

M.Ye. Zhukovsky National Aerospace University “Kharkiv Aviation Institute”

CALCULATION OF ECONOMIC INDICATORS FOR IT-ENTERPRISES

Tutorial

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Розглянуто методику виконання розрахункової роботи з найважливіших розділів курсу економіки підприємства. Основну увагу приділено розрахунку потреби в ресурсах і методичним підходам до визначення витрат і формування ціни продукції.

Для іноземних студентів, що вивчають курс «Economics of Enterprise» англійською мовою.

Composite authors:

T. Yu. Pavlenko, Ya. V. Safronov, D. S. Shvedova, V. S. Kupriyanova

Reviewers:

candidate of econ. sc., prof. I. Yu. Matushenko,
candidate of econ. sc., prof. V. I. Uspalenko

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Tutorial gives methodology for performing calculation paper including the most important topics of Enterprise Economics. The main focus is given to the calculation of resource requirements and methodological approaches to determining costs and formation of the products prices.

It is prepared for foreign students studying the course "Economics of Enterprise" in English.

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CONTENTS

Introduction.....	4
I. GENERAL ECONOMIC CONCEPTS.....	5
1.1. Resources, Property and Capital of Enterprises	5
1.2. General Description of Enterprise's Assets.....	7
1.3. Revenues, Costs and Profits of Enterprise	8
1.4. Types of Production Costs.....	9
1.5. Graphical Representation of Costs	12
1.6. Break-Even Analysis	14
II. THE TASK FOR THE CALCULATION PAPER.....	16
III. METHODOICAL GUIDELINES FOR COMPLETING CALCULATION PAPER	17
3.1. Task of the Paper and Its Main Indicators	17
3.1.1. Calculating the Amount of Equipment	17
3.1.2. Calculating the Amount of Investment into Equipment	18
3.1.3. Determining the Quantity of Employees.....	19
3.1.4. Calculating Wages for Employees	20
3.1.5. Determining the List of Expenses for Enterprise's Early Output.....	22
3.1.6. Determining Cost Price of Software Product.....	26
3.2. Determining Break-even Output.....	27
3.3. General Economic Indicators.....	28
Conclusions	30
Bibliography.....	31
Appendix 1. EXAMPLE OF TITLE PAGE	33
Appendix 2 TABLES OF INITIAL DATA FOR CALCULATION PAPER.....	34
Appendix 3 EXAMPLE OF FINISHED PAPER	38

Introduction

Economy covers all aspects of human life associated with satisfaction of all needs. People need food, clothing, shelter to maintain the standard of living, support a family, bring up children. These items are vital and are produced at industrial enterprises, agricultural and construction companies with the participation of transport and communication companies. Therefore, by knowing the economics of businesses which create main products for the society, we understand current economic processes.

In reality, the economy that is detached from material production does not exist. A particular economic process that does not follow the requirements of material production and does not take into account the demand for its products is going the wrong way. In order to avoid such a mistake while coming up with ideas and implementing business decisions, we need to study the performance indicators of an enterprise.

In modern conditions of rapid change in computer technologies an increasing need for software products arises, and the demand for such kind of labour also increases. Software products (SP) become an industry of mass production, where teams of specialists design software which becomes a commodity which is sold in competitive markets.

When designing a piece of software, it is necessary to study whether the project is profitable and economically efficient. Thus, many aspects should be checked: realistic terms, development expenses, marketing expenses, price of the product, market and competitor analysis.

Developers of SP should not only have professional knowledge, but also understanding of economics, and they have to be able not only to create new SP, but also to prove their value and prospects.

This tutorial was made to clarify how to do calculation paper which is intended to master the basic concepts of “Economics of Enterprise” course.

I. GENERAL ECONOMIC CONCEPTS

1.1. Resources, Property and Capital of Enterprises

For conducting a business, any enterprise needs a certain amount of **economic resources** or, in economic terms, **factors of production**. Factors of production include: land, labour, capital and entrepreneurial ability, — these are general inputs used to produce goods and services to make a profit. Generally, they mean the following:

- **land** (land itself, minerals, water, timber, coal);
- **labour** (all workers who do physical or intellectual work to keep a business running). There's also intellectual (human) capital and social capital (social laws and norms that contribute to business environment);
- **capital** (buildings, machines and tools, delivery trucks, computer, copying machine etc.);
- **entrepreneurial ability** (entrepreneurship) combines all these factors.

Generally, economic resources for enterprises include the **cost of capital** (property) and **human resources** (human capital/employees). As a result of investment, *capital* means goods that can help produce other goods. Unlike land or labour, it is created by human hands and for human purpose. This means time has to be invested into capital before it becomes useful. Invested capital is the total value of economic **assets** of the company. This is all the funds, in the form of equities or loans, invested into enterprise.

To start the business, any enterprise needs the initial amount of capital invested into operating assets (means of labour, objects of labour, cash) and personnel — workers, engineers, managers, lawyers, economists. All general and special skills, education, skills and work experience are collectively called **human capital**. The value of human capital is constantly increasing in develop-

ing modern economy. Enterprises developing their business under competition understand the value of investments into human resources — education, professional training and improvement of working conditions and social securities for the staff.

Moreover, economic resources have a special property — to create value and generate revenue. The potential success of a business lies within these resources being used effectively. In this regard, one of the most important tasks of enterprise's **management** is to create the conditions for effective use of these resources.

Competition makes companies do their best to meet the growing needs of consumers of goods and services. It encourages companies to introduce scientific and technological achievements, innovative methods of organising production and labour, — all of which reduce the costs of production, improve the quality of products and services, and expand the market share. Companies with high economic potential have modern fixed assets, qualified personnel, effectively manage fixed and working capital — these are the enterprises which have the competitive advantages.

Assets represent the property of enterprise in monetary assessment. Operating assets of the company, as a result of capital investment into the production, include:

- **fixed assets** which in material form are the **means of labour** (equipment, tools, building etc.);
- **circulating assets** (working capital) necessary for the capital turnover. That is: cash and **objects of labour** (raw materials, fuel, details, etc.).

Further explanation of enterprise's assets is given in the general description.

1.2. General Description of Enterprise's Assets

Material and technical resources of any enterprise consist of (1) **means (instruments) of labour** and (2) **objects of labour**, which together form the concept of **forces of production**.

(1) Means of labour include tools and machinery (the "instruments of production"), as well as buildings and land used for production purposes.

(2) The objects of labour may be materials provided directly by nature like timber or coal, or materials that have been modified by the labour.

Means of labour and objects of labour reflect the main fixed and circulating assets. The way they are divided is as follows:

- *the main production assets* (which are fixed) are involved in many production cycles and their value is partially transferred to the final product during the period of their service (f.e. a machinery which is used for 6 years — its value is not reimbursed after the first batch of product sold, the value is gradually accumulated in **depreciation** fund);

- *the circulating production assets* are fully involved (physically and by cost) in only one production cycle as they transform into the final product.

After selling the product the cost of fixed assets is partially reimbursed and accumulated according to the rate of depreciation. Fixed assets provide long-term income, losing value as they age. That is why these assets are expensed differently than other items. They are subject to periodic depreciation: asset's value decreases along with its depreciation amount on the company's balance sheet. Usually fixed assets have a useful life greater than one year. Therefore, fixed assets can be completely replaced only after their cost has been completely transferred to the cost of output. Buildings, real estate, equipment and furniture are good examples of those.

The cost of circulating capital is reimbursed immediately after the sale is completed. It allows firms to buy materials again to use in a new production cycle.

Information about a company's assets helps to create accurate financial reporting, business valuation and thorough financial analysis. Investors use these reports to determine a company's financial health and decide whether to buy shares in or lend money to the business. Because a company may use a range of accepted methods for recording, depreciating and disposing of its assets, analysts need to study the notes on the corporation's financial statements to find out how the numbers were determined.

Effectiveness of an enterprise economic activity depends on many economic, organisational, managerial and other factors. One of the main factors affecting profitability of a business are fixed assets: their composition and volume, their ability to perform tasks of making a product of appropriate quality, in the right amount, within required time and at the lowest cost.

The costs for acquiring fixed assets (and their maintenance in the future) reach large sums of money that later should be justified by the return that the company will receive from producing and selling the product.

1.3. Revenues, Costs and Profits of Enterprise

The main function of the company — is to produce goods and services to meet the consumer demand. Carrying out business activities, company receives income and bears the costs. The difference between these values is profit, which is the main economic goal of a firm.

How is firm's income defined? The firm uses labour, land, capital and entrepreneurial resources, turning them into products and services. This is known as the *production process*. The total amount of goods or services produced by firm per unit of time is the total product — Q (quantity). If the total product Q will be sold by the company at a price of P, the company will have the revenue of R. The company's revenue is the value of all goods produced:

$$R=P \times Q,$$

Where P — is the price of product unit, and Q — is the quantity of units.

While buying the necessary factors of production, the firm bears the costs. The costs of the company — are the monetary costs of all the factors involved in the production of finished products. Funds that entrepreneur is left with after paying all the costs is called profit. Profit is defined as the difference between revenue and total cost of production:

$$\text{Profit} = \text{Revenue} - \text{Costs}$$

If revenues exceed total costs, the company brings profit. If revenues are less than total costs, the company is unprofitable. To make a profit, the business should strive to increase revenue and reduce costs.

1.4. Types of Production Costs

By Nature of Elements, there are three broad elements of costs:

1. *Material*: The substance from which the product is made is known as material. It can be direct as well as indirect.

(a) *Direct materials*: It refers to those materials which become a major part of finished product and can be easily traceable to the units. Direct materials include:

- All material specially purchased for a particular job/process
- All material acquired and later reordered from stores
- Components purchased or produced
- Primary packing materials
- Materials passing from one process to another

(b) *Indirect materials*: All materials which are used for purposes auxiliary to production and which can not be conveniently assigned to a specific physical unit. E.g., oils, grease, consumable stores, printing and stationary materials, consumable stores etc.

2. *Labour* cost can be classified into direct labour and indirect labour.

(a) *Direct Labour*: It is defined as the wages paid to workers who are engaged in the production process and whose time can be conveniently and economically traceable to products. For example, wages paid to workers in the assembly shop etc.

(b) *Indirect Labour*: Labour employed for the purpose of carrying on unbudgeted tasks, related goods or services provided, is indirect labour. It cannot be practically traced to specific units of output, f. e. wages of store keepers, foremen, time-keepers, supervisors, inspectors etc.

3. *Expenses*: Expenses may be direct or indirect.

(a) *Direct expenses*: These expenses are incurred on a specific cost unit and identifiable with the cost of unit. E.g. cost of design, layout or drawings, hiring of a particular tool or equipment for a job, fees paid to consultants etc.

(b) *Indirect expenses*: These are expenses which cannot be directly, conveniently and wholly allocated to cost centre or cost unit. Examples are rent, rates and taxes, insurance, power, lighting and heating, depreciation etc.

When operating, a company performs a number of functions. These functional costs may be classified as follows:

(a) *Manufacturing/Production costs*: It is the cost of operating the manufacturing department. It includes the cost of direct materials, direct labour, direct expenses, packing (primary) cost and all overhead expenses relating to production.

(b) *Administrative costs*: They are indirect and cover all expenditure incurred in formulating the policy, directing the organisation and controlling the operation of an enterprise. It is not related to research, development, production, distribution or selling activities.

(c) *Selling and distribution costs:* Selling cost is the cost of seeking to create or stimulate demand e.g. advertisements, market research etc. Distribution cost is the expenditure incurred which begins with making the reconditioned packages available for reuse, warehousing, expenditure when transporting articles to central or local storage. Expenditure incurred in moving articles to and from prospective customers, as well as in case of goods that are on sale or subject to return policy.

(d) *Research and development costs:* They include the cost of discovering new ideas, processes and products by experiment and implementing such results on a commercial basis.

(e) *Reproduction costs:* When a new factory is started or when a new product is introduced, certain expenses are incurred, like trial runs. Such costs are termed as reproduction costs and treated as deferred revenue expenditure. They are charged to the cost of future production.

By changes in Activity or Volume costs can be classified as fixed and variable.

Fixed costs: are the costs which are incurred for a period, and which within certain output and turnover limits, tends to be unaffected by fluctuations in the levels of activity (output or turnover). These costs arise due to contractual obligations and management decisions. Examples are rent, property taxes, insurance, supervisors' salaries etc.

Variable cost: Variable costs are those costs that vary directly and proportionately with the output e.g., direct labour. It should be kept in mind that the variable cost per unit is constant but the total cost changes corresponding to the levels of output. It is always expressed in terms of units, not in terms of time.

1.5. Graphical Representation of Costs

FC (fixed costs) and are graphically represented as a horizontal line: for any value of the number of products Q , these costs are the same, including at $Q = 0$ (Fig. 1.1.).

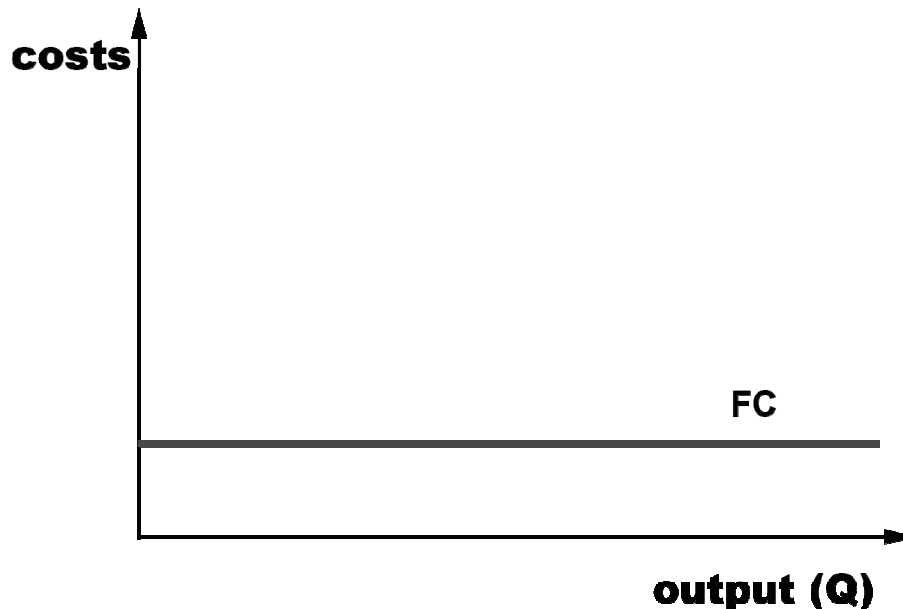


Figure 1.1. Fixed costs

Fixed costs can be: payment for the building; license fee; salaries of the management personnel; security personnel; the percentage for the bank loan; insurance fees and so on.

Variable costs — are costs the value of which depends on the level of output. For example, if a firm produces tables, with an increase in the amount of tables made there is an increase in the use of wood. The amount of consumed electricity will also grow if additional machines are used. Wages of workers increases if they are paid by the piece. Variable costs are called VC (variable cost) and are graphically depicted as an ascending curve: the higher the amount of output Q , the higher variable costs (VC). If the firm produces nothing ($Q = 0$), then the cost of wood, wages and so on is zero ($VC = 0$).

Variable costs can be: payment for raw materials and supplies; workers' wages; payment for electricity; payment for transportation services and so on.

The sum of fixed and variable costs gives us total costs — TC. Thus,

$$TC = FC + VC$$

Graphically, total costs are represented as the sum of graphs of fixed and variable costs (see Fig. 1.2.).

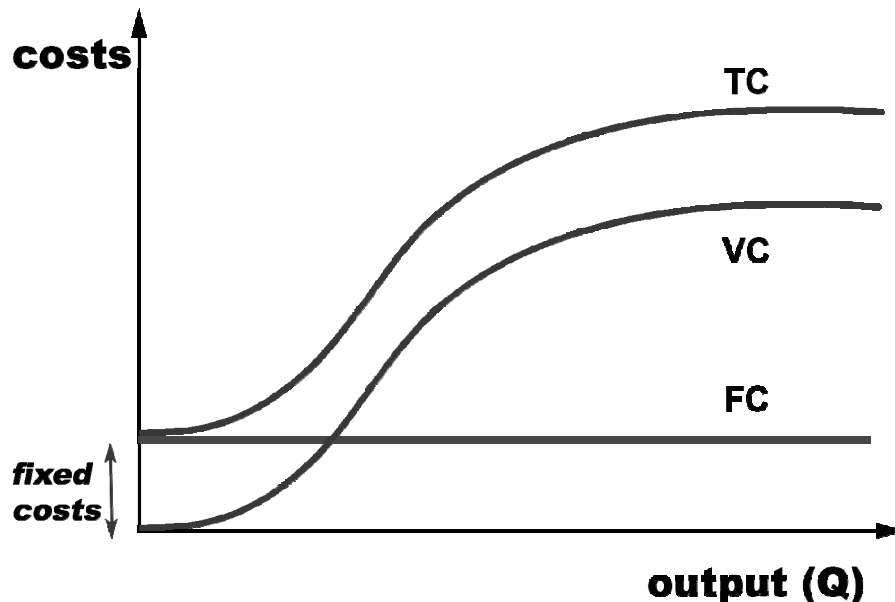


Figure 1.2. Total costs

It is necessary to mention that an important role in the division of costs into fixed and variable plays the time factor. There is a concept of short-term and long-term time periods. These concepts are not linked to calendar dates, such as a month or a year. The concepts of "short-term" and "long-term" depend on how the factors of production change. Short-Term Period — is the period during which some factors are constant, and others — variable. Long-Term Period — is the period during which all factors of production are variable.

Further is the distinction between the short run and the long run. To illustrate the short-run, suppose your factory for energy efficient automobiles is already up and running and producing 10,000 cars a year. Further suppose that the price of oil quadruples. At this point, demand starts to increase dramatically for your cars as consumers seek to substitute your car for the energy efficient ones. What do you do?

In the short run, you add two more shifts, hire more workers and use more energy and raw materials as you try to run your plant around the clock to meet increased demand. In fact, in the short run, this is your only option, because it would take over a year to build a new factory. That is the definition of the short run — the period in which firms can adjust production only by changing variable factors such as materials and labour but cannot change fixed factors such as capital.

In contrast, the long run is a period sufficiently long enough so that all factors in the production function, including capital can be adjusted. In this case, it is the time it would take for you to expand your existing factory or build a new one. This distinction between the short and long run is important in production theory because each period has its own kind of cost analysis.

1.6. Break-Even Analysis

The Break-even point may be defined as that point of sales volume where total revenue is equal to total cost, i.e., point of no profit or no loss. If sales are higher than this point, it means the business is earning profit. On the other hand, if sales are below this point means it is in losses. Thus, break-even point — is an equilibrium point or balancing point of no-profit/no-loss.

When it is used in the broader sense it means it is a system of analysis that can be used to determine the probable profit or loss at any given level of output. Under this sense, break-even analysis refers to the study of relationship between cost, volume and profit at different levels of production or output.

Break-Even Chart: Break-even chart is nothing but graphical representation of Break-even analysis.

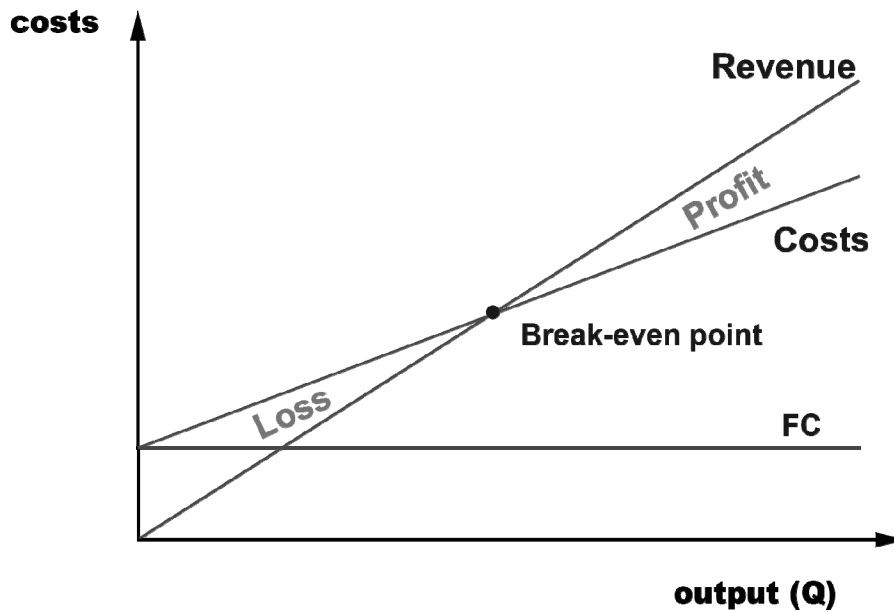


Figure 1.3. Break-even Chart

The following are the assumptions of the Break-even charts:

- (a) Fixed costs remain constant at every level and they do not increase or decrease with change in output or production.
- (b) Variable cost fluctuates per unit of output. In other words, they vary in the same proportion in which the volume of output or sales varies.
- (c) All costs are capable of being divided into fixed and variable.
- (d) Cost and revenue depend only on volume and not on any other factor.
- (e) Selling price remains constant even when the volume of production or sales changes.
- (f) Production and sales figures are either identical or changes in the inventory at the beginning and at the end of the accounting period are not significant.
- (g) Either the sales mix (range of goods) is constant or only one product is manufactured.

II. THE TASK FOR THE CALCULATION PAPER

Main parameters and initial data are given in the Appendix 2 (Table A, B).

1. During the year a company, creates and sells software product (SP) of _____ pieces.
2. Annual labour intensity during creation of SP is _____ in normative-hours.
3. Annual real time of equipment operation is _____ h.
4. Coefficient of performing work norms is _____.
5. Normative rate for additional equipment is _____ %.
6. Cost of a piece of basic equipment is _____ UAH.
7. Cost of a piece of additional equipment is _____ UAH.
8. Real hours of work for the staff over the year is _____ h.
9. Normative rate for the number of support staff is _____ %.
10. Normative rate for employees and junior staff is _____ %.
11. Average hourly payment for the main staff is _____ UAH/h.
12. Normative rate of extra salaries for the main staff is _____ %.
13. Average hourly payment for the support staff is _____ UAH/h.
14. Normative rate of extra salaries for the support staff is _____ %.
15. Average hourly payment for service staff is _____ UAH/h.
16. Normative rate of extra salaries for service staff is _____ %.
17. Average cost of consumables is _____ UAH/kg.
18. Normative rate of consumables is _____ %.
19. Standard unified social tax is _____ %.
20. Normative rate for the equipment operational costs is _____ %.
21. Annual depreciation rate for enterprise's equipment is _____ %.
22. Normative working space per employee is _____ m²
23. Cost of rent per square meter of premises is _____ UAH/m²
24. Normative rate for other operating expenses is _____ %.
25. Normative rate for administrative expenses is _____ %.
26. Normative rate for marketing and sales expenses is _____ %.
27. Number of ordered software products is _____ pcs.

III. METHODOLOGICAL GUIDELINES FOR COMPLETING CALCULATION PAPER

3.1. Task of the Paper and Its Main Indicators

This paragraph gives a detailed explanation of calculation paper with initial data and preliminary layout. Using the data given in the appendixes, the student is supposed to calculate the following economic indicators:

- 1) Calculate the number of basic and additional equipment.
- 2) Calculate the coefficient of load for main equipment (hardware).
- 3) Calculate the need for investments into equipment (hardware).
- 4) Determine the number of employees by categories.
- 5) Calculate the wages of workers by categories.
- 6) Comply the list of company's expenses and costs for the annual volume of output
- 7) Calculate the cost of producing and full cost of SP.
- 8) Determine analytically and graphically the break-even volume of output for the year.
- 9) Calculate generalised economic indicators of the company

3.1.1. Calculating the Amount of Equipment

Estimated number of basic equipment (hardware) is given by:

$$\text{Number of basic equipment} = \frac{\text{par 2}}{\text{par 3} \times \text{par 4}}, \quad (3.1)$$

where

par 2 — annual labour intensity of creating a SP (see initial data);

par 3 — annual real operation time of the equipment (see initial data);

par 4 — coefficient of performing work norms (see initial data);

The accepted amount of the main equipment would be rounded to a whole number. So that, for example, if the number turns out to be 75.3 pcs., we round it to bigger number = 76 pcs.

The coefficient of load of the main equipment is determined by dividing the estimated number of equipment by the rounded number of equipment:

$$\text{coefficient of load} = 75.3/76 = 0.99 \text{ (example)} \quad (3.2)$$

Estimated amount of additional equipment is given by:

$$\text{additional equipment} = \frac{\text{Number of basic equipment} \times \text{par 5}}{100}, \quad (3.3)$$

where the Number of basic equipment — accepted quantity of basic equipment, pcs., see (3.1);

par 5 — normative rate for additional equipment (see initial data).

The accepted amount of additional equipment is rounded to the nearest whole smaller number. For example, if we get 15.8 pcs., the accepted number will be 15 pcs.

3.1.2. Calculating the Amount of Investment into Equipment

The amount of required investment into equipment is defined as the sum of investment into capital equipment (main equipment) and the required investments into additional equipment, UAH:

$$\text{Required investment} = \text{main equip} + \text{additional equip}. \quad (3.4)$$

Investments required into capital equipment (main equipment) are determined by the formula:

$$\text{Investment (main equip)} = (3.1) \times \text{par 6}, \quad (3.5)$$

where (3.1) — accepted quantity of main equipment, pcs.;

par 6 — cost of a piece of main equipment (see initial data).

Investments that are required for additional equipment are determined by the formula:

$$\text{Investment (add. equip)} = (3.3) \times \text{par 7}, \quad (3.6)$$

where (3.3) — the amount of additional equipment, pcs.;

par 7 — cost of a piece of additional equipment (see initial data.).

3.1.3. Determining the Quantity of Employees

Company staff consists of: the main staff, support staff and service staff.

Main staff consists of main researchers, leading tech experts and software engineers. Support staff (or additional workers) includes managers, economists, financiers, administrators. Service staff includes PC operators, registers, couriers, guards and cleaners.

The number of main staff is calculated according to the labour intensity (time consumption):

$$\text{Main staff} = \text{par 2} / (\text{par 8} \times \text{par 4}), \quad (3.7)$$

where par 2 — annual labour intensity of creating SP (see initial data);

par 8 — real annual working time (see initial data.);

par 4 — coefficient of performing work load (see initial data).

Accepted number of main personnel is to be rounded to a bigger number.

Number of support staff is calculated, as a rule, according to the number of main staff, according to the general complexity or labour intensity of the development process. In this calculation paper, the number of support staff is determined as a percentage from the amount of accepted main personnel:

$$\text{Support staff} = (3.7) \times \text{par 9} / 100, \quad (3.8)$$

where (3.7) — accepted number of main staff, people;

par 9 — normative rate for the number of support staff (see initial data).

Number of service staff is defined by standards for such type of workers, either empirically, or as a percentage from the number of main and support staff. In the calculation paper their number is determined according to the normative as a percentage from the accepted number of main and support staff together:

$$\text{Service staff} = ((2.7) + (2.8)) \times \text{par 10} / 100, \quad (3.9)$$

where par 10 — the normative rate of the number of junior and service staff (see initial data).

3.1.4. Calculating Wages for Employees

Calculation of wages is based on generally accepted structure: basic salary with extra hours and additional salary, consisting of daily or monthly bonuses.

Extra hours to the basic salary are additional charges paid out from the salary funds, and may be as follows: bonuses from the salary funds, bonuses from the management fund, payment for night shifts, bonuses for team leading etc. These funds are allocated depending on the enterprise's policy.

Additional salary includes monthly payment for holidays and for performing public duties (f.e. military service or jury duty).

The basic salaries of main staff are determined by their number, annual real working time and average hourly payment:

$$\text{Salary (main)} = (3.7) \times \text{par 8} \times \text{par 11}, \quad (3.10)$$

where (3.7) — accepted number of main staff, № of people;

par 8 — annual real working time (see initial data);

par 11 — average hourly payment for main personnel (see initial data).

Statistical data on enterprise's information technologies and materials reveal that the additional salary is planned for all categories of workers. Therefore, it is possible to calculate total and extra salaries of main staff as follows:

$$\text{Extras} = (3.10) \times \text{par 12} \quad (3.11)$$

$$\text{Total salary (main)} = \text{extras} + (3.10),$$

where (3.10) — the basic salary of main staff, UAH;

par 12 — normative rate for extra salaries for the main staff, % (see initial data).

The basic salaries of support staff are defined according to the number of employees, the real annual hours of work and average hourly payment:

$$\text{Salary (support)} = (3.8) \times \text{par 8} \times \text{par 13}, \quad (3.12)$$

where (3.8) — is accepted number of support staff, number of people;

par 8 — real annual hours of work (see initial data);

par 13 — average hourly payment for support staff (see initial data).

It is also possible to calculate general and extra salaries of support staff as follows:

$$\text{Extras} = (3.12) \times \text{par 14} \quad (3.13)$$

$$\text{Total salary (support)} = \text{extras} + (3.12),$$

where (3.12) — are basic salaries of support staff, UAH;

par 14 — normative rate for extra salaries for the support staff, %;

The basic salaries of service staff are defined according to the number of these employees, the real annual hours of work and average hourly payment:

$$\text{Salary (service)} = (3.9) \times \text{par 8} \times \text{par 15}, \quad (3.14)$$

where (3.9) — is accepted number of service staff;

par 8 — real annual hours of work (see initial data).

par 15 — average hourly payment for service staff (see initial data).

It is also possible to calculate general and extra salaries of service staff as follows:

$$\text{Extras} = (3.14) \times \text{par 16} \quad (3.15)$$

$$\text{Total salary (service)} = \text{extras} + (3.14),$$

where (3.14) — is basic salary of service staff, UAH;

par 16 — normative rate for extra salaries for the junior and service staff, %.

3.1.5. Determining the List of Expenses for Enterprise's Early Output

Annual estimation of the cost of production starts from calculation of expenses. In this paper, we include the following types of expenses:

Table 3.1

List of total expenses for a year		Value
	the cost of basic materials and purchased products, UAH;	
+	total salaries of the main staff, UAH; (3.11)	
+	unified social tax from the total salaries of the main staff, UAH; (3.18)	
+	total salaries of the support staff, UAH; (3.13)	
+	unified social tax from the total salaries of support staff, UAH; (3.19)	
+	total salaries of service staff, UAH; (3.15)	

Table 3.1 continuation

List of total expenses for a year		Value
+	unified social tax from the total salaries of service staff, UAH; (3.20)	
+	Operating costs of the equipment, UAH; (3.21)	
+	annual refunds for equipment depreciation, UAH; (3.22)	
+	annual expenses on rent, UAH; (3.24)	
+	other operating expenses, which were not included previously, UAH; (3.25)	
+	administrative costs, UAH; (3.26)*	
+	sales and marketing costs, UAH. (3.27)*	
	Sum of all gives us total expenses for a year	Total _____ (3.16)

*The sum of all costs except administrative costs, sales and marketing costs (3.26 and 3.27) gives us total production cost. Thus: **TPC = (3.16) – ((3.26) + (3.27))**, where TPC — are total production costs.

Further, detailed instructions are given on how to calculate the indicators missing in the table. Once it is filled, we can determine total expenses for the year (3.16).

The cost of basic materials and purchased products is defined as follows:

$$\mathbf{Materials = (3.10) \times par\ 17 \times par\ 18,} \quad (3.17)$$

where (3.10) — is basic salary of the main staff, UAH;

par 17 — average cost of materials (see initial data);

par 18 — normative for consumable goods (see initial data).

Annual value of total wages for main workers, support staff and service staff are defined respectively by the formulas (3.11), (3.13), (3.15).

Annual value of unified social tax is calculated as a percentage from the total salary of each category of workers: main staff, support staff and service staff. The rate of interest is appointed by the Ukrainian regulations and in 2017 was established at 22.0 %. The interest for the social tax is given in the initial data. Thus, the annual values of the social fund are as follows:

$$\text{Social tax (main)} = (3.11) \times \text{par 19} / 100; \quad (3.18)$$

$$\text{Social tax (support)} = (3.13) \times \text{par 19} / 100; \quad (3.19)$$

$$\text{Social tax (service)} = (3.15) \times \text{par 19} / 100. \quad (3.20)$$

Operating costs of equipment (expenses on electricity and spare parts for equipment maintenance) is determined as a standard rate from the cost of equipment (see equation (3.4)).

Operating costs of equipment for the annual volume of work is defined as follows:

$$\text{Operating costs} = (3.4) \times \text{par 20} / 100, \quad (3.21)$$

where (3.4) — is the amount of required investment into the equipment (or cost of equipment);

par 20 — normative rate for the equipment operational costs (specified in the initial data).

Annual depreciation charges, that reflect the "wear and tear" of the main and additional equipment, are calculated as follows:

$$\text{Annual depreciation} = (3.4) \times \text{par 21} / 100, \quad (3.22)$$

where the standard rate (par 21) is given in the initial data

The necessary workspace for the enterprise is calculated by the formula

$$\text{Workspace} = ((3.7)+(3.8)+(3.9)) \times \text{par 22}, \quad (3.23)$$

where (3.7) — is the number of main staff, number of people;

(3.8) — the number of support staff, number of people;

(3.9) — the number of service staff, number of people;

par 22 — rate of floor space per employee (see the initial data), m².

Expenses for renting the premises are defined through the price of rent per square meter of premises and floor space of the production facilities:

$$\text{Rent} = \text{par 22} \times \text{par 23}, \quad (3.24)$$

where par 23 — is the cost of rent per square meter of space (see the initial data).

Other operating costs represent expenses for warranty service and repair of products, and it is estimated according to the normative rate as a percentage of total wages of the main staff:

$$\text{Other operating costs} = (3.11) \times \text{par 24} / 100, \quad (3.25)$$

where the par 24 — is the normative rate for other operating expenses (see the initial data).

Administrative costs are found out according to the normative rate as a percentage from the total salaries of all the staff:

$$\text{Administrative costs} = ((3.11) + (3.13) + (3.15)) \times \text{par 25} / 100, \quad (3.26)$$

where (3.11), (3.13), (3.15) – are annual values of total wages of main workers, support staff and service staff, UAH.;

par 25 – normative administrative expenses (see the initial data).

Expenses on sales and marketing (spending on market research, advertising and marketing of products) are determined by the normative rate as a percentage from the main staff salaries:

$$\text{Marketing} = (3.11) \times \text{par 26} / 100, \quad (3.27)$$

where par 26 — is the norm for sales and marketing costs (see the initial data.).

3.1.6. Determining Cost Price of Software Product

When calculating the cost of the software we distinguish between production cost and full cost of a single product.

The production cost of the software product is determined by the formula:

$$\text{Production cost} = \text{TPR} / \text{par 1}, \quad (3.28)$$

where TPR – total production costs (the sum of all the values, represented in the formula (3.16), except administrative costs, sales and marketing costs, UAH, see p. 21.

par 1 — number of ordered copies of the product (see the initial data).

The full cost of software product is the sum of its production cost, administrative cost and the cost of sales and marketing, all for 1 piece of software:

$$\text{Full cost} = (3.28) + (3.30) + (3.31). \quad (3.29)$$

Administrative expenses per one copy of software product, is given by:

$$\text{Administrative expenses} = (3.26) / \text{par 1}. \quad (3.30)$$

Sales and marketing costs per one copy of software product:

$$\text{Sales and marketing} = (3.27) / \text{par 1}. \quad (3.31)$$

Once the student has the full cost of software product, a percentage of profit should be added to get the wholesale price (without VAT).

$$\text{Wholesale price} = (3.29) + (3.29) \times \text{profit}/100,$$

Where profit may be chosen from 10 – 30 % from the full cost of SP. This can be discussed with the teacher.

3.2. Determining Break-even Output

The annual volume that reaches break-even point is the minimum amount of output of the program. Income from sales of this amount is only equal to the cost of production, so the profit is zero. This volume of output can be determined analytically or graphically.

Graphically, the break-even output is defined as the projected point of intersection of two lines: the annual revenue from sales and annual production costs (Figure 1.3.).

Annual revenue from sales is calculated by multiplying the price of a piece software by the number of ordered copies of SP:

$$\text{Annual revenue} = \text{wholesale price} \times \text{par 1.} \quad (3.32)$$

Analytically, the break-even output is calculated by dividing the annual fixed costs by the difference between the wholesale price of one SP and its variable costs, that is:

$$\text{BEP} = \text{FC} / (\text{wholesale price} - \text{VC per unit}). \quad (3.33)$$

Annual fixed costs (FC) will be the sum of expenses represented in (3.16.).

Annual variable costs (VC) consist of the sum of the first three types of annual costs (see Table 3.1):

$$\text{VC} = (3.17) + (3.18) + (3.11). \quad (3.34)$$

Variable costs per unit, determined by dividing the annual variable costs by the annual program of software release:

$$\mathbf{VC \text{ (per unit)} = (3.34) / \text{par 1.}} \quad (3.35)$$

3.3. General Economic Indicators

Annual revenue from sales is determined by formula (3.32).

Estimation of total enterprise's expenses was defined in (3.16).

Balance sheet profit is calculated by the formula:

$$\mathbf{Balance \text{ sheet profit} = (3.32) - (3.16).} \quad (3.37)$$

Investment into the equipment was determined by formula (3.4).

The number of employees consists of the sum of main staff, support staff and service staff (see formulas (3.7), (3.8), (3.9)).

Annual salaries are calculated by summing the annual wages of all categories of employees (see formulas (3.11), (3.13), (3.15.)):

The necessary space for business has been defined by formula (3.23).

Labour productivity is calculated by dividing the annual revenue from sale by the number of employees:

$$\mathbf{Labour \text{ productivity} = (3.32) / \text{number of employees.}} \quad (3.39)$$

Capital productivity is determined by dividing the annual income from sales (total revenue) by the value of investments into the equipment:

$$\mathbf{Capital \text{ productivity} = (3.32) / (3.4).} \quad (3.40)$$

Net profit ratio is calculated using the formula:

$$\mathbf{Net \text{ profit ratio} = (3.37) \times 100 / (3.32).} \quad (3.41)$$

Profitability is determined as follows:

$$\text{Profitability} = (3.32) \times 100 / (3.16). \quad (3.42)$$

After all the calculations are made, the student should submit a summary of all economic indicators of the enterprise in the form of a table. See Table 3.2 for references.

Table 3.2

The name of indicator	Unit of measure	Value
Number of ordered copies of SP	pcs.	
Number of main equipment	pcs.	
Number of additional equipment	pcs.	
Factor of load of the main equipment	-	
Investments into the equipment (its purchase)	UAH	
Number of employees	# of person	
Annual wages	UAH	
Space for business purposes	m ²	
Total enterprise's expenses	UAH	
Production cost (of a SP)	UAH	
Full cost (of a SP)	UAH	
Wholesale price (without VAT) (of a SP)	UAH	
Revenue at break-even point (sales at BEP)	UAH	
Break-even output	pcs.	
Annual profit from sales	UAH	
Balance sheet profit from sales	UAH	
Labour productivity	UAH/person	
Capital productivity	-	
Net profit ratio	%	
Profitability	%	

Conclusions

In this project economic assessment of software output programme development and implementation was performed. Development of the product included the following stages:

– the identification of the main segments and the market volume, which was estimated and amounted to _____ units / year;

– the labour intensity was defined and all the steps of the performers. Total labour intensity was estimated to be ____ man/days, the labour intensity for the developer will be 16 days, the ... - 11 days, the ... 9 days, ... - 12 days, the manager - 18 days;

– the calculation of wages and the price of the developed project. The main salary is equal to _____ UAH. The market price of the product is _____ UAH. The profit from selling the product was estimated to be at _____%.

Based on a full analysis of the production processes and the development of the _____, we can draw the following conclusions: in one year sales amount to ____ units. The analysis of the break-even point showed us the volume of sales, necessary to start making a profit after its reach.

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Appendix 1. EXAMPLE OF TITLE PAGE

Ministry of Education and Science of Ukraine
M.Ye. Zhukovsky Aerospace University
“Kharkiv Aviation Institute”
Department of Economic Theory

CALCULATION OF ENTERPRISE
ECONOMIC INDICATORS
Calculation paper
Economics of Enterprise

Done by:

Group and name _____

(Family name and initials)

Checked by:

Teaching assistant № 601 _____

(Family name and initials)

Kharkiv “KhAI” 2018

Appendix 2 TABLES OF INITIAL DATA FOR CALCULATION PAPER

The student should find the letter that corresponds to the 1st letter of family name or number by the group list. Using this, the student should find the corresponding parameters in tables A.1 and A.2 that will be the initial data for this calculation paper.

Main parameters by number

1. For whole year a company creates and sells software product (SP). Number of products (or volume of output) is taken from Table A.1 below.

Table A.1

№ in the list	Value	First letter of family name				
		from A to D	from E to K	from L to N	from O to T	from U to Z
1	Number of SP, pcs.	120	115	110	105	100
2	Number of SP, pcs.	125	120	115	110	105
3	Number of SP, pcs.	130	125	120	115	110
4	Number of SP, pcs.	135	130	125	120	115
5	Number of SP, pcs.	140	135	130	125	120
6	Number of SP, pcs.	145	140	135	130	125
7	Number of SP, pcs.	150	145	140	135	130
8	Number of SP, pcs.	155	150	145	140	135
9	Number of SP, pcs.	160	155	150	145	140
10	Number of SP, pcs.	165	160	155	150	145
11	Number of SP, pcs.	170	165	160	155	150
12	Number of	175	170	165	160	155

Table A.1 continuation

№ in the list	Value	First letter of family name				
		from A to D	from E to K	from L to N	from O to T	from U to Z
	SP, pcs.					
13	Number of SP, pcs.	180	175	170	165	160
14	Number of SP, pcs.	185	180	175	170	165
15	Number of SP, pcs.	190	185	180	175	170
16	Number of SP, pcs.	195	190	185	180	175
17	Number of SP, pcs.	200	195	190	185	180

Table A.2

№ of param.	Value	First letter of family name				
		from A to D	from E to K	from L to N	from O to T	from U to Z
1	Number of ordered software products, pieces.	Table A	Table A	Table A	Table A	Table A
2	Annual labour inten- sity, normative-hours	60000	65000	70000	75000	80000
3	Annual real time of equipment opera- tion, hours.	4000	4000	4000	4000	4000
4	Coefficient of per- forming work norms	1.05	1.1	1.05	1.1	1.05
5	Normative rate for additional equip- ment, %	25	26	27	28	29
6	Cost of a piece of main equipment, UAH	50000	48000	46000	44000	42000
7	Cost of a piece of additional equip- ment, UAH	10000	12000	14000	160 00	18000

Table A.2 continuation

№ of param.	Value	First letter of family name				
		from A to D	from E to K	from L to N	from O to T	from U to Z
8	Real hours of work for the staff over the year, h	1800	1800	1800	1800	1800
9	Normative rate for the number of support staff, %	30	25	20	30	25
10	Normative rate for service staff, %	10	12	14	10	12
11	Average hourly payment for the main staff, UAH /h.	42	44	46	48	50
12	Normative rate of extra salaries for the main staff, %	50	45	50	45	50
13	Average hourly payment for the support staff, UAH /h.	16	17	18	19	20
14	Normative rate of extra salaries for the support staff, %	35	30	35	30	35
15	Average hourly payment for service staff, UAH /h.	11	12	13	14	15
16	Normative rate of extra salaries for service staff, %	25	20	25	20	25
17	Average cost of materials, UAH /kg	1.5	2	1.5	2	1.5
18	Normative for consumables, %	№ by the list	№ by the list	№ by the list	№ by the list	№ by the list
19	Standard unified social tax, %	22	22	22	22	22
20	Normative rate for the equipment operational costs, %	№ by the list	№ by the list	№ by the list	№ by the list	№ by the list

Table A.2 continuation

№ of param.	Value	First letter of family name				
		from A to D	from E to K	from L to N	from O to T	from U to Z
21	Annual depreciation rate for enterprise's equipment, %	25	25	25	25	25
22	Normative working space per employee, m ²	10	9	10	9	10
23	Cost of rent per square meter of premises, UAH /m ²	300	275	250	225	200
24	Normative rate for other operating expenses, %	№ by the list	№ by the list	№ by the list	№ by the list	№ by the list
25	Normative rate for administrative expenses, %	2	4	6	8	10
26	Normative rate for marketing and sales expenses, %	9	8	7	6	5

Appendix 3 EXAMPLE OF FINISHED PAPER

Contents

Introduction

1. The task for the calculation paper

2. Calculation paper Guidelines

2.1. Purpose and content of the calculation paper

2.2.1. Calculating the number of equipment needed

2.2.2. Calculating the amount for investment into the equipment

2.2.3. Determining quantity of workers

2.2.4. Calculation of wages for workers

2.2.5. Determining the list of expenses for enterprise's yearly output

2.2.6. Determining cost price of a software product

2.3. Determining break-even product output program

2.4. Calculation of general economic indicators of enterprise

Introduction

Economy covers all aspects of human life associated with the satisfaction of his needs. To maintain the standard of living, support a family, raise children, people need food, clothing, shelter etc. These items are vital and are produced at industrial enterprises, agricultural and construction companies with the participation of Transport and Communication companies. Therefore, by knowing the economics of businesses which create main products we understand current economic processes.

In reality the economy that is detached from material production does not exist. A particular economic mechanism that does not follow the requirements of material production and does not take into account the demand for its products is false. In order to avoid such a mistake during the process of coming up with ideas and implementing business decisions, it is necessary to make the link between the contents of enterprise's documents and the performance requirements. For this we need to study the performance of an enterprise.

In modern conditions of mass application of computer technologies there's an increasing need for software products, and the demand for such kind of work also increases.

Software products (SP) become a mass industry, where teams of specialists design software which becomes a commodity sold in the markets with harsh competitive environment.

When designing a piece of software, it is required to make a study of whether the project is profitable: rational terms, development expenses, marketing expenses, price of the product, market analysis and product's competitiveness, evaluation of the economic efficiency.

Developers of SP should have not only professional knowledge, but also understanding of economics, and be able not only to create new SP, but also to prove their value and prospects.

1. The task for the calculation paper

Main parameters by number (from A and B for initial data)

1. for one year a company, working in two shifts, creates and sells a software product (SP) 115 pieces.
2. Annual labour intensity (labour inputs) during creation of SP — 75,000 normative-hours.
3. Annual real time of equipment operation — 4000 h.
4. Coefficient of performing work norms — 1.1.
5. Normative rate for additional equipment — 28 %.
6. Cost of a piece of basic equipment — 44,000 UAH.
7. Cost of a piece of additional equipment — 16,000 UAH.
8. Real hours of work for the staff over the year — 1800 h.
9. Normative rate for the number of support staff — 30 %.
10. Normative rate for employees and junior staff — 10 %.
11. Average hourly payment for the main staff — 48 UAH/h.
12. Normative rate of extra salaries for the main staff — 45 %.
13. Average hourly payment for the support staff — 19 UAH /h.
14. Normative rate of extra salaries for the support staff — 30 %.
15. Average hourly payment for service staff — 14 UAH /h.
16. Normative rate of extra salaries for service staff — 20 %.
17. Average cost of consumables — 2 UAH /kg.
18. Normative rate of consumables — 3 %.
19. Standard unified social tax — 22 %.
20. Normative rate for the equipment operational costs — 3 %.
21. Annual depreciation rate for enterprise's equipment — 25 %.
22. Normative working space per employee — 9 m²
23. Cost of rent per square meter of premises — 225 UAH /m²
24. Normative rate for other operating expenses — 3 %.

Appendix 3 EXAMPLE OF FINISHED PAPER

25. Normative rate for administrative expenses — 8 %.
26. Normative rate for marketing and sales expenses — 6 %.
27. Number of ordered software products — 115 pcs.

2. Calculation paper guidelines

2.1. Content of the calculation paper

Using the data given, perform the calculation of the following economic indicators:

1. Calculate the number of basic and additional equipment.
2. Calculate the coefficient of load for main equipment.
3. Calculate the need for hardware investments.
4. Determine the number of employees by categories.
5. Calculate the wages of workers by categories.
6. Complete the list of company's expenses and costs for the annual volume of output
7. Calculate the cost of producing and full cost of SP.
8. Determine analytically and graphically the break-even volume of output for the year.
9. Calculate generalised economic indicators of the company

2.2.1. The calculation of the amount of equipment (hardware).

Estimated number of basic equipment is given by:

Number of basic equipment =

$$= \frac{\text{annual labor intensity of creating a SP}}{\text{annual real time operation of the equipment} \times \text{coefficient of performing work}} =$$
$$= \frac{75000}{4000 \times 1.1} = 17.04$$

Appendix 3 EXAMPLE OF FINISHED PAPER

The accepted amount of the main equipment would be rounded to a whole number. So, we round it to number = 17 pcs.

The coefficient of load of the main equipment is determined by dividing the estimated number of equipment by the rounded number of equipment:

$$\text{Coefficient of load} = 17.04 / 17 = 1.002$$

Estimated amount of additional equipment is given by:

Additional equip. =

$$\frac{\text{Number of basic equipment} \times \text{normative rate for additional equipment}}{100} =$$

$$= \frac{17 \times 28}{100} = 4.76$$

The accepted amount of additional equipment is rounded to the nearest smaller whole number. The accepted number will be 5 pcs.

2.2.2. Calculation of investment into the equipment

The amount of required investment into the equipment is defined as the sum of investment into capital equipment (main equipment) and the required investments into additional equipment, UAH:

$$\text{Required investment} = \text{main equip} + \text{add. equip.} = 17 + 5 = 22$$

Investments required into capital equipment (main equipment) are determined by the formula:

Investment (main equip.) =

$$Q \text{ of main equip.} \times \text{cost of main equip} = 17 \times 44\,000 = 748\,000$$

Appendix 3 EXAMPLE OF FINISHED PAPER

Investments that are required into additional equipment are determined by the formula:

Investment (add. equip) =

$$\text{additional equip} \times \text{cost of a piece of add. equip.} = 5 \times 16000 = 8000$$

2.2.3. Determining the number of employees

Company staff consists of: the main staff, support staff and service staff. Main staff consists of researchers and leading tech experts, engineers and technical personnel. Support staff (or additional workers) consists of managers, economists and financiers. Service staff consists of PC operators, registers, couriers, guards and cleaners.

The number of main staff is calculated according to the labour intensity (time consumption):

$$\begin{aligned} \text{Main s.} &= \frac{\text{annual labor intensity}}{\text{real annual working time} \times \text{coefficient of performing work load}} = \\ &= \frac{75000}{1800 \times 1.1} = 37.8787 \end{aligned}$$

Accepted number of main personnel is to be rounded to a bigger number. So we take 38.

Number of support staff is calculated, as a rule, according to the number of main staff, according to general complexity (labour intensity) or complexity of the development process. The number of support staff is determined as a percentage from the amount of accepted main personnel:

$$\begin{aligned} \text{Support staff} &= \text{number of main staff} \times \\ &\frac{\text{the normative rate for the number of support staff}}{100} = 38 \times \frac{30}{100} = 11.4 \end{aligned}$$

We round the number of support staff to 12.

Number of service staff is defined by standards for such type of workers, either empirically, or as a percentage from the number of main and support staff. In this calculation, their number is determined according to the normative as a percentage of the accepted number of main and support staff together:

$$\frac{\text{Service staff} = (\text{Main staff} + \text{Support staff}) \times \text{normative rate of the number of junior and service staff}}{100} = (38 + 12) \times \frac{10}{100} = 5$$

2.2.4. Calculation of wages for workers

Calculation of wages is based on generally accepted structure: basic salary with extra hours and additional salary, consisting of daily or monthly bonuses.

Extra hours to the basic salary are additional charges paid out from the salary funds, and may be as follows: premiums from the salary funds, bonuses from the management fund, payment for night shifts, bonuses for team leading etc. These funds are allocated according to enterprise's staff.

Additional salary includes monthly payment of holidays and payment for public duties (i.e. military service).

The basic salary of main staff is determined by their number, annual real working time and average hourly payment:

$$\text{Salary (main)} = \text{main s.} \times \text{annual real working time} \times \text{hourly payment for main s.} = 38 \times 1800 \times 48 = 3283200$$

Statistical data on enterprise information technologies and materials reveal that the additional salary is planned for all categories of workers.

Appendix 3 EXAMPLE OF FINISHED PAPER

Therefore, it is possible to calculate total and extra salaries of main staff as follows:

Extras = basic salary of main staff \times normative rate for extra salaries for

$$\text{the main staff} = 3283200 \times \frac{45}{100} = 1477440$$

Total salary (main) =

$$\text{extras} + \text{basic salary of main staff} = 1477440 + 3283200 = 4760640$$

The basic salary of support staff is defined according to the number of support staff, real annual hours of work and average hourly payment:

Salary (support) =

number of support s. \times real annual h. of work \times aver. hourly pay for

$$\text{support s.} = 12 \times 1800 \times 19 = 410400$$

It is also possible to calculate general and extra salaries of support staff as follows:

Extras = Salary (support) \times norm. rate for extra salaries for support s. =

$$= 410400 \times \frac{30}{100} = 123120$$

Total salary (support) = extras + Salary (support) =

$$= 410400 + 123120 = 533520$$

The basic salaries of service staff are defined according to the number of service staff, real annual hours of work and average hourly payment:

Salary (service) = number of service s. \times real annual h. of work \times

$$\text{aver. hourly payment for service s.} = 5 \times 1800 \times 14 = 126000$$

Appendix 3 EXAMPLE OF FINISHED PAPER

It is also possible to calculate general and extra salaries of service staff as follows:

Extras = basic salary of service staff x normative rate for extra salaries for

$$\text{junior and service staff} = 126000 \times \frac{20}{100} = 25200$$

Total salary (service) = extras + basic salary of service staff =

$$= 25200 + 126000 = 151200$$

2.2.5. Complying the list of company's expenses and costs for the annual volume of output

Annual estimation of the cost of production can be expressed by calculation of costs. The calculation paper includes the following costs (Table 2.2):

Table 2.2

List of total expenses for a year		Value
	the cost of basic materials and purchased products, UAH;	748 000
+	total salaries of the main staff, UAH;	4 760 640
+	unified social tax from the total salaries of the main staff, UAH;	1 047 340.8
+	total salaries of the support staff, UAH;	533 520
+	unified social tax from the total salaries of the support staff, UAH;	117 374.4
+	total salaries of service staff, UAH;	151 200
+	unified social tax from the total salaries of service staff, UAH;	33 264

Appendix 3 EXAMPLE OF FINISHED PAPER

Table 2.2 continuation

List of total expenses for a year		Value
+	Operating costs of the equipment, UAH;	22 400
+	annual refunds for equipment depreciation, UAH;	189 000
+	annual expenses on rent, UAH;	2 025
+	other operating expenses, which were not included previously, UAH;	142 819.2
+	administrative costs, UAH;	435 628.8
+	sales and marketing costs, UAH.	28 638.4
Sum of all gives us total expenses for a year		
Total		8 211 850.60

*The sum of all costs except administrative costs, sales and marketing costs gives us total production cost.

The cost of basic materials and purchased products is defined as follows:

$$\text{Materials} = \text{salary of the main staff} \times \text{average cost of consumables} \times \text{normative rate of consumables} = 3283200 \times 2 \times \frac{3}{100} = 196992$$

Annual value of total wages of main workers, support staff and service staff are defined respectively by the formulas below.

Annual value of unified social tax is calculated as a percentage from the total salary of each category of workers: main staff, support staff and service staff. The amount of interest is appointed by the law of Ukraine. The interest

Appendix 3 EXAMPLE OF FINISHED PAPER

for the social tax is given in the initial data. Thus, the annual values of the social funds are as follows:

$$\begin{aligned} \text{Social tax (main)} &= \text{Total salary(main)} \times \text{Standard unified social tax} = \\ &= 4760640 \times \frac{22}{100} = 1\,047\,340.80 \end{aligned}$$

$$\begin{aligned} \text{Social tax (support)} &= \text{Total salary(support)} \times \text{Standard unified social tax} = \\ &= 533520 \times \frac{22}{100} = 117\,374.40 \end{aligned}$$

$$\begin{aligned} \text{Social tax (service)} &= \text{Total salary(service)} \times \text{Standard unified social tax} = \\ &= 151200 \times \frac{22}{100} = 33\,264 \end{aligned}$$

Operating costs of equipment (expenses on electricity and spare parts for the repair of equipment) is determined as a standard rate from the cost of equipment.

Operating costs of equipment for the annual volume of work is defined as follows:

$$\begin{aligned} \text{Operating costs} &= \text{cost of equip.} \times \text{norm.} \\ \text{rate for the equip. operational costs} / 100 &= 748000 \times \frac{3}{100} = 22400 \end{aligned}$$

Annual depreciation charges, that reflect the "wear and tear" of the main and additional equipment, are calculated as follows:

$$\begin{aligned} \text{Annual depreciation} &= \text{cost of equipment} \times \text{annual depreciation rate for} \\ \text{enterprise's equipment} / 100 &= (748000 + 8000) \times \frac{25}{100} = \mathbf{189000} \end{aligned}$$

The necessary workspace for the enterprise is calculated by the formula

Workspace =

$$((\text{no. of main staff}) + (\text{no. of support staff}) + (\text{no. of service staff})) \times$$

$$\text{rate of floor space per employee} = (38 + 12 + 5) \times 9 = 495$$

Appendix 3 EXAMPLE OF FINISHED PAPER

Expenses for renting the premises are defined through the price of rent per square meter of premises and floor space of the production facilities:

$$\text{Rent} = \text{Working space per employee} \times \text{cost of rent per square meter of space} = 225 \times 9 = 2025$$

Other operating costs represent expenses for warranty service and repair of products, and it is estimated according to the normative rate as a percentage from total wages of the main staff:

$$\text{Other operating costs} = \text{Total salary (main)} \times \text{norm. rate for other operating expenses} / 100 = 4760640 \times \frac{3}{100} = 142819.20$$

Administrative costs are found out according to the normative rate as a percentage from the total salaries of all the staff:

$$\begin{aligned} \text{Admin. costs} &= (\text{total wages of main workers} + \text{support s.} + \text{service s.}) \\ &\times \text{norm. admin. expenses} / 100 = (4760640 + 533520 + 151200) \times \frac{8}{100} = \\ &435628.80 \end{aligned}$$

Expenses on sales and marketing (spending on market research, advertising and marketing of products) are determined by the normative rate as a percentage from the main staff salaries:

$$\begin{aligned} \text{Marketing} &= (\text{total salary of main workers}) \times \text{norm for sales and} \\ \text{marketing costs} / 100 &= 4760640 \times \frac{6}{100} = 285638.40 \end{aligned}$$

2.2.6. Determining cost price of a software product

When calculating the cost of the software we distinguish between production cost and full cost of a single product.

Appendix 3 EXAMPLE OF FINISHED PAPER

The production cost of the software product is determined by the formula:

$$\text{Production cost} = \text{TPR} / \text{№ ordered copies} = \frac{8211850.60}{115} = 71407.40,$$

where TPR — are means total production costs, UAH.

The full cost of software product is the sum of its production cost, administrative cost and the cost of sales and marketing, all for 1 piece of software:

$$\text{Full cost} = (\text{Production cost}) + (\text{Administrative expenses}) + (\text{Sales and marketing}) \\ 71407.40 + 3788.1 + 2483.8 = 77679.30$$

Administrative expenses per one copy of software product, is given by:

Administrative expenses = Administrative costs / no. of products

$$\text{ordered} = \frac{435628.80}{115} = 3788.1$$

Sales and marketing costs per single piece of software:

Sales and marketing = Marketing cost / № products

$$\text{ordered} = \frac{285638.4}{115} = 2483.8$$

Once the full cost of software product is found, a percentage of profit should be added to get the wholesale price (without VAT).

Wholesale price = (Full cost) + (Full cost) × profit/100,

Where profit is chosen as 25 % from the full cost of SP.

$$\text{Wholesale price} = 77679.30 + 72723.60 \times 25/100 = 97099.10 \text{ UAH}$$

2.3. Determining Break-Even Product Output Program

The annual volume that reaches break-even point is the minimum amount of output of the program, income from sales of which is equal to the cost of production, i.e. profit is zero. The volume of output can be determined analytically or graphically.

Graphically, the break-even output is defined as the projected point of intersection of two lines: the annual revenue from sales and annual production costs.

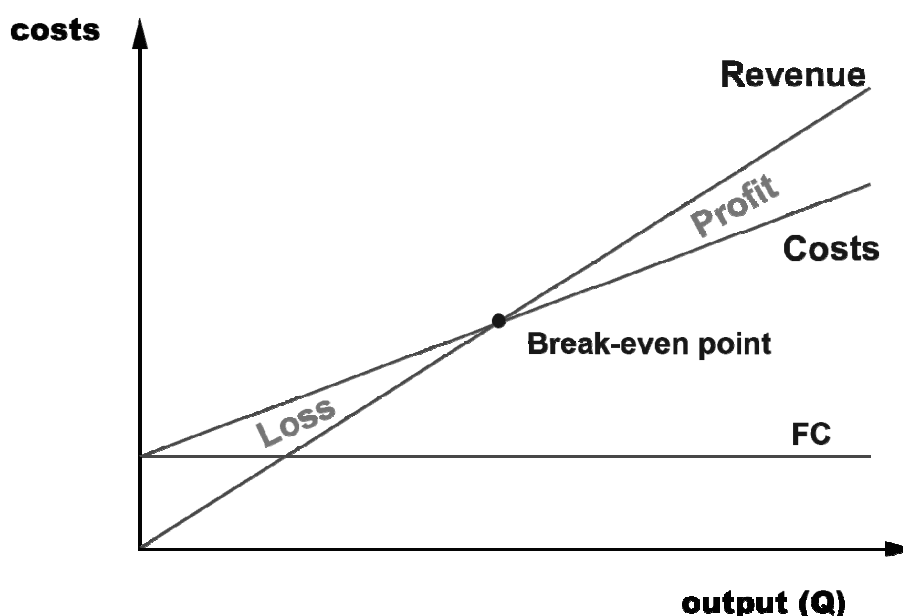


Figure 2.1. Break-Even Output Program

Annual revenue from sales is found out by multiplying the price of software piece by the number of ordered copies of SP:

$$\begin{aligned} \text{Annual revenue} &= \text{wholesale price} \times \text{no. of copies ordered} = \\ 97099.10 \times 115 &= 11166398.90 \end{aligned}$$

Analytically, the break-even output is calculated by dividing the annual fixed costs by the difference between the wholesale price of one SP and its variable costs, that is:

Appendix 3 EXAMPLE OF FINISHED PAPER

$$\text{BEP} = \text{FC} / (\text{w.price} - \text{VC per unit}) = \frac{7747583.40}{(97099.10 - 11840.9)} = 90.87$$

Annual fixed costs (FC) will be the sum of the expenses.

Annual variable costs (VC) consist of the sum of the first three types of annual costs:

$$\text{VC} = \text{cost of basic materials} + \text{social tax(main)} + \text{total salary} = 196992 + 1047340.8 + 117374.4 = 1361707.20$$

Variable costs per unit, determined by dividing the annual variable costs by the annual program of software release:

$$\text{VC (per unit)} = \text{Total VC} / \text{No. of products ordered} = \frac{1361707.2}{115} = 11840.9$$

2.4. Calculation of General Economic Indicators of Enterprise

Annual revenue from sales is determined from wholesale price.

Estimation of the total enterprise's expenses has been defined earlier.

Balance sheet profit is calculated by the formula

$$\text{Balance sheet profit} = \text{Annual revenue} - \text{Total expenses} = 11166398.90 - 8211850.60 = 2954548.30$$

Investment into the equipment was determined earlier.

The number of employees consists of the sum of main staff, support staff and service staff.

Annual salaries are calculated by summing the annual wages of all categories of employees.

The necessary space for business has been defined by formula.

Appendix 3 EXAMPLE OF FINISHED PAPER

Labour productivity is calculated by dividing the annual revenue from sale by the number of employees:

Labour productivity = Annual revenue / number of employees =

$$\frac{11166398.90}{55} = 203025.50$$

Capital productivity is determined by dividing the annual income from sales (total revenue) by the value of investments into the equipment:

$$\text{Capital productivity} = \text{Annual revenue} / \text{Investment (main)} = \frac{11166398.90}{22} = 507563.60$$

Net profit margin is calculated using the formula:

$$\begin{aligned} \text{Net profit margin} &= \text{Balance sheet profit} \times (100 / \text{Annual Revenue}) \\ &= 2954548.30 \times \frac{100}{11166398.90} = 26.5 \% \end{aligned}$$

Profitability is determined as follows:

$$\begin{aligned} \text{Profitability} &= \text{Total Expenses} / \text{Total revenue} \times 100 \\ &= \frac{8211850.60}{11166398.90} \times 100 = 73.5\% \end{aligned}$$

After all the calculations the student should submit a summary of all economic indicators of the enterprise in the form of a table.

Table 2.2

Generalised Economic Indicators of the Enterprise

The name of indicator	Unit of measure	Value
Number of ordered copies of SP	pcs.	115
Number of main equipment	pcs.	17
Number of additional equipment	pcs.	5
Factor of load of the main equipment	-	1.002
Investments into the equipment (its purchase)	UAH	748000
Number of employees	# of person	55
Annual wages	UAH	4760640
Space for business purposes	m ²	495
Total enterprise's expenses	UAH	8211850.60
Production cost (of a SP)	UAH	71407.40
Full cost (of a SP)	UAH	77679.30
Wholesale price (without VAT) (of a SP)	UAH	97099.10
Revenue at break-even point (sales at BEP)	UAH	11166398.9
Break-even output	pcs.	91
Annual profit from sales	UAH	2954548.30
Balance sheet profit from sales	UAH	2954548.30
Labour productivity	UAH/person	203025.50
Capital productivity	-	507563.60
Net profit margin	%	26.5
Profitability	%	73.5

Conclusions

In this project economic assessment of software output program development and implementation was performed. Development of the product included the following stages:

– the identification of the main segments and the market volume, which was estimated and amounted to _____ units / year;

– the labour intensity was defined and all the steps of the performers. Total labour intensity was estimated to be ____ man/days, the labour intensity for the developer will be 16 days, the ... - 11 days, the ... 9 days, ... - 12 days, the manager - 18 days;

– the calculation of wages and the price of the developed project. The main salary is equal to _____ UAH. The market price of the product is _____ UAH. The profit from selling the product was estimated to be at _____%.

Based on a full analysis of the production processes and the development of the _____, we can draw the following conclusions: in one year sales amount to ____ units. The analysis of the break-even point showed us the volume of sales, necessary to start making a profit after its reach.

From the calculation paper results, we can see that the break-even point is at 91st unit. In this way, the company's breakeven point is the point at which its sales exactly cover its expenses. As the total number of units is 115 we make profit after the 91st unit. The profit margin calculated is at 26.5% which is close to the chosen profit of 25%. Hence the calculation provided by me is valid and gives good prospects and can be implemented in real situation.

Навчальне видання

**Павленко Тетяна Юріївна,
Сафронов Яків Васильович,
Шведова Дар'я Сергіївна,
Купріянова Валентина Сергіївна**

**РОЗРАХУНОК ЕКОНОМІЧНИХ ПОКАЗНИКІВ ІТ-ПІДПРИЄМСТВА
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Видавець і виготовлювач
Національний аерокосмічний університет ім. М. Є. Жуковського
«Харківський авіаційний інститут»
61070, Харків-70, вул. Чкалова, 17
[http:// www.khai.edu](http://www.khai.edu)
Видавничий центр «ХАІ»
61070, Харків-70, вул. Чкалова, 17
izdat@khai.edu

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