the company's interest expenses and before deducting its taxes. This item is after EBIT.

8 -Net income: it is the company's profit after deducting all company interest expenses and taxes. It also represents the total profits that the shareholders will get in the company. The net income item is after the pre-tax income item in the income statement.

9 -Earnings per share (EPS): It is the earnings per share from all outstanding shares in the company. The earnings per share item is the penultimate item in the income statement.

10- Diluted earnings per share: It is the earnings per share after the growth in the number of shares outstanding of the company. This is the last item on the income statement.

How to calculate statement components with an application

In this paragraph, I will mention the laws of each item of the income statement with its implementation for Facebook during the years 2020 and 2019. Through the laws, I will explain the change that happened to Facebook's income.

§ Gross Profit = Total Sales - Cost of Sales

Gross Profit in 2020: $\$85,965 - \$16,692 = \$69,273$

Gross Profit in 2019: $\$70,697 - \$12,770 = \$57,927$

The amount of change over the period = $\$69,273 - \$57,927 = \$11,346$

∴ Therefore, Facebook gross profit increased by \$11,346 million US during the year.

§ Operating Income = Gross Profit - Operating Expenses

Operating Income in 2020: $\$69,273 - \$36,602 = \$32,671$

Operating Income in 2019: $\$57,927 - \$33,941 = \$23,986$

The amount of change over the period = $\$32,671 - \$23,986 = \$8,685$

∴ Therefore, Facebook operating income increased by \$8,685 million US during the year.

§ EBIT = (Operating Income + Other Income) - Other Expenses

EBIT in 2020: $(\$32,671 + 0) - 0 = \$32,671$

EBIT in 2019: $(\$23,986 + 0) - 0 = \$23,986$

The amount of change over the period = $\$32,671 - \$23,986 = \$8,685$

∴ Therefore, Facebook earnings before interest and taxes increased by \$8,685 million US during the year.

§ Pre-Tax Income = EBIT - Interest Expense

Pre-Tax Income in 2020: $\$32,671 - (\$509) = \$33,180$

Pre-Tax Income in 2019: $\$23,986 - (\$826) = \$24,812$

The amount of change over the period = $\$33,180 - \$24,812 = \$8,368$

∴ Therefore, Facebook pre-taxes income increased by \$8,368 million US during the year.

☞ Net Income = Pre-Tax Income- Taxes

Net Income in 2020: $\$33,180 - \$4,034 = \$29,146$

Net Income in 2019: $\$24,812 - \$6,327 = \$18,485$

The amount of change over the period = $\$29,146 - \$18,485 = \$10,661$

∴ Therefore, Facebook net income increased by \$10,661 million US during the year.

☞ EPS = Net Income / shares outstanding

EPS in 2020: $\$29,146 / 2,851 = \10.22

EPS in 2019: $\$18,485 / 2,854 = \6.48

The amount of change over the period = $\$10.22 - \$6.48 = \$3.74$

∴ Therefore, Facebook basic earnings per share increased by \$3.74 million US during the year.

(new shares outstanding = Total basic and new shares outstanding - basic shares outstanding)

new shares outstanding in 2020: $2,888 - 2,851 = 37$ shares

new shares outstanding in 2019: $2,876 - 2,854 = 22$ shares

The amount of change over the period = $37 - 22 = 15$ shares

∴ Therefore, the number of new shares outstanding for Facebook increased by only 15 during the year.

☞ DEPS = Net Income / (basic shares outstanding + new shares outstanding)

DEPS in 2020: $\$29,146 / (2,851 + 37) = \10.09

DEPS in 2019: $\$18,485 / (2,854 + 22) = \6.43

The amount of change over the period = $\$10.22 - \$6.48 = \$3.66$

∴ Therefore, Facebook diluted earnings per share increased by \$3.66 million US during the year.

We note that the diluted earnings per share is less than the earnings per share due to the growth of the number of company shares while maintaining the same net income value.

Requesting a financial account statement for a company

After I defined and calculated each component of Facebook's income statement, I developed the following income statement: [5]

<i>Annual Data Millions of US \$; except per share data</i>		
Income Statement	2020 31/12	2019 31/12
Total sales	\$85,965	\$70,697
Cost of sales	\$16,692	\$12,770
Gross Profit	\$69,273	\$57,927
Selling, general and administrative expenses	\$18,155	\$20,341
Research and development	\$18,447	\$13,600
Total Operating Expenses	\$36,602	\$33,941
Operating Income	\$32,671	\$23,986
Other income	0	0
Other expenses	0	0
Earnings Before Interest and Taxes (EBIT)	\$32,671	\$23,986
Total non-operating income/ (Interest Expense)	(\$509)	(\$826)
Pretax Income	\$33,180	\$24,812
Taxes	\$4,034	\$6,327
Net Income	\$29,146	\$18,485
Basic Earnings per share (EPS)	\$10.22	\$6.48
Diluted earnings per share (DEPS)	\$10.09	\$6.43
Basic shares outstanding	2,851	2,854
Total basic and new shares outstanding	2,888	2,876

The meaning of each ratio and its uses

There are several important ratios that can be used on the income statement. These ratios will enable us to compare the company itself over time or compare it with other companies. I will explain these modifiers, what they mean and why they are used:

§ Gross Margin: It is the profitability ratio of the company that shows us the extent to which the company is able to sell a product at more than one production cost.

§ Operating Margin: It is the company's profitability ratio that shows the company's revenue from every dollar of its sales before interest and taxes are applied.

§ EBIT Margin: It is a company's profitability ratio that helps us compare several companies, especially within a particular industry, and it helps us assess how the company has grown over time.

§ Net Profit Margin: It is the profitability ratio of the company that shows the total revenue of the company's sales after deducting its interest and taxes. It is used to find out how successful the company is in collecting its profits for every dollar it earns. This shows the extent of the company's ability to control its costs.

§ Interest Coverage Ratio: This ratio measures how easy it is for a company to payable its interest on its outstanding debt. Therefore, the company's creditors look to this ratio to ensure the company's ability to meet its debt interest obligations.

How to calculate ratios with application and conclusions

Now, in this paragraph, I'll explain how to calculate ratios from Facebook's income statement. I will draw some conclusions from each ratio for both investors and shareholders:

Profitability Ratios:

☞ Gross Margin = Gross Profit / Sales

Gross Margin in 2020 = $(\$69,273 / \$85,965) * 100 = 80.58\%$

Gross Margin in 2019 = $(\$57,927 / \$70,697) * 100 = 81.94\%$

Because the ratio gross margin decreased in 2020, this means that Facebook has reduced its ability to sell a product by more than the cost, but this is because it affects both investors and shareholders.

☞ Operating Margin = Operating Income / Sales

Operating Margin in 2020: $(\$32,671 / \$85,965) * 100 = 38.01\%$

Operating Margin in 2019 = $(\$23,986 / \$70,697) * 100 = 33.93\%$

Because the ratio operating margin increased in 2020, this means that Facebook's revenue from every dollar of its sales before applying interest and taxes has increased, and thus the profits of shareholders and investors will increase.

☞ EBIT Margin = EBIT / Sales

EBIT Margin in 2020: $(\$32,671 / \$85,965) * 100 = 38.01\%$

EBIT Margin in 2019 = $(\$23,986 / \$70,697) * 100 = 33.93\%$

Because the ratio EBIT margin has increased, this means Facebook's profits before interest and taxes have grown in the year 2020, and therefore, of course, the profits of shareholders and investors will increase.

☞ Net Profit Margin = Net Income / Sales

Net Profit Margin in 2020: $(\$29,146 / \$85,965) * 100 = 33.9\%$

Net Profit Margin in 2019 = $(\$18,485 / \$70,697) * 100 = 26.15\%$

Because the ratio net profit margin increased in 2020, this means that Facebook's total profits from its sales after interest and taxes have increased, so it can be said that Facebook is successful in collecting its profits from every dollar it earns. Profits for both investors and shareholders from Facebook will increase.

Interest Coverage Ratios:

☞ Interest Coverage Ratios = EBIT / Interest Expense

EBIT per Interest Coverage in 2020 = $\$32,671 / \$509 = 64.2$

EBIT per Interest Coverage in 2019 = $\$23,986 / \$826 = 29.04$

Because the interest coverage rate has increased dramatically in 2020, this means that Facebook is able to pay the interest of its owed debt with ease. So Facebook's creditors won't have to worry about benefits.

3. DISCUSSION:

In conclusion, I explained in the concept summary paragraph that the financial statement that I chose was the income statement. I defined this statement and mentioned its usefulness and uses in many positions. I also explained all the components of the income statement that I studied and how to calculate it with an application on Facebook and drew some conclusions through these accounts and then put together the income statement for Facebook. I also explain in this report the meaning of rates that can be deduced from the income statement and their uses. Then I explained how the rates were calculated and applied it to Facebook, and concluded from it that the profits of the Facebook company increased in the year 2020 and that both the shareholders and the investors increased their profits.

We deduce from the foregoing the importance of engineering economics in analyzing the financial statements of companies and determining their profits and losses in any period. It will also help investors compare companies to invest in. We also conclude that the engineering economics subject facilitated determining the economic and financial feasibility by looking only at the financial data as these financial data showed us where the company's money goes, the amount of its stock, the amount of its cash, debts, revenues and other important information that benefit both investors Shareholders and corporate directors.

We conclude from the application that you made on the income statement for Facebook that Facebook has increased its profits in 2020 and this is a joy for both investors and shareholders. Also, we conclude that the earnings per share of Facebook has increased in 2020, and this will definitely increase its shareholders' profitability. Also, Facebook is a company that is able to easily pay any interest on its debts. From here we conclude the importance of the income statement in analyzing the financial performance of the company, as it directly clarified the revenues and expenses of the Facebook company during the year 2020 and was also able to compare it with the year 2019.

I recommend that every student studying industrial engineering, especially focus on engineering economics, as it will greatly benefit him in the future when he analyzes the financial statements of companies. I also recommend that everyone who wants to invest in a specific company should look at its financial statements before investing in it to determine the extent of its profits. I also recommend that every person or institution that will give another company a debt to look at the interest coverage rate, as it shows the company's ability to fulfill its debt interest obligations.

In conclusion, I hope that I have fully fulfilled what was required of me in this report and clarified the extent of my understanding of what I studied in the subject of engineering economics.

4. REFERENCES:

[1]

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[2]

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[3]

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[5]

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