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**MANAGEMENT CONTROL:
LECTURE NOTES**

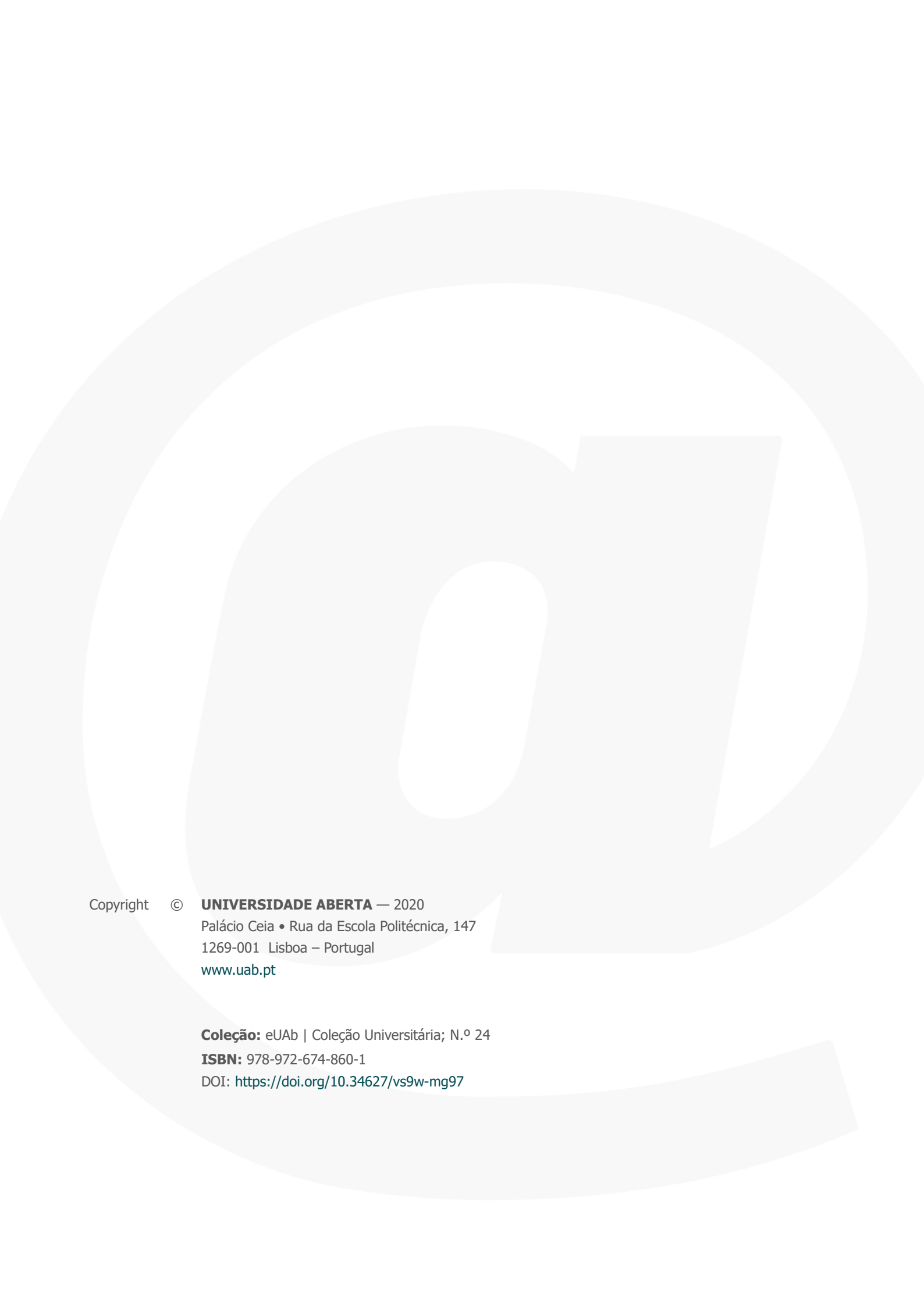


**MANUEL MOUTA LOPES
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MANAGEMENT CONTROL: LECTURE NOTES

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INTRODUCTION

This book appeared after several editions of the course in a master's degree, in which the idea of extending the entire experience of master's classes to a universe of interested in really knowing how the management control concepts of companies apply to an engineering practice was solidified, for reasons such as an appealing title for master's students or the recognition that the chosen program contents were the appropriate ones.

The work's purpose is to present a mainly financial, but also economic, view of the functioning of organizations, with theoretical and conceptual basis for the practice of financial project analysis capable of sustaining investment decisions and increasing the value of organizations. It also intends to able the engineer to use their practical need toward informed financial decisions in a range of engineering areas: mechanical, civil, industrial or manufacturing, among others.

The book targets master's students, and even bachelor's degree students, with a non-economic basic training but with an interest in perceiving the real functioning of companies. The numerous solved examples also appeal to professionals from various sectors of activity with management responsibilities in corporations, because decisions involve money and the business success depends upon the expertise of economic and financial issues.

The structure of the book begins with basic concepts of management control – planning and control, main costs, performance evaluation – in order to frame the reader in the importance of control systems to the activities of an organization, addressing topics such as the organizational structure, key aspects of a control system or the decentralization of management.

Chapter two focuses on the different types of organizational structure at the level of management, with an indication of differences in terms of management and relations with shareholders and stakeholders.

Chapter three deals with cost control, and highlights costs that are often overlooked in management: depreciation and depreciation, opportunity costs, and sunk costs.

Chapter four presents the differences between financial reporting from the perspective of those who produce and those who trade, where the profits of one are the costs of the other.

Chapter five focuses on production profit margins, with a separation between fixed and variable costs and their importance in the contribution margin and safety margin for profits.

Chapter six is about cost centers, separated by department, by products, and by activity, as well as isolated production and joint production.

Chapter seven is about budgeting, with emphasis on its importance, the separation between the master and subsequent budgets: sales, production, buying, labor, inventories, administrative. It also addresses cash budgets, and those relating to the income statement and balance sheet.

Chapter eight addresses responsibility centers, with analysis of variations in manufacturing costs: raw material, labor, general manufacturing costs.

Chapter nine deals with performance evaluation based on return on investment, residual income, and Economic Value Added (EVA).

Chapter ten focuses on transfer pricing between departments and between organizations.

The last chapter is about a source of information for the management of organizations: Balanced Scorecard, where objectives to be achieved and how to achieve it, metrics to be adopted and points of the organization to correct and improve.

1. BASIC CONCEPTS OF MANAGEMENT CONTROL SYSTEMS

Management Control constitutes the process of accumulation, analysis and communication of financial information. It is used by management to plan, evaluate, control and support decision making activities within an organization.

Why the companies need management control?

1. To performance evaluation.
2. To incentive alignment.
3. To minimize divergence of actual from desired results.

These problems result from the interests of the business owners are not aligned with the managers and employees and the decentralized organizations require the assignment of decision rights to points further away from the owner. The management control approaches the following issues:

1.1 COMPANY GOVERNANCE MODELS AND AGENCY THEORY

Considering the existence of problems related with the power distribution inside the companies and with the protection of different interests, there is a need to regulate the role of the stakeholders (entities that interact with companies).

Additionally, there are problems of alignment of interests between management and ownership which are studied by the agency theory in management. In order to deal with these problems, the companies adopt different corporate governance systems and models of business structures.

1.2 KEY PROPERTIES OF A MANAGEMENT CONTROL SYSTEM

A management control system is means of gathering and using information. It guides the behavior of managers and employees. Thus, the main purposes of a Management Control Systems (MCS) are:

- a. Accomplishment of the organization's objectives;
- b. Financial and non-financial performance measurement;
- c. Strategy Implementation and task control;

1.3 MAIN ACTIVITIES OF A MANAGEMENT CONTROL SYSTEM

In general, the work performed by management can be classified as:

- a. Strategic and Operational Planning: Budgeting;
- b. Implementing: Analyze relevant information;
- c. Controlling: Actual vs budget comparison.

Some examples of Planning Decisions are:

Table 1 (Wijayana, 2019)

Strategies Formulation	Management Control	Task Control
Acquire an unrelated business	Introduce new product or brand	Coordinate irder entry
Enter a new business	Expand a plant	Schedule production
Add direct mail selling	Determine advertising budget	Book TV commercial
Change debt or equity ratio	Issue new debt	Manage cash flows
Adopt affirmative action policy	Implement Minority recruitment program	Maintain personnel record
devise inventory speculation policy	Decide inventory levels	Reorder an item
Decide magnitude and direction of research	Control of research organization	Run individual reserch project

1.4 PLANNING AND CONTROL CYCLE

The control cycle of an MCS can be structured in the following way:

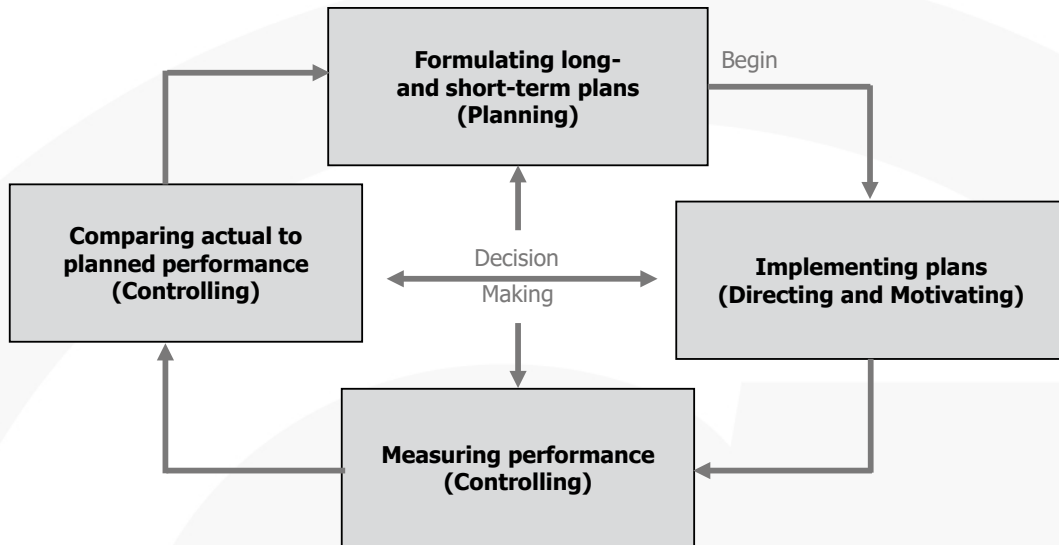


Figure 1: Management Control System (Ray H Garrison, Noreen, & Folk, 2005)

The control cycle entails the implementation of a decision method and employs a feedback process so that the firm's goals and specific strategic plans are adequately obtained.

1.5 MCS MEANS DECENTRALIZATION THROUGHOUT THE ORGANIZATION

The decision delegation for managers throughout the organization has benefits and disadvantages:

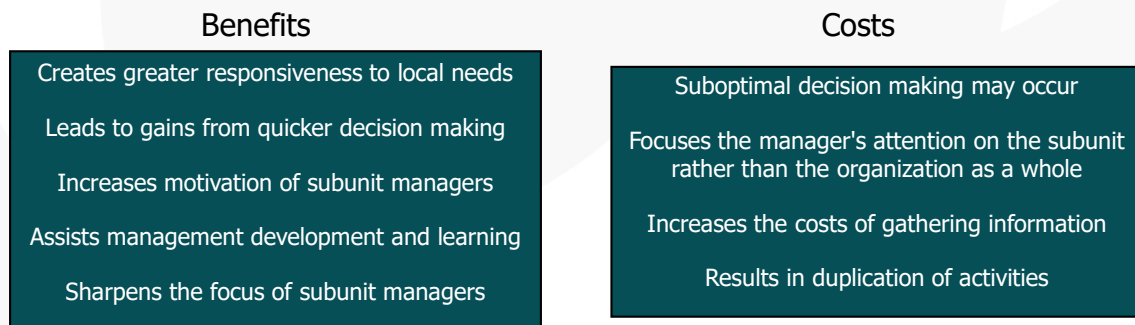


Figure 2: Benefits and costs of decentralization (Horngren, 2009)

1.6 MAIN COSTS CONCEPTS

The main costs concepts are the following:

- a. **Contribution margin (CM)** = total revenue - total variable cost
- b. **Unit contribution margin (UCM)** = CM/Q
- c. **Gross margin (GM)** = total revenues (TR) - cost of goods sold (COGS)
- d. **Manufacturing costs:** direct materials, direct labor and manufacturing overhead.
- e. **Marketing, selling and administrative costs** are not manufacturing costs. These are operating costs.
- f. **Operating Income (OI)** = GM - operating costs = CM – fixed costs (FC).

A way to control agency problems is through accounting control systems:

- a. **Responsibility centers:** organization unit that is headed by a manager who is responsible for its activities and results. Revenues and costs information are collected and reported by responsibility centers;
 - b. **Standard costing:** Rather than assigning the actual manufacturing costs many producers assign the expected or standard cost. However, they still have to pay the actual costs. As there always differences between the actual costs and the standard costs, they calculate the variances and analyze those differences.
 - c. **Budgeting:** Planning future income and expenditures for use as a guideline for spending and saving.
 - d. **Transfer pricing:** Price at which divisions of a company deal with each other. They may include the trade of supplies or labor between departments.
- **Responsibility Centers**

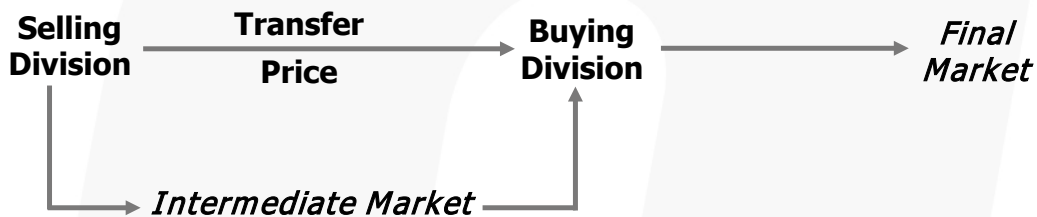
There are four types of responsibility centers:

Table 2 (Horngren, 2009)

Responsibility Center	Manager is responsible for...	Examples
Cost center	Controlling costs	Production line at Dell Computer; legal department and accounting departments at Nike
Revenue center	Generating sales revenue	Midwest sales region at Pace Foods; central reservation office at Delta
Profit center	Producing profit through generating sales and controlling costs	Product line at Anheuser-Busch; individual Home Depot stores
Investment center	Producing profit and managing the division's invested capital	Company divisions, such as Walt Disney World Resorts and Toon Disney

- **Transfer Prices**

Valuation of goods and services traded between profit or investment centers in decentralized organizations:

**Figure 3:** Transfer Pricing

- Selling division wants the transfer price to be high;
- Buying division wants the transfer price to be low.

- **Cost Classification**

- Detect long run vs. short run cost behavior;
- Cost assignment: Direct vs. Indirect
 - Direct costs: can be traced in a cost-effective manner.
 - Indirect costs (overhead): non-traceable costs.

- **Standard Costs and Transfer Prices**

Example 1: Consider 3 profit centers. Two produce components (Comp. 12 and Comp. 13). One produces the product Z. The company adopted standard costs and analyzes the variances. How can we define the transfer price between profit centers inside the same company?

Table 3 (Drury, 2013)

	Unit Costs					
	Profit Center S, Component 12		Profit Center S, Component 13		Profit Center B, Product Z	
	Standard Cost	Actual Cost	Standard Cost	Actual Cost	Standard Cost	Actual Cost
Transfer price					\$?	\$?
Direct materials	\$2.20	\$2.30	\$3.00	\$3.20	0.50	0.55
Direct labour	2.00	2.25	2.00	2.25	1.00	1.05
Variable factory overhead	4.00	3.80	4.00	3.80	1.50	1.60
Fixed factory overhead	<u>1.50^a</u>	<u>1.50</u>	<u>1.50^a</u>	<u>1.50</u>	<u>0.40^b</u>	<u>0.40</u>
Variable selling	2.50	2.55	2.50	2.55	0.30	0.35
Fixed selling	<u>0.50^a</u>	<u>0.50</u>	<u>0.50^a</u>	<u>0.50</u>	<u>0.10^b</u>	<u>0.10</u>
Total controllable costs	12.70	12.90	13.50	13.80	\$?	\$?

^a Unit fixed costs are based on the production and sale of a total of 100,000 units.

^b Unit fixed costs are based on the production and sale of a total of 20,000 units.

1.7 PERFORMANCE EVALUATION

There are several performance evaluation criteria:

- **Return on Investment (ROI%):** Contribution of the division to corporate earnings. Type of questions answered by this criterion: Are the dollars invested in the division generating an adequate return? Should more or less money be put into these activities?

$$ROI\% = \frac{\text{income}}{\text{invested capital}} = \frac{\text{income}}{\text{revenue}} \times \frac{\text{revenue}}{\text{invested capital}}$$

How can we improve performance?

- Increasing income by reducing expenses
 - Boost sales without increasing expenses
 - Reduce investments in working capital and fixed assets without decreasing sales
- **Residual Income (RI): Residual income is a variation of ROI%.**

Focuses on an absolute amount rather than a percentage:

$$\text{Residual income} = \text{Divisional net income} - (\text{cost of capital} \times \text{invested capital})$$

The firm's cost of capital is the acceptable rate of return for investments in a division with similar risk.

Table 4

	(€)	Current	New Proposal	Revised
Net income		200 000	75 000	275 000
Invested capital		1 000 000	500 000	1 500 000
ROI%		20%	15%	18%
Cost charge (8%)		80 000	40 000	120 000
Residual income		80 000	35 000	155 000

- **Economic Value Added (EVA)**

EVA is a variation of Residual Income (Stern Stewart & Co) and corresponds to the income earned by the firm less the cost of financing the firm's capital. The EVA focuses on an absolute amount rather than on the percentage.

$$\text{EVA} = \text{Net Operating Income} - \text{WACC} \times (\text{Long-Term Liabilities} + \text{Shareholders Equity})$$

WACC describes the weighted average cost of capital, which is the after-tax cost of long-term liabilities and shareholders' equity weighted by their relative size for the company or the division.

The principal functions of the controller are:

- Planning for control;
- Financial reporting and interpreting;
- Tax administration;
- Management audits, and development of accounting systems and computer data processing;
- Internal audits.

2. CORPORATE GOVERNANCE

Although used for corporations, the idea of Governance is also applied in the economic field in many other situations such as Public Governance and more recently Economic Governance. There are several definitions for governance:

- (a) the action or manner of governing: controlling, directing, or regulating influence;
- (b) the office, function, or power of governing;
- (c) the way something is governed or regulated; and
- (d) the conduct of life or business.

These diverse meanings allow the word to be used (and sometimes misused) for almost any context of economic decision-making or policy. The corporate governance analyzes the internal management of a corporation — organizational structure and the design of incentives for managers and workers — and the rules and procedures by which the corporation deals with its shareholders and other stakeholder (Dixit, 2011).

Another relevant governance concept is economic governance expressed as the study of good order and workable arrangements. It includes the institutions and organizations that underpin economic transactions by protecting property rights, enforcing contracts and organizing collective action to provide the infrastructure of rules, regulations (Williamson, 2005).

One of the major reasons for the existence of *Corporate Governance* is to avoid the executive board to take actions that benefit themselves in the short-term and leave the cost of those actions to the shareholder in the long-term. Economists refer to such situation as the **agency problem**.

2.1 HOW THE CORPORATIONS TRY TO AVOID THE AGENCY PROBLEM?

By creating a structure to monitoring the executive board

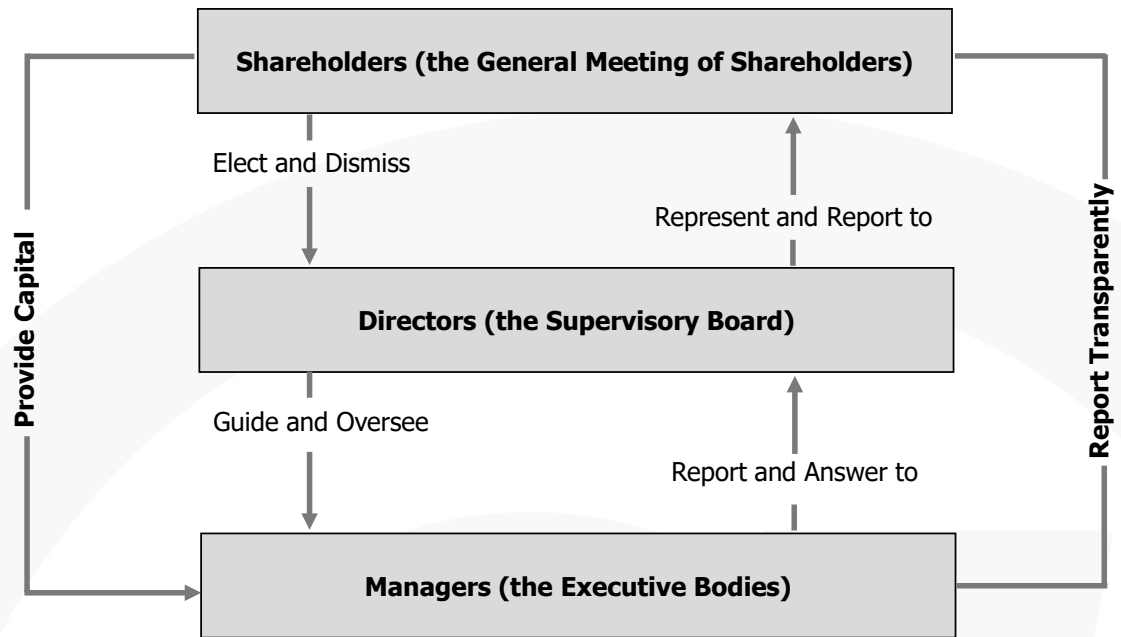


Figure 4: Monitoring the executive board (Choi, 2011)

But Corporate Governance is a growing idea whose goals need time to be fulfilled, since controlling the executive board is not always simple, and the supervisory board must have experience and skills.

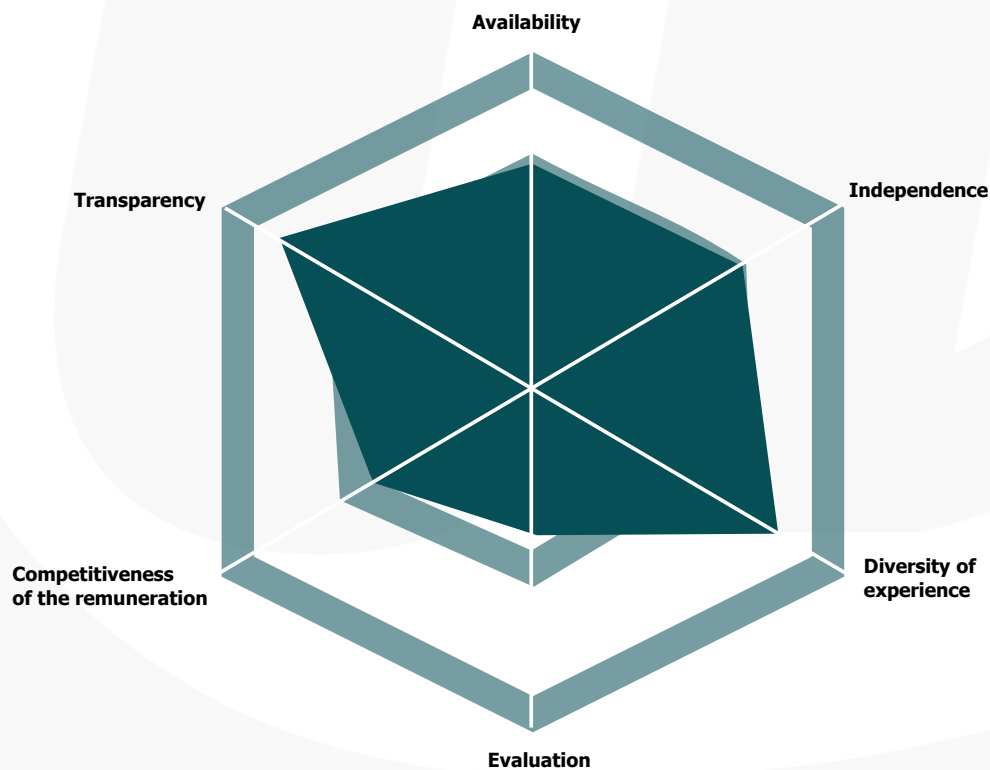


Figure 5: Objectives of the Corporate Governance (Struggles, 2011)

The Corporate Governance must have guidelines so that all the stakeholders (a corporate **stakeholder** corresponds to an entity which can affect or be affected by the actions of the business as a whole) can clearly understand clearly the company's objectives:

- a) **Fair treatment** of stakeholders
- b) **Transparency** in management
- c) **Alignment** of interests in the organization
- d) Accountability
- e) Business sustainability
- f) Social and environmental **responsibility**
- g) **Regulating conflicts** between agents (managers, shareholders, customers, employees, suppliers)

2.2 COMPRISES FOR THE CORPORATE GOVERNANCE

In order to pursue the company's objectives, it must be defined comprises for the Corporate Governance, such as:

- a) Mechanisms for the formulation of corporate goals;
- b) Bodies that assess the performance** in achieving the objectives;
- c) Bodies for auditing;**
- d) Adoption of rules for managing conflicts;
- e) The ethical conduct** of organs and employees;
- f) System of enforcement and sanctioning.

2.3 ORGANIZATIONAL STRUCTURES

In corporations, the organizational structure allows to see if the Corporate Governance is applied or if there are some obstacles delaying its implementation.

2.3.1 Latin model

Tends to be less codified than the Anglo-Saxon model and finds less need for procedures

for adjudication because it is founded in the context of the family and the local community. Based on a bottom up philosophy rather than a hierarchical top down approach, there is no real need for formal codification of governance procedures. The system of adjudication does not need to be formalized, working very satisfactorily on an informal basis (Crowther & Seifi, 2011).

- a) Consists of a board of directors, an audit board and a statutory board.
- b) **Family-owned businesses** who own a large % of shares.
- c) Holding companies and state ownership are key shareholders.

2.3.2 Two-tier board

In Germany the two-tier board system is mandatory for stock corporations. The main reason for choosing two-tier models is clearly the system of labor co-determination. The trade unions treat labor co-determination in corporate boards as sacrosanct. The board members who were generally satisfied with the two-tier board system liked the clear separation between management and control. They also thought the supervisory board is a good way for control by and advice from major shareholders, outside directors from other companies, bankers and representatives of the workforce (Hopt & Wymeersch, 1997).

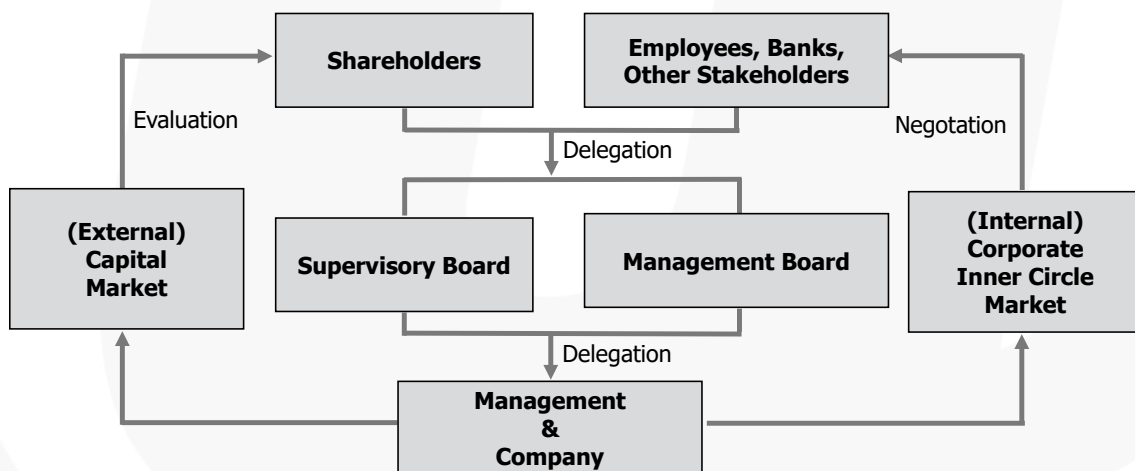


Figure 6: Two-tier board (Choi, 2011)

- a) Consists of a supervisory board and executive board
- b) Co-determination – partnership between capital and labor
- c) Social cooperation
- d) Efficiency in separation of supervision and management
- e) **Cross-shareholding** in financial – industrial groups

f) **Role of banks** as major shareholders

g) Primary sources of capital – **retained earnings and loans**

2.3.3 One-tier model

Anglo-Saxon countries such as the US, the UK and Canada have adopted variants of the one-tier board model where executive directors and non-executive directors operate together in one organizational layer (board). Some one-tier boards are dominated by a majority of executive directors while others are composed of a majority of non-executive directors. Additionally, one-tier boards can have a board leadership structure that separates the CEO and chair positions of the board. One-tier boards can also operate a board leadership structure that combines the roles of the CEO and the chairman. This is called CEO-duality (Maassen, 1999).

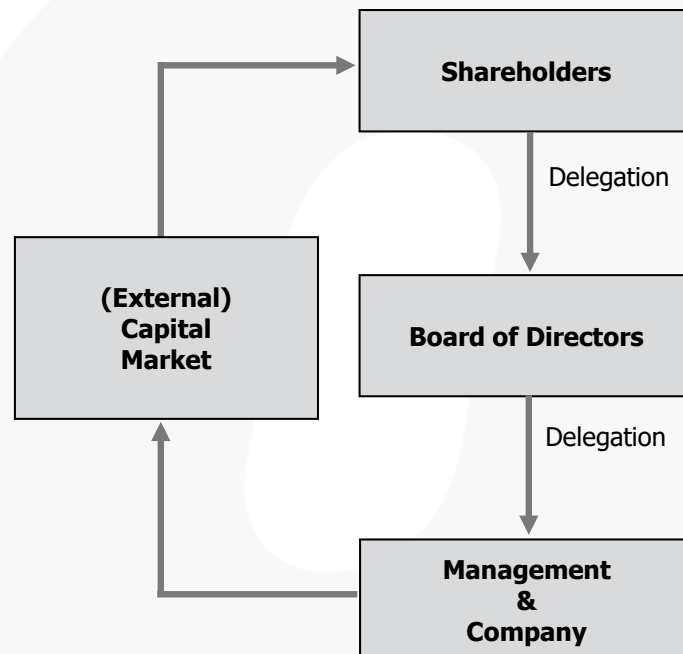
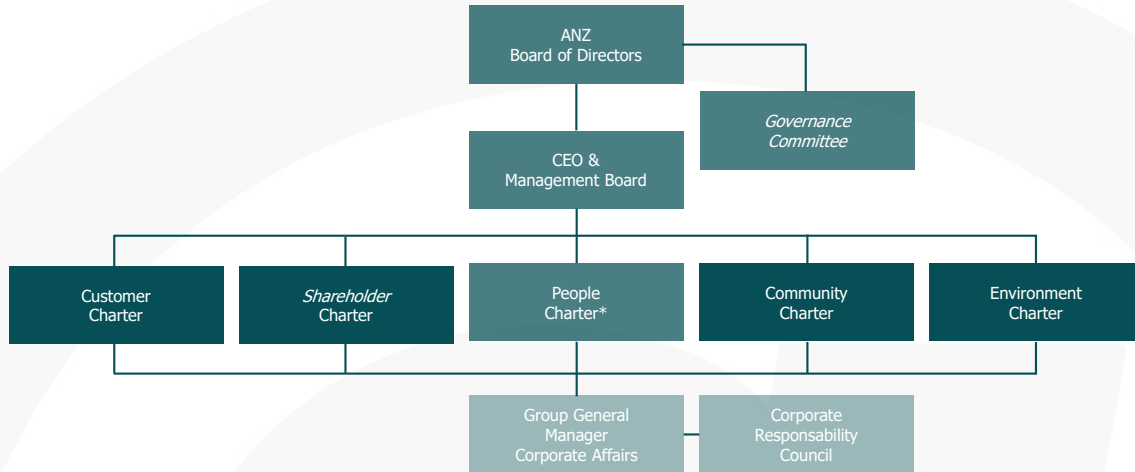


Figure 7: One-tier model (Choi, 2011)

- a) Shareholder value maximization: “outsider” model
- b) Internal governance mechanisms:
 - a. board of directors
 - b. employee compensation
- c) External mechanisms:
 - a. **market** for corporate control
 - b. monitoring by financial institutions
 - c. competition in product and input market

- d) Reliance on **legal mechanisms** to protect shareholder rights
- e) Short term financial performance key

Example 2:**Figure 8:** Corporate governance structure

Question: What kind of corporate governance structure is shown in the previous picture?

- a) **Anglo-Saxon Structure**
- b) German (Continental) Structure
- c) Latin Structure

2.4 OWNERSHIP STRUCTURES

In the efforts to raise governance standards the boardrooms try to enhancing diversity and create a positive culture, to explore the challenges of an evolution leadership on progress in the structural aspects of governance. So, there are different ownership structures for different corporate cultures.

In Asia, the predominance of partly listed family-owned businesses and government-linked entities creates a totally different context for a Corporate Governance model to operate in. The quite different system of regulation and demands for transparency that apply in the Anglo-Saxon shareholder capitalist model would actually provide information to the competitors of the family firms, as well as reduce the family's or government's ability to run the company. Figure 8 below shows the difference. In Asia, Latin America, and Europe, the model is about achieving and retaining control, rather than allowing the market to operate freely (Zinkin, 2011).

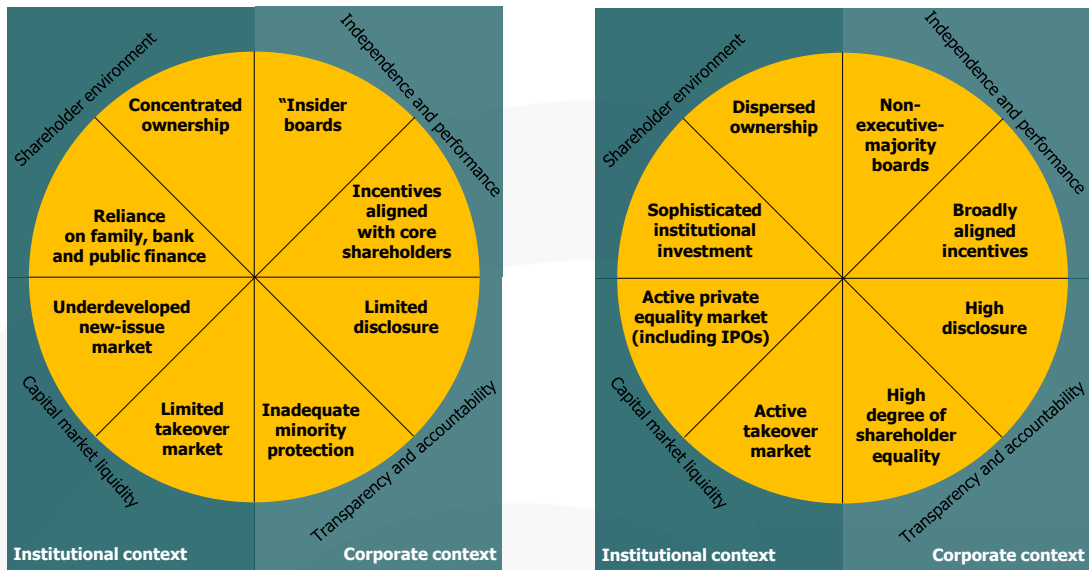


Figure 9: Models of corporate governance (Wallace & Zinkin, 2005)

Although there are several differences in the two models, the major point is the corporate control done through (Zinkin, 2011):

- 1) Concentrated ownership and a reliance on family or bank finance (public or private);
- 2) Boards with aligned incentives such that the board is dependent on the same outcomes as the controlling shareholders;
- 3) Limited disclosure and inadequate minority protection;
- 4) Illiquid capital markets with restricted takeover activities and an underdeveloped new-issue market.

The two different ownership structures can be seen as outsider systems versus insider systems. In the insider system, ownership and control is concentrated in the hands of a small number of entities (individuals, families, managers, directors, holding companies, banks and other non-financial companies. Most countries, especially those governed by civil law, have concentrated ownership structures. In the outsider system, owners rely on independent board members to monitor managerial behaviour and keep it in check. As a result, outsider systems are considered more accountable and less corrupt and they tend to foster liquid capital markets (Fernando, 2011).

Table 5

Outsiders System (Capital market focus)	Insider System (Bank focus)
Capital markets and external control	Universal banks and internal ownership and control
Widely dispersed/passive shareholders	Concentrated ownership/active shareholders
Shareholders democracy and Competitive interests and contractual solutions	Long term cooperation among stakeholders
One tier corporate boards dominated by insiders	Two-tiered corporate boards with interlocking directors, cross shareholdings, pyramid schemes, holding company structures
Liquidity for shareholders Strong minority shareholder protection Transparency, information disclosure Creditors' rights protected better Self dealing prohibited Clear Take-over rules' Clear Bankruptcy procedures More active securities markets	Employee participation in management Proxy rules Active participation of universal banking in providing financial solutions Active owners, closer monitoring of management, insider control Family ownership more common

2.4.1 Companies with several minority shareholders

Concentrated ownership points out to one of two effective shareholders and the management team tend to respond only to them. It is possible to identify the characteristics, the problems and the need of those corporations:

1) Characteristics:

- a) Higher influence in the management team
- b) Possible collusion of shareholders with exploitation of the minority shareholders

2) Problems:

- a) Management control
- b) Greater discretion of power of the management team

3) Needs:

- a) Control of minority shareholders
- b) Protection of the remaining minority shareholders
- c) Monitoring and supervision of the board

2.4.2 Companies with highly dispersed capital

If a corporation has multiple shareholders, they usually don't control the company and the managing team has more freedom. Here it's also possible to identify the characteristics, the problems and the needs:

1) Characteristics:

- a) Spreading the risk
- b) High capital-raising scale
- c) Easy access to capital markets

2) Problems:

- a) Administration board with great freedom and lack of control
- b) Agency costs

3) Needs:

- a) Mechanisms for monitoring the administration board
- b) A Corporate Governance's model

2.5 THE SHAREHOLDER'S APPROACH VERSUS THE STAKEHOLDER'S APPROACH

2.5.1 The shareholder's approach

Shareholder approaches argue that corporations have a limited set of responsibilities, which primarily consist of obeying the law and maximizing shareholder wealth. The basic argument is that corporations, by focusing on shareholder interests maximize societal utility. The logic of this position goes back to the ability of the shareholder model to maximize utility, however, is tenuous in that it is based on the assumption of perfect competition. To the extent that the conditions of perfect competition are not in place, the argument falters. More specifically, as deviations from the conditions of perfect competition increase (e.g. imperfect markets, incomplete contracts, information asymmetries), after a certain point, corporations will not be maximizing societal utility by merely pursuing shareholder interests. The shareholder approach is logically most compatible with the Anglo-American model of corporate governance (Fernando, 2011). In the shareholder model corporations are working only to reward the owners and those want remunerations to be consistent over time, as if it were interest from capital. In the shareholder model is possible to identify its characteristics, its assumptions, and its problems.

1) Characteristics:

- a) The objective is maximizing profits
- b) The market controls the management board achievements
- c) Managers are the agents for the investors

2) Assumptions:

- a) Perfect access to information
- b) Inexistence of entry barriers (no limit to share trading)

3) Problems:

- a) Aligning the managers' objectives with maximizing the shareholders or company's value.

But if the shareholders can have a source of remuneration for their capital that is reliable and even growing when the management team achieves their goals, why is this model not optimal? There are some reasons:

- a) Sometimes the financial markets do not guarantee the best capital allocation (dot.com bubble).
- b) Sometimes Mergers and Acquisitions (M&A) activities do not prove to provide higher returns on equity or investment (poor synergies).
- c) Stock options remuneration does not prove to align Management with Shareholders objectives.

Even so the shareholder model is still popular. Why?

- a) International investment relies on the contractual protection of those investments, provided by shareholder agent theory.
- b) Global competition is 'survival of the fittest' with is measured in Return on Equity & Investment.
- c) Rapid pace of changes favor investors' perspective instead of rigid labor markets.

But all shareholders want to know if their capital will be reward for as many years as they expected, and try to understand if their corporation is safe and sound and seek for information as:

- a) The number of people employed in the firm.
- b) The book value of the firm's assets less the book value of its liabilities.
- c) The amount of salary paid to its employees.
- d) The market price per share of the firm's common stock (X).

2.5.2 The stakeholder's approach

The stakeholder theory is grounded in any normative theoretical perspectives including ethics of care, the ethics of fiduciary relationship, social contract theory, theory of property rights, theory of the stakeholders as investors and critical theory. While it is possible to develop stakeholder analysis from a variety of theoretical perspectives, in practice much of stakeholder analysis does not firmly or explicitly root itself in a given theoretical tradition, but rather operates at the level of in principles and norms for which it provides little formal justification. Insofar as stakeholder approaches uphold responsibilities to non-shareholder groups, they tend to be in some tension with the Anglo-American model of corporate governance, which generally emphasizes the primacy of fiduciary obligations owed to shareholders over any stakeholder claims (Fernando, 2011). The stakeholder model has a much wider view of the corporation's needs, since implies not only its capital owners but also its employees, suppliers, customers, and even other funders. The characteristics of the stakeholder model are:

- a) Profits derived from value creation.
- b) Profits should satisfy the needs of a variety of stakeholders (moral end of corporations).
- c) Sound legal framework in addition to incentive structures.
- d) Ethical and transparent operations.

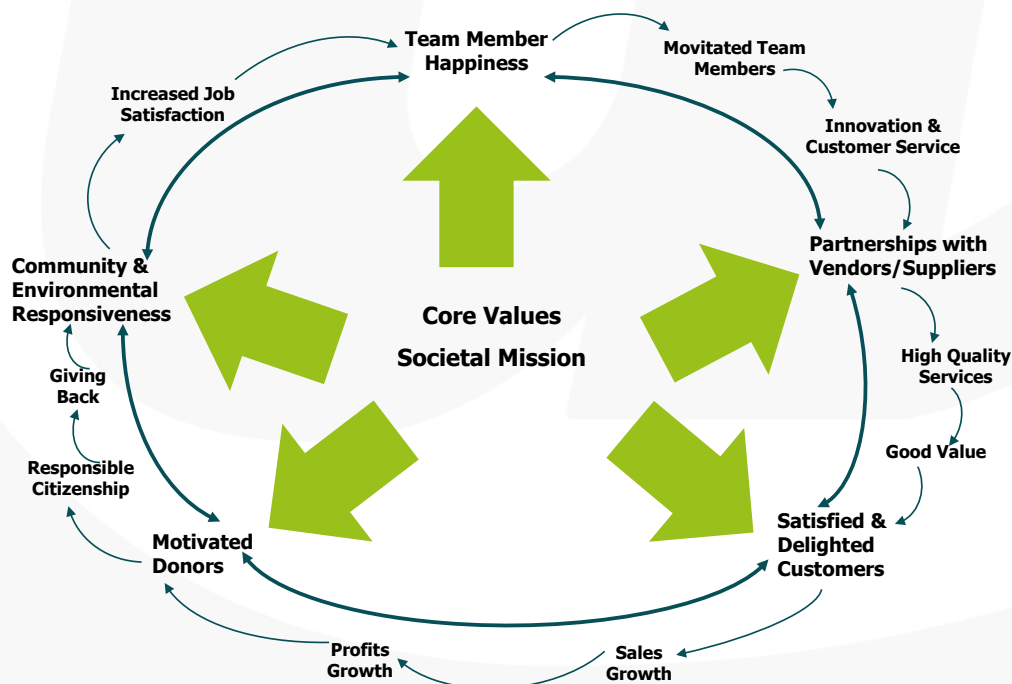


Figure 10: Stakeholders Core Values (Johnston, 2008)

The wide responsibility brought by the stakeholder model (in opposition to the shareholder model) results from the evolutionary economy and intends to set up worldwide:

- a) Globalization of international economy
- b) Corporate Scandals
- c) Good Corporate Governance (strict sense):
 - i. Compliance oriented
 - ii. Legislation and Regulatory
 - iii. Codes of Best Practices
- d) Good Corporate Governance (broad sense):
 - i. Different participants who can express their trust in the company
 - ii. Importance of Reputation

3. CONTROL COSTS

Some costs are useful for inventory valuation and income determination, others for planning, budgeting, and cost control. Still others are useful for making short-term and long-term decisions. In a manufacturing firm, costs are divided by the associated functional activities: manufacturing costs and nonmanufacturing costs (operating expenses).

From a planning and control standpoint, perhaps the most important way to classify costs is by how they behave in accordance with changes in volume. By behavior, costs can be classified into 2 basic categories:

- a. **Variable costs** vary in total in direct proportion to changes in activity. (direct materials and gasoline expense based on mileage driven);
- b. **Fixed costs** remain constant, regardless of changes in activity (rent, insurance, and taxes).

In what concern to Flexible Resources, they have the following characteristics:

- a. **Proportional to the amount** of the resource used (wood, fuel)
- b. Flexible costs are always **direct costs**.
- c. When it is not feasible to treat flexible costs as direct, they are treated as **indirect costs**.

The capacity resources:

- a. Resources acquired and paid for in advance of when the work is done.
- b. Capacity-related costs are the costs associated with capacity-related resources.
- c. Capacity-related costs can be direct or indirect.

There are 2 types of Flexible Costs:

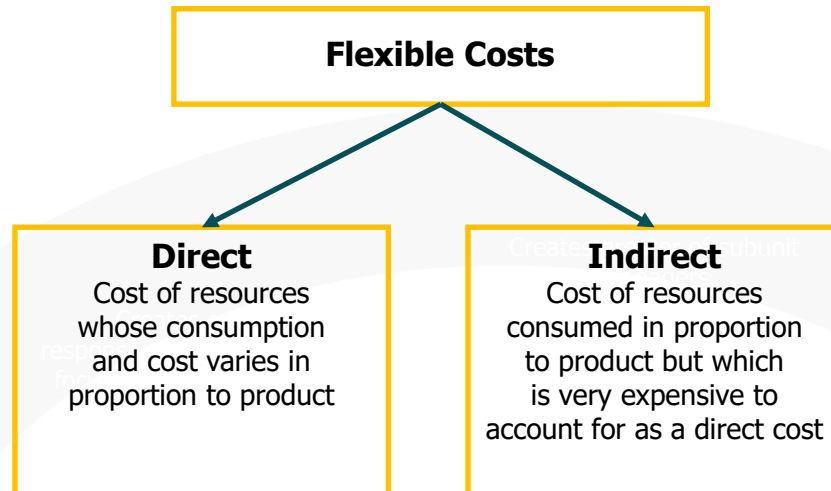


Figure 11: Flexible Costs (Drury, 2013)

The manufacturing costs incurred inside the factory and are associated with transforming raw materials into a finish product. The types of manufacturing costs are:

- a. **Direct:** Traced to the products that created those costs.
- b. **Indirect:** Allocated to the products.

Manufacturing costs can be flexible or capacity-related and have the following categories: direct materials, direct labor, and factory overhead.

- a. **Direct materials:** all materials that become parts of the finished product (steel to make an automobile, wood to make furniture).
- b. **Direct labor:** labor that is involved directly in making the product (wages of assembly workers and of machine tool operators).
- c. **Factory overhead:** all costs of manufacturing except direct materials and direct labor (depreciation, rent, taxes).
 - Indirect materials: glues, nails.
 - Indirect labor: wages of supervisory personnel.

Nonmanufacturing costs are all of the organization's other costs (distribution, selling, marketing, after-sales costs). They can be flexible or capacity-related and direct or indirect.

The costs can also be classified into according their timing of charges against revenue or by whether they are inventoriable (product costs vs period costs):

- a. **Product Costs:** Incurred to produce the volume of products made during the period. Costs that become expenses when the products are sold.

- b. **Period costs:** All nonmanufacturing costs incurred during the period (administrative, marketing and selling, research and development).

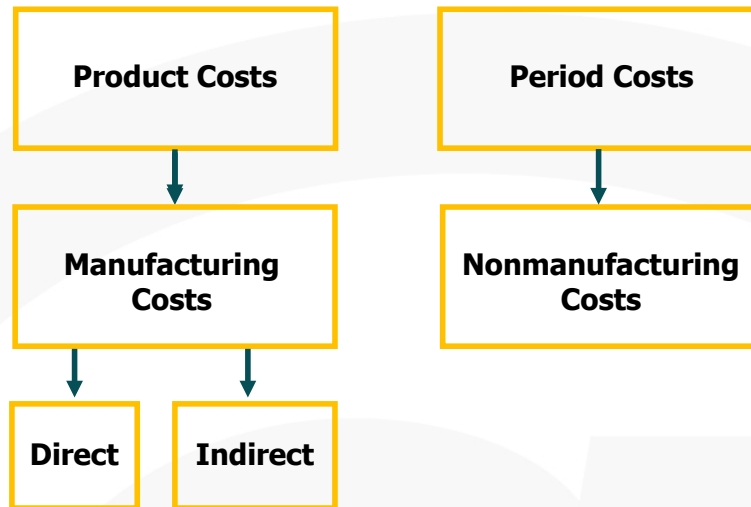


Figure 12: Product and Period Costs (Drury, 2013)

3.1 DEPRECIATION COSTS

The depreciated cost is the aggregate amount of capital that is used up in a given period, such as a fiscal year. This value can be examined for trends in capital spending and accounting aggressiveness. It consists in way of accounting for the cost of an asset. It's like a distribution of a prepayment for future services and involves in amortizing this **prepayment over the period of use** of the asset. **Buildings and equipment are depreciable** if used in a business or to generate income.

Example 3: Straight-line Depreciation Method: A new machine costs 160 000€, has a useful life of 10 years, and can be sold for 15 000€ at the end of its useful life. It is expected that 5 000€ will be spent to dismantle and remove the machine at the end of its useful life. Determine the straight-line depreciation schedule for this machine (Siegel & Shim, 2006).

Answer: For an asset with useful life n years, the annual depreciation cost per year is:

Net Salvage Value	10 000	= 15 000 – 5 000
Acquisition Cost	160 000	
Depreciation Cost	15 000	

$$\text{Depreciation Cost} = \frac{\text{Acquisition cost} - \text{Net salvage value}}{\text{Asset economic life}} = \frac{160\,000 - 10\,000}{10} = 15\,000$$

3.2 OPPORTUNITY COSTS

Some costs cannot be collected within the accounting system. Sometimes it is necessary to allocate costs that will not require cash outlays. An opportunity cost is a benefit foregone from the next best alternative. Thus, it measures the opportunity lost when a one course decision implies that an alternative decision be given up.

Example 4: Suppose a company has a choice of using its capacity to produce an extra 10 000 units or renting it out for 2 000€. **The opportunity cost** of using the capacity is 20 000€.

Example 5: Suppose a given machine can produce product A or product B. Demand is such that the company can sell all it makes of either product. Product A has a profit of 18€ and product B has a profit of 15€ (Warren, Reeve, & Duchac, 2013).

- a. Which product should be emphasized?
- b. Assume that machine time is the only constraint limiting production and that it takes one hour to product A on the machine but only 30 minutes to make product B. Which product should be emphasized?
- c. What is the opportunity cost of machine time assuming that production is capacity constrained?

§ Product A maximizes profits

§ Product B maximizes profits.

§ **Product B** = $15€ \times 2 = 30€/hour$; **Product A** = $18€ \times 1 = €18$ per hour;
OC = 30€/hour.

3.3 SUNK COSTS

Sunk costs represent costs of resources **that have already been incurred** whose total will not be affected by any decision made now or in the future. Thus, they represent past or historical costs and are **irrecoverable**, regardless of the alternative chosen.

Example 6: Suppose you acquired an asset for 50 000€ three years ago which is now listed at a book value of 20 000€. The **20 000€ book value** is a **sunk cost** which does not affect a future decision.

4. MANUFACTURER AND MERCHANTISER FINANCIAL REPORTS

The following figure compares income statements taken from a merchandiser and a manufacturer. The income statement from a manufacturer is supported by a schedule of cost of goods manufactured. This schedule shows the specific costs (direct materials, direct labor, and factory overhead) that have gone into the goods completed during the period. Since the manufacturer carried 3 types of inventory (direct materials, work-in-process, and finished goods), all 3 items must be integrated into the calculation of the Cost of Goods Sold. These inventory accounts also appear on the Balance Sheet of a manufacturer (J. Shim & Siegel, 2007).

Table 6: Schedule of Cost of Goods Manufactured (J. Shim & Siegel, 2007)

Direct Materials:		
Inventory (31.12.N0)	23 000	
Purchases of Direct Materials	64 000	
Cost of Direct Materials Available for Use	87 000	
Inventory (31.12.N1)	7 800	
Direct Materials Used		79 200
Direct Labor		25 000
Factory Overhead:		
Indirect Labor	3 000	
Indirect Materials	2 000	
Utilities	500	
Depreciation-Plant, Building	800	
Rent	2 000	
Miscellaneous	1 500	
	9 800	
Total Manufacturing Costs Incurred		
During N0		114 000
(+) Work-in-Process Inventory (31.12.N0)		9 000
Manufacturing Costs to Account for		123 000
(-) Work-in-Process Inventory (31.12.N1)		2 000
Cost of Goods Manufactured		121 000

4.1 MANUFACTURER'S INCOME STATEMENT VS MERCHANTISER'S INCOME STATEMENT

Table 7 (J. Shim & Siegel, 2007)

Manufacturer		Merchandisers	
Sales	320 000	Sales	1 125 000
(-) Cost of Goods Sold		(-) Cost of Goods Sold	
Finished Goods (31.12.N0)	18 000	Merchandise Inventory (31.12.N0)	68 000
Cost of Goods Manufactured	121 000	Purchases	925 000
Cost of Goods Available for Sale	139 000	Cost of Goods Available for Sale	993 000
Finished Goods (31.12.N1)	21 000	Merchandise Inventory (31.12.N1)	63 000
Cost of Goods Sold	118 000	Cost of Goods Sold	930 000
Gross Margin	202 000	Gross Margin	195 000
(-) Selling and Administrative Expense	60 000	(-) Selling and Administrative Expense	54 000
Net Income	142 000	Net Income	141 000

4.2 BALANCE SHEETS

Table 8 (J. Shim & Siegel, 2007)

Manufacturer		Merchandisers	
Current Assets:		Current Assets:	
Cash	25 000	Cash	20 000
Accounts Receivable	78 000	Accounts Receivable	90 000
Inventories:		Merchandise Inventory	
Raw Materials	7 800		63 000
Work-in-process	2 000		
Finished Goods	21 000		
	30 800		
Total	133 800		173 000

5. COST-VOLUME-PROFIT

5.1 CONTRIBUTION MARGIN

Contribution margin (CM). The contribution margin is the excess of sales (S) over the variable costs (VC) of the product ($CM=S-VC$) **Unit CM.** The unit CM is the excess of the unit selling price (p) over the unit variable cost (c) ($ucm=p-c$).

Example 7:

Table 9 (J. Shim & Siegel, 2007)

	Per Unit (€)	Total (€)	%
Sales (1 500 units)	25	37 500	100%
Variable costs	10	15 000	40%
Contribution margin	15	22 500	60%
Less: Fixed costs		15 000	
Net income		7 500	

Contribution Margin=22 500€

Unit CM=15€

% CM=60%

The break-even point is the point of no profit and no loss. In order to obtain the break-even level, there are 3 approaches:

1. **The equation approach:** $S=VC+FC+Net\ income$

2. **The contribution approach:**

$$\text{Break-even unit sales volume: } Q_c = \frac{FC}{p - c}$$

$$\text{Break-even unit sales in value: } S_c = \frac{FC}{\%CM}$$

3. **The graphical approach:**

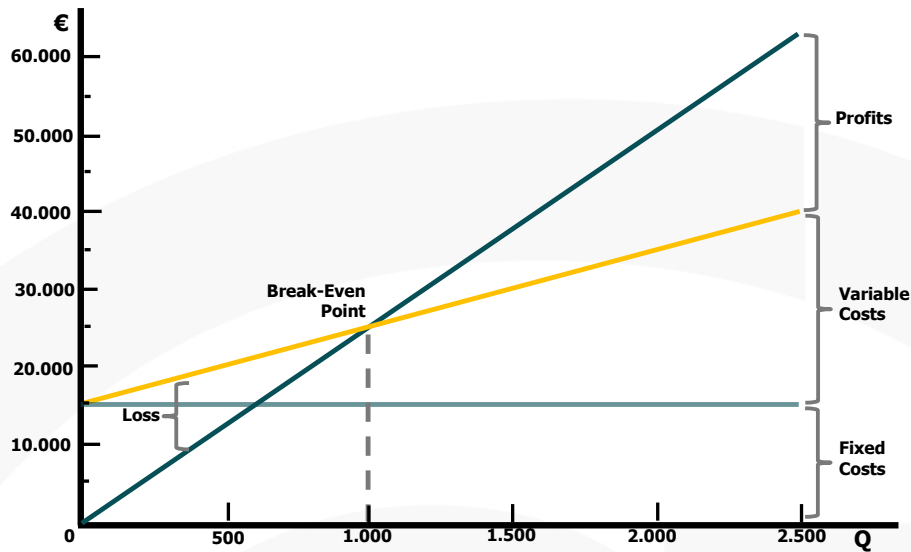


Figure 13: Break-even point (J. Shim & Siegel, 2007)

Example 8:

From previous example: $p = 25\text{€}$, $c = 10\text{€}$, and $FC = 15\ 000\text{€}$.

The equation is: $25 \times Q = 10 \times 15\ 000 \Rightarrow Q = 1\ 000$

By the Contribution Approach:

$$Q_c = \frac{15\ 000}{25 - 10} = 1\ 000 \text{ units}$$

$$S_c = \frac{15\ 000}{22\ 500 / 37\ 500} = 25\ 000\text{€}$$

5.2 MARGIN OF SAFETY

The margin of safety is the difference between the actual level of sales and the break-even sales. It can be seen as the amount by which sales revenue may drop before losses begin.

$$\text{Margin of safety} = (\text{Budgeted sales} - \text{Break-even sales}) / \text{Budgeted sales}$$

The margin of safety is also a measure of risk: the larger the ratio, the safer is the situation.

Example 9: Assume that a company projects Sales of 30 000€ with a break-even sales level of 25 000€. The expected margin of safety (MS) is:

$$MS = \frac{30\ 000 - 25\ 000}{30\ 000} = 0.167 = 16.7\%$$

Example 10: The operating income of region A is negative. This value results from an allocation base application:

Table 10

	Regions			Total
	(€)	A	B	
Sales	20	100	120	240
Direct Materials	16	85	101	202
Director Labor	2	6	8	16
Factory Overhead	3	7	10	20
Operating income	-1	2	1	2

- a) Calculate the break-even sales value and the safety margin.
- b) Abandoning region A leads to an activity increased in region B with additional estimated sales of 12 m€ would generate a variable contribution margin of 20% (free of additional labor costs). The impact of closing the region A implies a cost of €2 m necessary to fire all the staff. Identify favorable impacts in terms of increments on the actual value structure.
- § a) Calculating the contribution margin for each region:

Table 11

	Regions			Total
	(€)	A	B	
Sales	20	100	120	240
Direct Materials	16	85	101	202
Director Labor	2	6	8	16
Contribution Margin	2	9	11	22

Contribution margin of region A is positive.

Table 12

	Per Unit (€)	Total (€)	%
Sales (1 500 units)	25	37 500	100%
Variable costs	10	15 000	40%
Contribution margin	15	22 500	60%
Less: Fixed costs		15 000	
Net income		7 500	

Contribution Margin = 22 500

Unit CM = 15

% CM = 60%

§ b) Dropping Region A:

Table 13

(€)	Regions			Total
	A	B	C	
Sales	0	112	120	232
Direct Materials	0	94.6	101	195.6
Director Labor	0	6	8	14
Removal Costs	2			2
Contribution Margin	-2	11.4	11	20.4

Contribution Margin goes down to 20,4 m€.

Proposed solution will only generate positive results after 5 years

$[2/(20,4-20)]$.

Sales Mix Analysis

The break-even and cost-volume-profit analysis can also be applied to a company that **sells more than one product**. Different selling prices and different variable costs result in different unit contribution margin (UCM) and Contribution Margin ratios. It is necessary to predetermine the sales mix and compute a weighted-average contribution margin. Thus, the formula of the break-even quantity for the company as a whole is:

$$Q_c = \frac{FC}{\text{Average (ucm)}}$$

For the break-even sales:

$$S_c = \frac{FC}{\text{Average (ratio(cm))}}$$

Example 11: The Company sells three products with the following data

Table 14

	A	B	C	Total
Sales (€)	30 000	60 000	10 000	100 000
Sales mix (%)	30%	60%	10%	100%
(-) VC (€)	24 000	40 000	5 000	69 000
CM	6 000	20 000	5 000	31 000
CM ratio	20%	33%	50%	31%
Total fixed costs (€)	18 600			

The break-even point in €:

$$\text{ratio}(CM) = \frac{18\,600}{0.31} = 60\,000\text{€}$$

The break-even points (A, B, C) in €:

$$A: 60\,000 \times 0.3 = 18\,000\text{€}$$

$$B: 60\,000 \times 0.6 = 36\,000\text{€}$$

$$C: 60\,000 \times 0.1 = 6\,000\text{€}$$

Problem: The company Oleaster, Ltd. produces shoes incurring in the following unit cost:

Table 15

Description	Cost (€) per unit
Direct Materials	3
Direct Labor	2
Factory Overhead	2
Total Cost	7

The selling price of a pair of shoes is 10€. The full capacity of the company is 100 000 pairs of shoes per period. The fixed overhead costs are valued at 120 000€/period. Next year, it's estimated a drop in sales of 30%.

There is a proposal to supply 50 000 pairs of boots. The boots unit cost of raw materials is 1.50€ lower than the shoes unit cost of raw materials. The management thinks this is an opportunity to recover 50% of the expected loss of profit (30% drop). Comment the last statement.

Solution:

Factory Overhead:

$$\text{Total Factory Overhead} = 2 \times 100\,000 \text{ pairs} = 200\,000\text{€}$$

$$\text{Fixed Overhead} = 120\,000\text{€}$$

$$\text{Variable Overhead} = 200\,000 - 120\,000 = 80\,000\text{€}$$

$$\text{Unit Variable Overhead} = 80\,000 / 100\,000 \text{ pair} = 0.80\text{€ p/ pair of shoes.}$$

Cost Equation:

$$\text{Unit Selling Price} = 10\text{€}$$

$$\text{Global Variable Costs} = 3(\text{Materials}) + 2(\text{Direct Labor}) + 80\%(\text{VFOverhead}) = 5,80 \text{ p/ pair of shoes.}$$

$$\text{Fixed Costs} = 120\,000.$$

$$\text{TC} = 120\,000 + 5.80 \times Q$$

Net Income (Full Capacity):

$$Q = 100\,000 \text{ pair of shoes} \Rightarrow \text{Sales} = p \times Q = 10 \times 100\,000 = 1\,000\,000\text{€}$$

$$\text{NIO} = (p - vc) \times Q - FC = (10 - 5.80) \times 100\,000 - 120\,000 = 300\,000\text{€}$$

For a 70% drop of sales:

$$Q_s = 0.7 \times 100\,000 = 70\,000 \text{ pairs} \Rightarrow NI_1 = (10 - 5.8) \times 70\,000 - 120\,000 = 174\,000\text{€}$$

$$\text{Drop in Net Income: } NI_0 - NI_1 = 300\,000 - 174\,000 = 126\,000\text{€}$$

$$\text{Production Capacity} = 100\,000 \text{ pairs}$$

Possible Production of Shoes (after the proposal):

$$NI_2 = (10 - 5.8) \times 50\,000 - 120\,000 = 90\,000\text{€}$$

In order to recover the lost profit, the net income should be:

$$NI = 174\,000 + 0.50 \times 126\,000 = 237\,000\text{€}$$

Cost Equation (boots proposal):

$$uvc = 1.5 + 2.0 + 0.80 = 4.3\text{€}; FC = 0$$

$$\text{Sales (boots)} = p \times 50\,000 \text{ pairs of boots}$$

$$TC = 0 + 4.3 \times 50\,000 = 215\,000\text{€}$$

Selling Price:

$$NI = 147\,000 = p \times 50\,000 - 4.3 \times 50\,000 - 0 \Rightarrow p = 7.24\text{€}$$

6. COSTING SYSTEMS

We can find different purposes for allocating costs:

- Financial reporting and tax purposes: Inventory values must be calculated at full cost.
- Long run pricing and **decision making**: Insource / outsource? Add an airline route?
- Motivation and control: Preventing overconsumption.
- Cost-plus contracts: Used in rate regulation (e.g., natural gas).
- Damage claims from insurance providers.

The following picture shows the components of a costing system design:

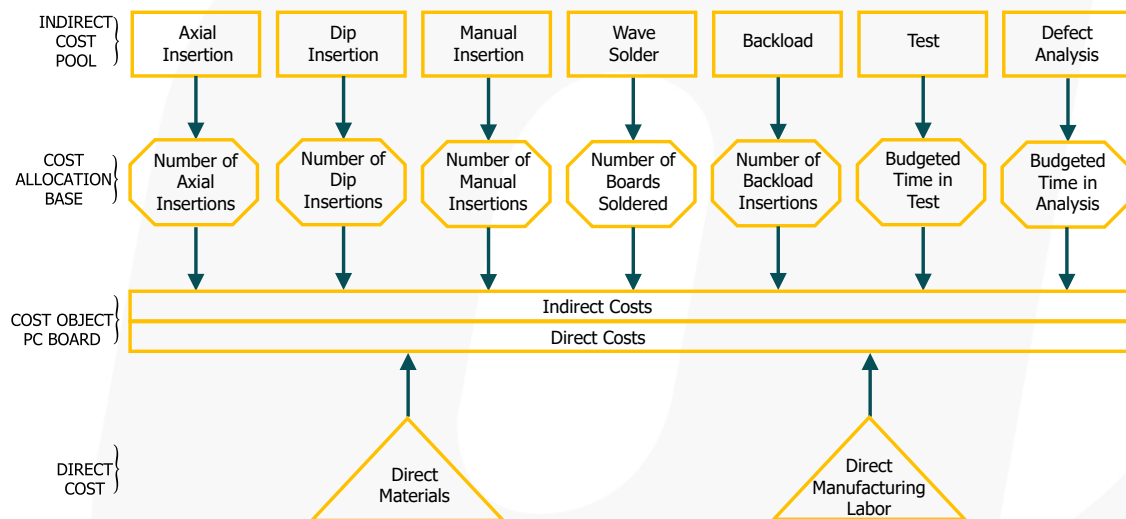


Figure 14 (Blocher, Stout, & Cokins, 2010)

Product Costing System

Cost of any cost object = direct costs + allocated indirect costs.

Indirect costs are also called **overhead** or common costs. There is an **arbitrariness** introduced by the allocation of common costs. A product costing system is essentially an **overhead allocation system**. Costs are allocated to products, customers or departments. We can consider two types of costing systems (absorption and variable):

Absorption (Full) Costing: Cost of producing a product includes direct materials, direct labor and an apportioned share of the factory overhead costs. Absorption costing refers to any costing system in which all **manufacturing costs are assigned to** (or “absorbed”

by) products, e.g.: Job costing, Process costing, etc.

Variable (Direct) Costing: All variable costs (direct materials, direct labor, and variable overhead) are assigned to production and become part of the unit costs of the products. **Fixed manufacturing costs** are treated as **period costs** (selling and administrative expenses).

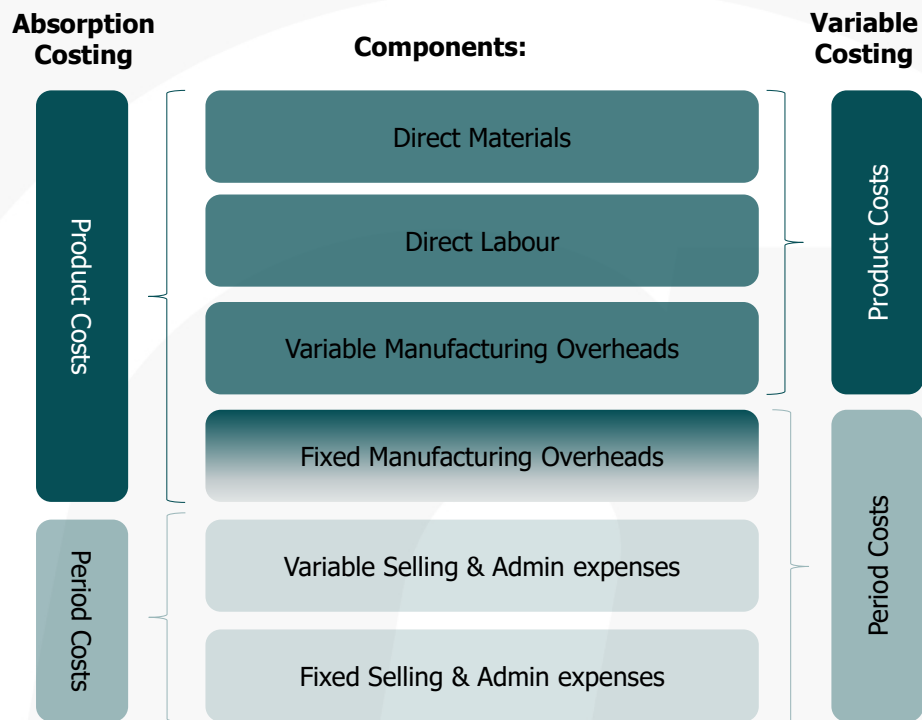


Figure 15: Costing system (Dikov, 2019)

Example 12: A small company produces a single product and has the following cost structure:

Table 16 (Nawatu, 2013)

Number of units produced	6 000
Variable costs per unit (€)	
Direct materials	2
Direct labor	4
Manufacturing overhead	1
Selling and administrative expenses	3
Fixed costs per year (€)	
Manufacturing overhead	30 000
Selling and administrative expenses	10 000

Calculate the unit product cost with Full and Variable Costing.

Table 17

Full (Absorption) Costing Method		Direct (Variable) Costing Method	
Direct materials	2€	Direct materials	2€
Direct labor	4€	Direct labor	4€
Variable manufacturing overhead	1€	Variable manufacturing overhead	1€
Total variable production cost	7€	Total variable production cost	7€
Fixed manufacturing overhead	5€	Unit product cost	7€
Unit product cost	12€		

Example 13: Assume the following information and calculate the income statement under Direct and Absorption Costing Systems (J. Shim & Siegel, 2007):

Table 18

Variable	€	Variable costs (per unit)	€
Beginning inventory	0	Direct materials	2.00
Production (units)	10 000	Direct labor	1.00
Sales (units)	9 000	Factory overhead	0.30
		Total	3.30
Fixed factory overhead	6 000		
Selling expenses	15 000	Variable selling expenses (per unit)	0.20
Administrative expenses	12 000		
Total	33 000	Selling price (per unit)	8.00

§ **Income Statement under Direct (Variable) Costing.** The fixed factory overhead is treated as a period cost and is deducted, along with the selling and administrative expenses:

Table 19

Direct materials	xx	
Direct labor	xx	
Variable factory overhead	xx	
Product cost	xx	
<hr/>		
Sales (9 000 unites at 8€)		72 000
Cost of Goods Sold:		
Variable Production Costs Incurred		
(10 000 unites at 3,30€)	33 000	
(-) Inventory (1 000 unites at 3.30€)	3 300	29 700
Manufacturing Contribution Margin		42 300
Gross Margin		42 300
Period Costs:		
(-) Factory Overhead	6 000	
(-) Selling Expenses (Variable: 1 800€)	16 800	
(-) Administrative Expenses	12 000	34 800
Net Income		7 500

§ **Income Statement under Absorption (Full) Costing:**

Table 20

Sales (9 000 unites at 8€)		72 000
Cost of Goods Sold:		
Variable Costs of Production (10 000 unites at 3,30€)	33 000	
Fixed Overhead Costs	6 000	
Total Costs of producing 10 000 unites	39 000	
(-) Inventory (1 000 unites at 3.90€)	3 900	35 100
Gross Margin		36 900
Operating Expenses;		
Selling (15 000 fixed plus 9 000 unites at 0.20€ each)	16 800	
Administrative	12 000	28 800
Net Income		8 100

Therefore, the effects of the two costing methods on the net income are:

- § When **production exceeds sales**, a **larger net income** will be reported under **absorption costing**.
- § When **sales exceed production**, a **larger net income** will be reported under **direct costing**.

§ When **sales and production are equal, net income will be the same under both methods.**

The reconciliation of the direct and absorption costing net income figures comes from:

$$\text{Difference in net income} = \text{Change in inventory} \times \text{Fixed factory overhead rate}$$

The above formula works only if the fixed overhead rate per unit does not change between the periods.

A cost accumulation system is a product costing system. Its purpose is accumulating manufacturing costs (materials, labor, factory overhead) and assigns them to cost objectives. There are two basic approaches to cost accumulation:

- a. Job-order Costing: **Direct material and direct labor** are traced to a particular job. Costs that are not directly traceable-factory overhead-are applied to individual jobs using an overhead rate;
- b. Process Costing: Aggregates manufacturing costs by departments or by production processes. **Total manufacturing costs** are accumulated by **direct materials** and **conversion costs** (direct labor plus factory overhead). Unit cost is determined by dividing the total costs charged to a cost center by the output of that cost center. Process costing is used in such industries as petroleum, chemicals, oil refining, textiles, and food processing.

The following table gives a comparison between Job-Order Costing and Process Costing (Jae K Shim & Siegel, 2009):

Table 21 (Jae K Shim & Siegel, 2009)

	Job-Order Costing	Process Costing
1. Cost unit	Job, order, or contract	Physical unit
2. Costs are accumulated	By jobs	By Departments
3. Subsidiary record	Job cost sheet	Cost-of-production report
4. Used by	Custom manufacturers	Processing industries
5. Permits computation of	(a) A unit cost for inventory costing purposes	A unit cost to be used to compute the costs of goods completed and work in process
	(b) A profit or loss on each job	

Example 14: (Job-Order Costing) CW collects its cost data using the job-order cost system. For Job 123, the following data are available:

Table 22 (J. Shim & Siegel, 2007)

Direct Materials	(€)	Direct Labor
7/14 Issued	1 200	Week of 180 hours @ 6.50€
7/20 Issued	650	Week of 140 hours @ 7.25€
7/25 Issued	350	
	<u>2 200</u>	

Factory overhead is applied at the rate of per direct labor hour. Compute (a) the cost of Job 123 and (b) the sales price of the job, assuming it was contracted with a markup of 40 percent of cost.

a) The cost of the job is:

Table 23 (J. Shim & Siegel, 2007)

		(€)
Direct material		2 200
Direct labor:		
180 hours × 6.50€	1 170	
140 hours × 7.25€	<u>1 015</u>	2 185
Factory overhead applied:		
320 hours × 4.50€		1 440
Cost of job 123		<u>5 825</u>

b) The sales price of the job is:

$$5\,825€ + 40\% (5\,825) = 8\,155$$

Problem: California Bikes uses a job costing accounting system at their plant. There are two departments: Machining and Finishing. Each department is an overhead cost pool. The allocation base for Machining is machine-hours, and for Finishing is direct labor value. The budget and job 431, May data have the following values (Pforsich, 2005):

Table 24

Budget	Machining	Finishing	Job 431	Machining	Finishing
Overhead (€)	10 000 000	8 000 000	Materials (€)	14 000	3 000
Direct Labor (€)	900 000	4 000 000	Direct labor (€)	600	1 250
Direct Labor (hours)	30 000	160 000	Direct Labor (hours)	30	50
Machine-Hours	200 000	33 000	Machine-Hours	150	10

1. Calculate the total manufacturing costs of Job 431, considering: Two cost pools.
2. Only one cost center (allocation base: Direct Labor Value).

Problem: Zaitun Liar (ZL) uses a costing system with 2 stages (materials, conversion). At the beginning of month, the inventory consists of 2 800 units in the following manufacturing stages: Materials (100%) and Conversion (50%). Considering the following information, calculate (Chryssolouris, 2013):

Table 25

	Materials	Direct Labor	Overhead
Units in process July 1:			
2 800 units	100%	50%	50%
Costs	1 120	1 120	2 240
Units transferred out			
12 000 units			
Current costs	6 240	6 720	13 440
Units in process July 31:			
1 200 units	100%	50%	50%

a) The equivalent production in units and the unit cost in July.

b) The cost of work in process in the end of the month.

Table 26

	Euros	Physical Flow	Materials	Conversion
Work in process, beginning		2 800		
Units transferred in		10 400		
Units to account for		13 200		
Units completed and transferred out		12 000	12 000	12 000
Work in process, ending		1 200	1 200	600
Units accounted for		13 200		
Equivalent units used for weighted average costing			13 200	12 600
(-) Old equivalent units for work done on beginning inventory in prior period		2 800	2 800	1 400
Equivalent units used for FIFO			10 400	11 200

Table 27: FIFO Costing

	Euros	Total Costs	Equivalent Units	Unit Costs
Work in process, beginning		4 480		
Current costs				
Materials		6 240	10 400	0.60
Conversion costs		20 160	11 200	1.80
Total costs to account for Cost of goods completed, 10 400 units		30 880		2.40
Work in process, beginning to be transferred out first				4 480
Additional costs to complete $(2\,800 \times (1-0.50) \times 1.80)$				2 520
Cost of goods started and completed this month $(10\,400-1\,200) \times 2.40$				22 080
				29 080
Work in process, end				
Materials $(1\,200 \times 0.60)$				720
Conversion (600×1.80)				1 080
				1 800
Total costs accounted				32 680

Table 28: Weighted Average Costing

	Euros	Work-in-Process Beginning	Current Costs	Total Costs	Equivalent Units	Average Unit Costs
Materials		1 120	6 240	7 360	13 200	0.56
Conversion costs		3 360	20 160	23 520	12 600	1.87
		4 480	26 400	30 880	25 800	2.43
Costs of goods completed $(12\,000u \times 2,43€)$						29 160
Work in process, ending						
Materials $(1\,200u \times 0.56€)$			672			
Conversion $(600u \times 1.87€)$			1 122			1 794
						30 956

Table 29

	Physical Flow		Materials	Conversion
Work in process, beginning	800	60%		
Units transferred in	44 200			
Units to account for	45 000			
Units completed and transferred out	40 000		40 000	40 000
Work in process, ending	5 000	30%	5 000	1 500
Units accounted for	45 000			
Equivalent units used for weighted average costing			45 000	41 500
(-) Old equivalent units for work done on beginning inventory in prior period			800	480
Equivalent units used for FIFO			44 200	41 020

Euros

6.1 ASSIGNING SERVICE DEPARTMENT COSTS

Some service department **costs are direct (salaries of the workers)**. Other service department **costs are indirect: incurred jointly with some other department** (building depreciation). Indirect costs must be allocated on some arbitrary basis. The problem is selecting **appropriate bases for assigning the indirect costs** of service departments to other departments. Alternative procedures for service department cost allocation:

1. Direct method
2. Step method
3. Reciprocal method

DIRECT METHOD: Allocates the **costs of each service department directly** to production departments. **No consideration** is given to **services performed by one service department for another**.

Example 15: Assume the following data and allocate the overhead costs by the direct method:

Table 30

	Service	Departments	Production	Departments
(€)	General Plant (GP)	Engineering (E)	Machining (M)	Assembly (A)
Overhead costs before allocation	20 000	10 000	30 000	40 000
Direct labor hours by General Plant (GP)	15 000	20 000	60 000	40 000
Engineering hours by Engineering (E)	5 000	4 000	50 000	30 000

Using the direct method yields:

	Service	Departments	Production	Departments
(€)	(GP)	(E)	(M)	(A)
Overhead costs	20 000	10 000	30 000	40 000
Reallocations:				
DLH (%Total)			60%	40%
GP	-20 000		12 000	8 000
EH (%Total)			62.5%	37.5%
E		-10 000	6 250	3 750
			<u>48 251</u>	<u>51 751</u>

STEP METHOD (step-down method or the sequential method): **Allocates services** rendered by service departments **using a sequence of allocation**:

1. Begins with **the department that renders service to the greatest number of other service** departments;
2. Continues in **step-by-step** fashion.
3. Ends with the **allocation of costs of service departments that provide the least amount** of service.
4. After a given service department's costs have been allocated, it will not receive any charges from the other service departments.

Table 31

	Service Departments Production Departments			
	General Plant (GP)	Engineering (E)	Machining (M)	Assembly (A)
Overhead costs before allocation	20 000	10 000	30 000	40 000
Direct labor hours by General Plant (GP)	15 000	20 000	60 000	40 000
Engineering hours by Engineering (E)	5 000	4 000	50 000	30 000

Using the direct method yields:

	Service Departments Production Departments			
	(GP)	(E)	(M)	(A)
Overhead costs	20 000	10 000	30 000	40 000
Reallocations:				
DLH (%Total)			60%	40%
GP	-20 000		12 000	8 000
EH (%Total)			62.5%	37.5%
E		-10 000	6 250	3 750
			48 251	51 751

RECIPROCAL METHOD: **Reciprocal services** are allowed between service departments. **Simultaneous equations** to determine the allocable cost of each service department.

Table 32

	Service Departments Production Departments				
	General Plant (GP)	Engineering (E)	Machining (M)	Assembly (A)	
Overhead costs before allocation	20 000	10 000	30 000	40 000	
Direct labor hours by General Plant (GP)	15 000	20 000	60 000	40 000	120 000
Engineering hours by Engineering (E)	5 000	4 000	50 000	30 000	85 000

Using the direct method yields:

	Service Departments Production Departments			
	(GP)	(E)	(M)	(A)
Overhead costs	20 000	10 000	30 000	40 000
Reallocations:				
DLH (%Total)		17%	50%	33%
GP	-28 695	4 783	14 348	9 565
EH (%Total)			35.3%	6%
E	8 695	-14 782	5 217	870
	0	1	49 565	50 435

$$\begin{cases} GP = 20\,000 + \frac{5}{85}E \\ E = 10\,000 + \frac{1}{6}GP \end{cases} \Rightarrow GP = 28\,695; E = 14\,782$$

6.2 JOINT-PRODUCT AND BY-PRODUCT COSTS

When **two products result from a single production process**, the outputs are referred to as either **joint products** or **by-products**. **Joint products** are those that have a **significant sales value**, while **by-products** are those whose **sales value is relatively minor** in comparison with the value of the main, or joint, products.

Joint costs **cannot be identified directly** with any of the joint products that emerge from the process. (An example of a joint cost is the price paid by a packing house for a steer). **Any assignment of the joint cost to the joint products is arbitrary**. The point in the production process at which joint products are separated is the **split-off point**.

Example 16: Total Mining Company produces two products from ore, copper and zinc. The following events took place in May:

Table 33

	Copper	Zinc	Total
Units produced	40 000	60 000	100 000
Unit selling price (€)	2.00	1.00	

Considering the joint costs incurred were 110 000€, allocate the joint costs to the two products using the relative sales value method.

Table 34

	Sales Value at Split-off	Ratio	Joint Costs	Allocated Joint Costs
Copper	80 000	57%	110 000	62 857
Zinc	60 000	43%	110 000	47 143
	<u>140 000</u>			<u>110 000</u>

Example 17: The KSOL have manufactured under joint production the products A and B and the by-product X. The manufacturing process involves three stages: Materials and Processing (P1, P2). At November N, the production and sales were as follows (Demski, 2013):

Table 35

Product	Production (tons)	s.u.p. (€)
A	1 200	25
B	1 000	15
X	200	5

Answer: The manufacturing and other expenses are as follows:

Table 36

Manufacturing	Costs (€)	Distribution Expenses €			Sales (tons)
M	7 800	Variable	A	625 per	1 000
P1	5 122		B	600 per	600
P2	7 628		X	150 per	200
		Fixed		1 200	
		Administrative		2 100	
		Financing		900	
		Expenses			

Compute the cost of goods manufactured, using the relative sales method at the split-off point for allocating the joint costs for goods A and B. In the case of by-product X, it should be used the zero-profit method.

Joint Cost allocated to by-product X: Using the zero-profit method, will be allocated to X, an amount equal to its selling price at the point of separation.

Table 37

	Units	u.p. (€)	Total (€)
Sales Volume	200	5	1 000
Specific Expenses			1 000
Manufacturing			
Distribution (variable)			150
Allocated Joint-Costs			850

The joint costs allocated to products A and B are 19 700€ (20.550-850): These costs will be allocated with sales value method volume at the split-off point.

Table 38

Products	Units	Sales Value	Specific		Margin Value	%	Joint-Costs	Manufacturing Cost	
			Manufact.	Distrib.				Global	Unit
	(0)	(1)	(2)	(3)	(4)=(1)-(2)-(3)		(5)	(6)=(5)+(2)	(7)=(6)-(0)
A	1 200	30 000		750	29 250	0.68	13 323	13 323	11.10
B	1 000	15 000		1 000	14 000	0.32	6 377	6 377	6.38
Total		45 000		1 750	43 250	1.00	19 700	19 700	

6.3 ACTIVITY BASED COSTING

Using a **single predetermined overhead rate** based on any single activity measure can **produce distorted product costs**. The **increased use of high-tech machinery** has diminished the significance of direct labor cost and **other overhead costs have increased**. Overhead application rates based on volume-based cost driver no longer represent cause-and-effect relationships between output and overhead costs. Activity-based costing (ABC) attempts to get around this problem. An ABC system **assigns costs to products based on the product's use of activities, not product volume**. An activity-based cost system **traces costs to activities and then to products**.

In traditional product costing, in the first stage, costs are traced to departments, not to activities. In both traditional and activity-based costing, the second stage consists of tracing costs to products. The principal difference between the two methods is the **number of cost drivers used**. **Activity based costing** uses a much **larger number of cost drivers** than the one or two volume-based cost drivers typical in a conventional system. The ABC approach **separates overhead costs into overhead cost pools**, where **each cost pool is associated with a different cost driver**. Then a **predetermined overhead rate is computed for each cost pool and each cost driver**. The ABC approach implies the following steps:

1. Identify the **activities or transactions that cause costs** to be incurred. **Cost drivers are causes of costs** incurred.
2. Assign a **cost to each cost driver**.
3. Sum the **costs of the cost drivers** that make up the product.

ABC Cost Drivers (examples):

Table 39**Manufacturing:**

Number of setups	Square footage
Weight of material	Number of vendors
Number of units reworked	Asset value
Number of orders placed	Number of labor transactions
Number of orders received	Number of units scrapped
Number of inspections	Number of parts
Number of material handling operations	Replacement cost
Number of orders shipped	Machine hours
Design time	Direct labor hours

Nonmanufacturing:

Number of hospital beds occupied
Number of take-offs and landings for an airline
Number of rooms occupied in a hotel

Example 18: (ABC Costing) GM, Inc. has established the following overhead cost pools and cost drivers for their product (J. Shim & Siegel, 2007):

Table 40

Overhead Cost Pool	Budgeted Overhead Cost	Cost Driver	Predicted Level for Cost Driver
Machine setups	100 000	Number of setups	100
Material handling	100 000	Weight of raw material (pounds)	50 000
Waste control	50 000	Weight of hazardous chemical used (pounds)	10 000
Inspection	75 000	Number of inspections	1 000
Other overhead costs	200 000	Machine hours	20 000
	525 000		€

Example 19: Job No. 10 consists of 2 000 special-purpose machine tools with the following requirements:

Table 41

Machine setups	2
Raw material required	10 000 pounds
Waste material required	2 000 pounds
Inspections	10
Machine hours	500

Calculate the assigned overhead to Job No. 10 per tool.

Answer: The overhead assigned to Job No. 10 is computed below.

Table 42

Overhead Cost Pool	Predetermined Overhead Rate	Level of Cost Driver	Assigned Overhead Cost
Machine setups	1 000 € per setup	2 setups	2 000
Material handling	2 € per pound	10000 pounds	20 000
Waste control	5 € per pound	2000 pounds	10 000
Inspection	75 € per inspection	10 inspections	750
Other overhead costs	10 € per machine hour	500 machine hours	5 000
Total			37 750

The total overhead cost assigned to Job No. 10 is 37 750€ or 18.88€ (37 750€/2 000) per tool. If the firm uses a single predetermined overhead rate based on machine hours:

$$\frac{\text{Total budgeted overhead cost}}{\text{Total predicted machine hours}} = \frac{525\,000}{20\,000} = 26.25 \text{ per machine hour}$$

Under this approach, the total overhead cost assigned to Job No. 10 is:

$$26.25 \times 500 \text{ machine hour} = 13\,125\text{€}$$

This is only $\frac{13\,125}{2\,000} = 6.56$ per tool, which is about one-third of the overhead cost per tool computed when multiple cost drivers are used.

The fundamental differences in traditional and **ABC** cost systems can be summarized:

Table 43

	Traditional	ABC
Cost pools	One or a limited number	Many, to reflect different activities
Applied rate	Volume-based, financial	Activity-based, nonfinancial
Suited for	Labour-intensive, low-overhead companies	Capital-intensive, product-diverse, high-overhead companies
Benefits	Simple, inexpensive	Accurate product costing, possible elimination of non-value-added activities

Therefore, the main benefits of an ABC system:

1. **Improved product or service cost data.**
2. **Improved decisions about pricing** based on more accurate cost information.
3. **Cost reduction** by eliminating the non-value-added activities.

4. **Greater control of costs** because of its focus on the behavior of costs at their origination, both short-term and long-term.
5. More **accurate evaluation of performance** by programs and responsibility center.

Problem (J. Shim & Siegel, 2007): Assume that a plant has two categories of overhead: material handling and quality inspection. The costs expected for these categories for the coming year are as follows.

Table 44

	(€)
Material Handling	100 000
Quality inspection	300 000

The plant currently applies overhead using direct labor hours and expected actual capacity. This figure is 50 000 direct labor hours. The plant manager has been asked to submit a bid and has assembled the following data on the proposed job:

Table 45

	Potential Job
Direct materials (€)	3 700
Direct labor (1.000 hours)	7 000
Overhead	?
Number of material moves	10
Number of inspections	5

The manager has been told that many competitors use an ABC approach to assign overhead to jobs. Before submitting his bid, he wants to assess the effects of this alternative approach. He estimates that the expected number of materials moves for all jobs during the year is 1 000. He also expects 5 000 quality inspections to be performed.

- a) Compute the total cost of the potential job using direct labor hours to assign overhead. Assuming the bid price is full manufacturing cost plus 25 percent, what would be the manager's bid?
- b) Compute the total cost of the job using the number of materials moves to allocate material-handling costs and the number of inspections to allocate the quality inspection costs. Assuming a bid price of full manufacturing cost plus 25 percent, what should be his bid using this approach?
- c) Which approach do you think best reflects the actual cost of the job? Explain.

a) Total overhead is 400 000€. The plant-wide rate is 8€ per direct labor hour (400 000€/50 000DLH).

b) In the ABC approach, the consumption ratios are different for all two-overhead activities, so overhead pools are formed for each activity. The overhead rates for each of these pools are as follows:

Material moves:	$100 = 100\,000/1\,000 = 100/\text{move}$
Quality inspections:	$60 = 300\,000/5\,000 = 60/\text{inspection}$

This produces the following job costs and bid prices:

Table 46

Volume-based approach (€):

Prime costs	$10\,700 = 3\,700 + 7\,000$
Overhead costs	$8\,000 = 1\,000 \times 8\text{€/h}$
Total costs	18 700
Plus 25%	$4\,675 = 0.25 \times 18\,700$
Bid price	<u>23 375</u>

Table 47

Activity-based approach (€):

Prime costs	$10\,700 = 3\,700 + 7\,000$
Overhead costs:	
Material moves	$1\,000 = 10\text{m} \times 100\text{€/move}$
Inspections	$300 = 5\text{ inspections} \times 60\text{€/inspection}$
Total costs	12 000
Plus 25%	$3\,000 = 0.25 \times 12\,000$

c) The volume approach overestimates the overhead and would cause the company to overbid the job.

7. BUDGETING

7.1 NATURE AND OBJECTIVES OF BUDGETING

One of management's major responsibilities is planning for establishing company's objectives. The organizations make both long-term and short-term plans. A budget is a formal written statement of management's plans for a specified future time period, expressed in financial terms. Once adopted, a budget becomes important for evaluating performance and promoting efficiency. Some managers consider the role of budgeting as a control device (Weygandt, Kimmel, & Kieso, 2009).

The business actions involve several decisions in areas as sales, production, purchasing and finance. All of those functions need to be coordinate since they are interrelated, and a change in one of them will imply corrections on the others (Drury, 2013). A major plan – long-term – must be elaborated and the details plans are usually referred as short-term budgets (J. Shim & Siegel, 2007).

7.2 PURPOSES OF A BUDGET

Why do we need a budget? Budgets are about numbers, and those numbers can be units or cash, and have several purposes:

- a) Communicate specialized knowledge to the organization.
- b) Coordinate the activities of the organization. If 10 000 units have to be produced does purchasing have enough materials ordered?
- c) Confer **decision rights** (the budget of government is a legal document).
- d) Control **behavior and processes** (short-term deviations).
- e) Evaluate and **reward performance** (longer term deviations).
- f) **Motivate performance** (setting challenging goals).
- g) Compel planning
- h) Provide a guide to action.

7.3 MASTER BUDGET

The master budget corresponds to more than just the collection of the budgets developed in the context of the responsibility centers. There is a strong linkage between the organization master budget and the budget of the responsibility centers and we can consider that the master budget is much more than a control device. It is much more a planning device. Being both a planning and control device produces specific problems in terms of balancing efficiency and effectiveness, control and creativity, risk taking and caution (Camillus, 1986).

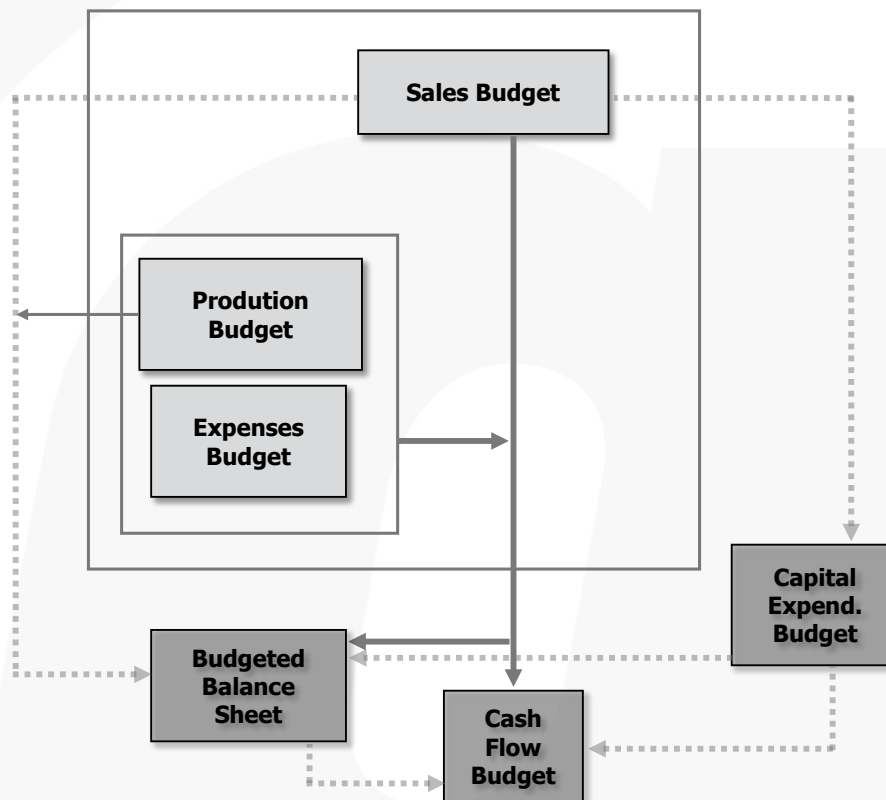


Figure 16: Master Budget (Iteam, 1997)

The master budget as a predetermined order:

1. Prepare a **sales forecast**.
2. Determine production volume.
3. Estimate manufacturing costs and operating expenses.
4. Determine **cash flow** and other financial effects.
5. Formulate projected financial statements.

7.4 SALES BUDGET

The sales budget indicates the **quantity of product expected to be sold**. There are several ways of making estimates for the sales budget:

1. Make a **statistical forecast** (business conditions, market conditions, and product growth curves).
2. Make an **internal estimate** (opinions of executives and salespersons).
3. Analyze the **factors that affect sales revenue** and then predict the future behavior of each of these factors.

The sales budget is constructed by multiplying the expected sales in units by the expected unit sales price.

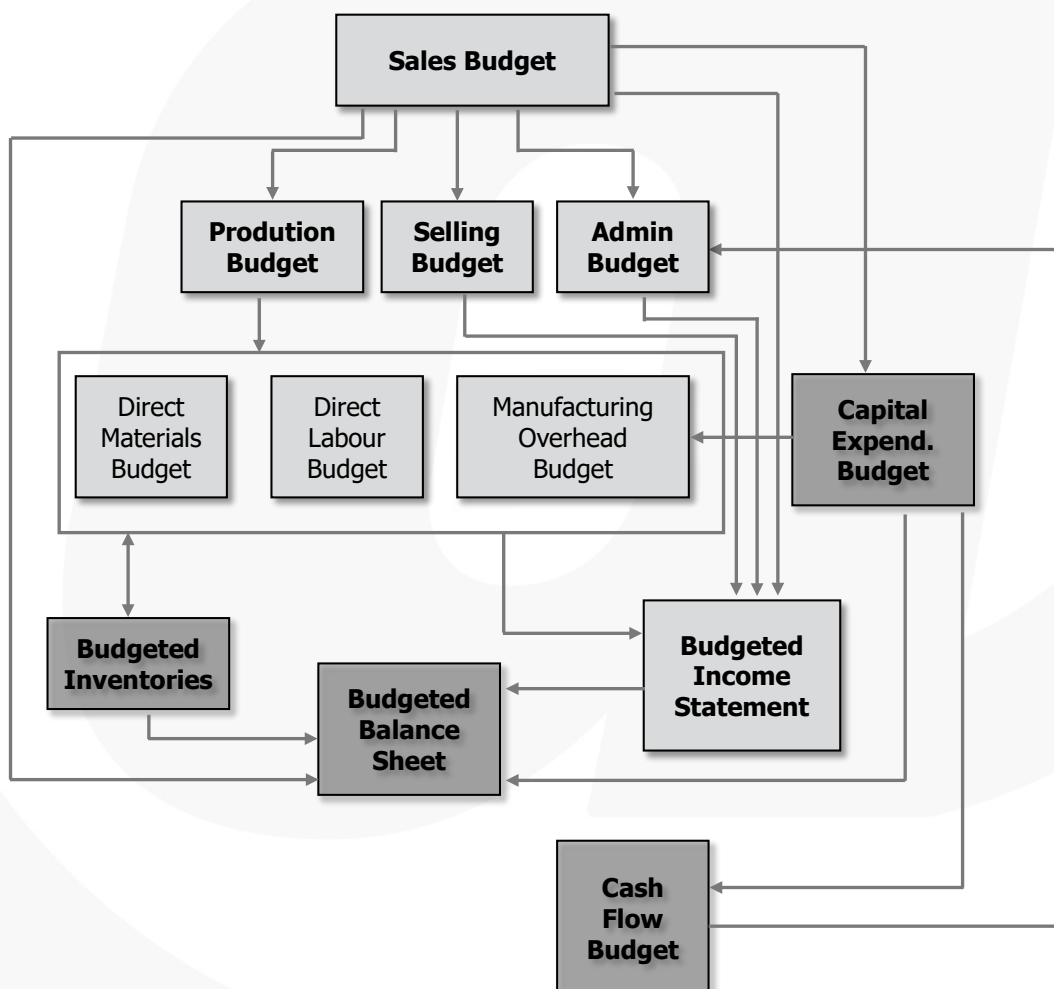


Figure 17: Sales Budget (Iteam, 1997)

Example 20: Consider the following estimated quantity of product to be sold at a selling unit price of 80€ and calculate the sales budget (J. Shim & Siegel, 2007).

Table 48
Quarter

	1	2	3	4	Total
Expected sales in units	800	700	900	800	3 200
Unit sales price	80	80	80	80	80
Total sales (€)	64 000	56 000	72 000	64 000	256 000

Considering the following assumptions in what concern to cash collection:

- All 9.500€ accounts receivable balance is assumed to be collectible in the first quarter;
- 70% of a quarter's sales are collected in the quarter of sale;
- 28% of a quarter's sales are collected in the quarter following, and the remaining 2 percent are uncollectible.

The schedule of expected cash collections from credit sales will be:

Table 49: Total cash collections

	(€) Sales	1Q	2Q	3Q	4Q	Total
Accounts receivable, 31.12.N		9 500				9 500
1st quarter sales	64 000	44800	17 920			62 720
2nd quarter sales	56 000		39 200	15 680		54 880
3rd quarter sales	72 000			50 400	20 160	70 560
4th quarter sales	64 000				44 800	44 800
Total cash collections		54 300	57 120	66 080	64 960	242 460

7.5 PRODUCTION BUDGET

After specifying sales, the production budget comes next. Considering a constant level inventory, the production level should be equal to budgeted sales level. Therefore, the starting point for budgeting production is the sales budget after assuming some possible changes in inventory levels and that production levels must fall within existing capacity. The production budget specifies the range of products to be made, which departments are involved on the production, the direct cost of labor, and materials and machine time cost (Mott, 2012).

- Production Budget

§ Number of units to be produced = sales + target ending inventory – beginning finished goods inventory.

§ Ending inventory is a budgeted or planned amount.

b) Materials usage and purchases budget:

§ Purchases = Materials to be used + target ending inventory – beginning materials inventory.

c) Direct labor budget: labor hours required for production, cost per hour and total labor cost.

d) Manufacturing overhead budget: variable overhead, fixed overhead and total overhead.

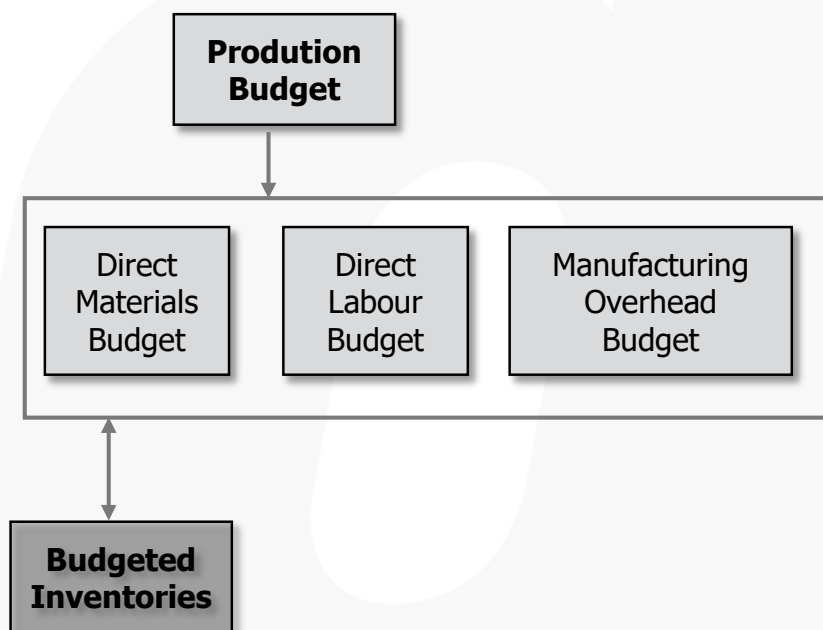


Figure 18: Production Budget (Iteam, 1997)

Example 21: Once more, assuming that:

a) DEI (desired ending inventory): 10 percent of the next quarter's sales.

b) DEI (last quarter): estimated.

c) BI (first quarter): the same as the previous quarter's ending inventory.

The following production is obtained:

Table 50: Units to be produced (J. Shim & Siegel, 2007)

	Quarter				Total
	(units)	1	2	3	
Planned sales	800	700	900	800	3 200
(+) Desired ending inventory	70	90	80	100	100
Total needs	870	790	980	900	3 300
(-) Beginning inventory	80	70	90	80	80
Units to be produced	790	720	890	820	3 220

7.6 DIRECT MATERIAL BUDGET

When the level of production has been computed, we should be constructed a budget to demonstrate how much material will be needed for production and must be purchased to fulfil production requirements. The purchase is a function of both the expected usage of materials and inventory levels (Siegel & Shim, 2006). The formula for computation of the purchase is as follows:

Purchase in units = Usage + Desired ending material inventory units – Beginning inventory units

Example 22:

Assumptions:

- a) DEIM: 10 percent of the next quarter's units needed for production.
- b) DEIM (last quarter): estimated = 250
- c) BIM (first quarter): the same as the prior quarter's ending inventory.
- d) Each product needs 3 parts (pieces) with the unit price of 2€.

Table 51: Purchase cost (J. Shim & Siegel, 2007)

	Quarter				Total
	1	2	3	4	
Units to be produced	790	720	890	820	3 220
(*) Material needs per unit (pieces)	3	3	3	3	3
Material needs for production	2 370	2 160	2 670	2 460	9 660
(+) Desired ending inventory of materials	216	267	246	250	250
Total needs	2 586	2 427	2 916	2 710	9 910
(-) Beginning inventory of materials	237	216	267	246	237
Materials to be purchased	2 349	2 211	2 649	2 464	9 673
(*) Unit price	2	2	2	2	2
Purchase cost (€)	4 698	4 422	5 298	4 928	19 346

Example 23:

Assumptions:

- Fifty percent of a quarter's purchases are paid for in the quarter of purchase. The remainder is paid for in the following quarter.
- Accounts Payable (31.12.N0) = 2 200€

Table 52: Schedule of expected cash disbursements (J. Shim & Siegel, 2007)

	Euros				
Accounts payable 31.12.N	2 200				2 200
1st quarter purchases	2 349	2 349			4 698
2nd quarter purchases		2 211	2 211		4 422
3rd quarter purchases			2 649	2 649	5 298
4th quarter purchases				2 464	2 464
Total disbursements	4 549	4 560	4 860	5 113	19 082

7.7 DIRECT LABOR BUDGET

The direct labor budget shows the total direct labor hours needed and the associated cost for the number of units in the production budget. As with direct materials, the usage of direct labor is determined by the technological relationship between labor and output. Assuming the labor is used efficiently, this rate is fixed for the existing technology. The

relationship will change only if a new approach to manufacturing is introduced (Hansen, Mowen, & Guan, 2007).

Direct labor requirements: Expected production volume for each period \times number of direct labor hours required to produce a single unit.

Total direct labor costs: Direct labor hours required to meet production requirements \times direct labor cost per hour.

Example 24:

Assumptions:

- a) Each product unit needs 5 DLH.
- b) Each DLH costs 5€.

Table 53: Total direct labor cost (J. Shim & Siegel, 2007)

Direct Labor Budget	Quarter				Euros
	1	2	3	4	Total
Ending December, 31, N					
Units to be produced	790	720	890	820	3 220
Direct labor hours per unit	5	5	5	5	5
Total hours	3 950	3 600	4 450	4 100	16 100
Direct labor cost per hour	5	5	5	5	5
Total direct labor cost	19 750	18 000	22 250	20 500	80 500

7.8 ENDING INVENTORY BUDGET

The desired ending inventory (DEI) budget offers information for the assembly of budgeted financial statements. More specifically, it will help calculate the cost of goods sold on the budgeted income statement and gives the monetary value of the ending materials and finished goods inventory. The **desired ending inventory** budget provides us with the information required for (Siegel & Shim, 2006):

- a) Compute the **cost of goods sold** on the budgeted income statement.
- b) Value of the ending materials and finished goods inventory on the budgeted balance sheet.

Example 25:

Assumptions

a)

Table 54

	Unit Cost (€)	Units	Total
Direct materials (units)	2	3	6
Direct labor (hours)	5	5	25
Variable overhead (hours)	2	5	10

b) Ending Inventory (Direct Materials): 250 units; Ending Inventory (Finished Goods): 100 units

Table 55

	Unit Cost (€)	Units	Total
Direct materials (units)	2	3	6
Direct labor (hours)	5	5	25
Variable overhead (hours)	2	5	10
Total unit variable cost of products completed (€)			41

Table 56

Ending Inventory	Units	Unit Cost (€)	Total (€)
Direct materials	250	2	500
Finished goods	100	41	4 100

7.9 FACTORY OVERHEAD BUDGET

The factory overhead budget offers a schedule of manufacturing costs other than direct materials and direct labor. These costs may include rent, insurance, property taxes, and utilities related with factory facilities. As depreciation cost is a non-financial cash outlay, it must be deducted from the total factory overhead in computing cash disbursement for factory overhead (Siegel & Shim, 2006).

Example 26:

Assumptions:

- Total factory overhead budgeted:** 6 000€ fixed (per quarter) plus 2€ per hour of direct labor.
- Depreciation Expenses** are 3 250€ each quarter.
- All **overhead costs** involving cash outlays are paid for in the **quarter incurred**.

Table 57: Cash disbursements for overhead (J. Shim & Siegel, 2007)

	Quarter				Total	
	(€)	1	2	3		4
Budgeted direct labor hours		3 950	3 600	4 450	4 100	16 100
(*) Variable overhead rate		2	2	2	2	2
Variable overhead budgeted		7 900	7 200	8 900	8 200	32 200
(+) Fixed overhead budgeted		6 000	6 000	6 000	6 000	24 000
Total budgeted overhead		13 900	13 200	14 900	14 200	56 200
(-) Depreciation		3 250	3 250	3 250	3 250	13 000
Cash disbursements for overhead		10 650	9 950	11 650	10 950	43 200

7.10 SELLING AND ADMINISTRATIVE EXPENSES BUDGET

Most of the times, companies combine their operating expenses into one budget, the selling and administrative expense budget. It anticipates selling and administrative expenses for the budget period. This budget should also classify expenses as either variable or fixed (Weygandt et al., 2009). In order to develop the selling and administrative expenses budget should be listed the operating expenses involved in selling the products and in managing the business and should be computed the variable selling and administrative expense per unit.

Example 27:

Assumptions:

Table 58: Total selling and administrative expenses (J. Shim & Siegel, 2007)

Variable Expenses	4 € / unit
Fixed Expenses:	
Advertising	1 100 € /each.quarter
Insurance	2 800 € @1st. quarter
Office salaries	8 500 € /each.quarter
Rent	350 € /each quarter
Taxes	1 200 € @3rd. quarter

Answer:

Table 59

	Quarter				Total	
	(€)	1	2	3		4
Expected sales in units		800	700	900	800	3 200
(*) Variable selling and administrative expense per unit		4	4	4	4	4
Budgeted variable expense		3 200	2 800	3 600	3 200	12 800
Fixed selling and administrative expenses:						
Advertising		1 100	1 100	1 100	1 100	4 400
Insurance		2 800				2 800
Office salaries		8 500	8 500	8 500	8 500	34 000
Rent		350	350	350	350	1 400
Taxes				1 200		
Total budgeted selling and administrative expenses		15 950	12 750	14 750	13 150	56 600

7.11 CASH BUDGET

At this point, one of the most important budgets, the cash budget (a composite of several budgets) should be prepared. The revenue budget, the budget for other operating revenue tell how much cash will be flowing into the company. The operating expense budget tells how much cash will be flowing out of the hospital. The difference between what flows in and what flows out tells whether the institution can afford their activities or must go to the bank for additional short-term funds, or whether because of frugal management it has excess cash available to be invested (Ward, 1994). It presents the **expected cash and outflow** for a designated time period. The cash budget consists typically of four major sections:

1. The **receipts section**, which is the beginning cash balance, cash collections from customers, and other receipts.
2. The **disbursements section**, which comprises all cash payments made by purpose.
3. The **cash surplus or deficit section**, which simply shows the difference between the cash receipts section and the cash disbursements section.
4. **The financing section**, which provides a detailed account of the borrowings and repayments expected during the budgeting period.

Example 28:

Assumptions:

- a) Initial cash balance: 10 000€
- b) Maintain a **5 000€ minimum cash balance** at the end of each quarter.
- c) Borrowing and repayment must be in **multiples of 500€** (10%/year)
- d) Borrowing takes place at the beginning of each quarter and repayment at the end of each quarter.
- e) **Machinery acquisition** in the 2nd quarter: 24 300€
- f) **Income Tax** from the previous period: 4 000€

Table 60: Cash balance (J. Shim & Siegel, 2007)

	Quarter				
	(€)	1	2	3	4
Cash balance, beginning	10 000	9 401	5 461	9 106	10 000
(+) Receipts:					
Collection from customers	54 300	57 120	66 080	64 960	242 460
Total cash available	64 300	66 521	71 541	74 066	252 460
(-) Disbursements:					
Direct materials	4 549	4 560	4 860	5 113	19 082
Direct labor	19 750	18 000	22 250	20 500	80 500
Factory overhead	10 650	9 950	11 650	10 950	43 200
Selling and administrative	15 950	12 750	14 750	13 150	56 600
Machinery purchase		24 300			24 300
Income tax	4 000				4 000
Total disbursements	54 899	69 560	53 510	49 713	227 682
Cash surplus (deficit)	9 401	-3 039	18 031	24 353	24 778
Financing:					
Borrowing			8 500		8 500
Repayment				- 8 500	-8 500
Interest				-425	-425
Total financing			8 500	-8 925	-425
Cash balance, ending	9 401	5 461	9 106	24 353	24 353

7.12 BUDGETED INCOME STATEMENT

The budget income statement summarizes the various component projections of **revenue and expenses for the budgeting period**. For control purposes the budget can be divided into quarters or even months. In the sequence of the previous examples and assuming a 20% income tax rate:

Table 61: Net income (J. Shim & Siegel, 2007)

Sales (3 200 units @ 80€)		256 000
(–) Variables expenses		
Variable cost of goods sold (3 200 units @ 41€)	131 200	
Manufacturing contribution margin		124 800
Variable selling and administrative	12 800	
Contribution margin		112 000
(–) Fixed expenses		
Factory overhead	24 000	
Selling and administrative	43 800	
Net operating income		44 200
(–) Interest expense	425	
Net income before taxes		43 775
(–) Income taxes (20%)	8 755	
Net income		35 020

7.13 BUDGETED BALANCE SHEET

The last component of the master budget is the budgeted balance sheet. It is simply a planned balance sheet (sometimes named a pro forma balance sheet). Managers can use it to evaluate the effect of their planned decisions on future financial positions (Weygandt et al., 2008). The reasons why the budgeted balance sheet must be prepared are:

- § It may disclose some unfavourable financial conditions that management might want to avoid.
- § It serves as a **final check** on the mathematical accuracy of all the other budgets.
- § It helps management **perform a variety of ratio** calculations.
- § It highlights future resources and obligations.

Considering the Balance Sheet as follows (J. Shim & Siegel, 2007):

Table 62

31.12.N-1

ASSETS (€)		LIABILITIES AND STOCKHOLDERS' EQUITY (€)	
Current Assets:		Current Liabilities:	
Cash	10 000	Accounts Payable	2 200
Accounts Receivable	9 500	Income Tax Payable	4 000
Materials Inventory	474	Total Current Liabilities	<u>6 200</u>
Finished Goods Inventory	3 280	Stockholders' Equity:	
	<u>23 254</u>	Common Stock No-Par	70 000
Fixed Assets:		Retained Earnings	37 054
Land	50 000		
Building and Equipment	100 000		
Accumulated Depreciation	<u>-60 000</u>		
	90 000		
Total Assets	<u>113 254</u>	Total Liabilities and Stockholders' Equity	<u>113 254</u>

Table 63

ASSETS (€)		LIABILITIES AND STOCKHOLDERS' EQUITY (€)	
Current Assets:		Current Liabilities:	
Cash	10 000	Accounts Payable	2 200
Accounts Receivable	9 500	Income Tax Payable	4 000
Materials Inventory	474	Total Current Liabilities	<u>6 200</u>
Finished Goods Inventory	3 280	Stockholders' Equity:	
	<u>23 254</u>	Common Stock No-Par	70 000
Fixed Assets:		Retained Earnings	37 054
Land	50 000		
Building and Equipment	100 000		
Accumulated Depreciation	<u>-60 000</u>		
	90 000		
Total Assets	<u>113 254</u>	Total Liabilities and Stockholders' Equity	<u>113 254</u>

- a) Cash Budget
- b) $23\ 040 = 9\ 500(\text{BS.N-1}) + 256\ 000 (\text{SB.sales}) - 242\ 460 (\text{CB.receipts})$
- c) Ending Inventory Budget
- d) Ending Inventory Budget
- e) Balance Sheet (N-1)
- f) $124\ 300 = 100\ 000 (\text{BS.N-1}) + 24\ 300 (\text{CB.Machinery.Aquisition})$
- g) $73\ 000 = 60\ 000 (\text{BS.N-1}) + 13\ 000 (\text{BFOverhead})$

- h) $2\,464 = 2\,200$ (BS.N-1) + $19\,436$ (Purchase.Cost) – $19\,082$ (Total.disbursements)
 i) Budgeted Income Statement (Income Tax)
 j) Balance Sheet (N-1)
 k) $72\,074 = 37\,054$ (BS.N-1) + $35\,020$ (ISB.Net income)

Problem: The Bee Company manufactures two models of adding machines, A and B. The following production and sales data for the month of June are given for N (J. Shim & Siegel, 2007):

Table 64

	A	B
Estimated inventory (units) June 1	4 500	2 250
Desired inventory (units) June 30	4 000	2 500
Expected sales volume (units)	7 500	5 000
Unit sales price (euros)	75	120

Prepare a sales budget and a production budget for June N.

Solution:

Table 65

Product	Sales Volume	Unit Selling Price	Total Sales
A	7 500	75	562 500
B	5 000	120	600 000
			<u>1 162 500</u>

	Product A	Product B
Expected sales	7 500	5 000
Ending inventory, desired	4 000	2 500
Total	<u>11 500</u>	<u>7 500</u>
Less: Beginning inventory	4 500	2 250
Total productions (in units)	<u>7 000</u>	<u>5 250</u>

8. RESPONSIBILITY CENTERS

Responsibility accounting is the system for collecting revenue and cost information by areas of responsibility. Managers should be held **responsible for their performance** and all activities within their responsibility center. The main advantages of responsibility accounting are (J. Shim & Siegel, 2007):

1. Delegation of decision making.
2. Management by objectives.
3. Guide to the evaluation of performance and to establish standards of performance.
4. Management by exception: concentrated on the deviations from standards and budgets.

The responsibility center is the unit which has control over costs, revenues, and investment funds. They can be one of the following types (Siegel & Shim, 2006):

1. **Cost center:** Responsible only for costs (ex. production and maintenance departments of a company). Typical measure: **Variance analysis** based on **standard costs** and **flexible budgets**.
2. **Profit center:** Responsible for the revenues earned and costs (ex: a sales office of a company). Typical measure: **Contribution approach to cost allocation**.
3. **Investment center:** Responsible for the costs, revenues, and related investments (ex: corporate headquarters). Typical measures: **Return on investment** and **residual income**.

8.1 VARIANCE ANALYSIS

After establishing **standard costs** and the difference (**variance**) between the actual costs and the standard costs must be calculated. The **variance analysis** is a tool for **measuring performance** of a cost center. The **standard cost** is determined by multiplying the standard quantity of an input by its standard price. Two types of variances can be calculated: **price variance** and **quantity variance** (Jae K Shim & Siegel, 2009). The **price variance** is calculated as follows:

$$\text{Price Variance} = \text{Actual quantity} \times (\text{Actual price} - \text{Standard price}) = (AQ \times AP) - (AQ \times SP)$$

The **quantity variance** is calculated as follows:

$$\text{Quantity Variance} = (\text{Actual quantity} - \text{Standard quantity}) \times \text{Standard price} = (AQ \times SP) - (SQ \times SP)$$

Table 66

Actual Quantity of Inputs, at Actual Price ($AQ \times AP$) (1)	Actual Quantity of Inputs, at Standard Price ($AQ \times SP$) (2)	Standard Quantity Allowed for Output, at Standard Price ($SQ \times SP$) (3)
Price Variance (1)–(2)		
Quantity Variance (2)–(3)		
Total Variance		
* Materials purchase price variance		* Materials quantity (usage) variance
* Labor rate variance		* Labor efficiency variance
* Variable overhead spending variance		* Variable overhead efficiency variance

Price variance and a quantity variance can be calculated for all three variable cost items—direct materials, direct labor, and the variable portion of factory overhead. Price variance is called a **materials purchase price variance** in the case of direct materials. **Labor rate variance** in the case of direct labor. **Variable overhead spending variance** in the case of variable factory overhead (J. Shim & Siegel, 2007):

1. A variance is **unfavorable (U)** if the actual price AP or actual quantity AQ exceeds the standard price SP or standard quantity SQ ;
2. A variance is **favorable (F)** if the actual price AP or actual quantity AQ is less than the standard price or standard quantity SQ .
3. The standard quantity allowed for output should have been used to produce actual output. It is computed by **multiplying the output by the number of input units allowed**.

8.2 MATERIAL VARIANCES

The materials purchase price variance is computed based on the **actual quantity purchased**. The materials quantity (usage) variance is computed based on the **actual quantity used**.

Example 29: DE Corporation uses a standard cost system. The standard variable costs for product Z are as follows:

Table 67 (J. Shim & Siegel, 2007)

Standard Variable Costs

Material (pounds):	2 @ 3€/pound
Labor (DLH):	1 @ 5€/DLH
Variable overhead:	1 @ 3€/DLH

During March, 25 000 pounds of material were purchased for 74 750€ and 20 750 pounds of material were used in producing 10 000 units of finished product. Direct labor costs incurred were 49 896€ (10 080 direct labor hours) and variable overhead costs incurred were 34 776€. Using the three-column general model, calculate the materials variances.

Table 68: (J. Shim & Siegel, 2007)

Actual Quantity of Inputs, at Actual Price ($AQ \times AP$)	Actual Quantity of Inputs, at Standard Price ($AQ \times SP$)	Standard Quantity Allowed for Output, at Standard Price ($SQ \times SP$)
74 750 = 25 000 × 2.99	75 000 = 25 000 × 3.00	60 000 = 20 000 × 3.00
250 = 75 000 – 74 750 (F)		
Price Variance (1)–(2)		
62 250 = 20 750 × 3.00		
2 250 = 62 250 – 60 000 (U)		
Quantity Variance (2)–(3)		

The amount of materials purchased (25 000 pounds) differs from the amount of materials used in production (20 750 pounds). The materials purchase price variance was computed using 25 000 pounds purchased, whereas the materials quantity (usage) variance was computed using the 20 750 pounds used in production. A total variance cannot be computed because of the difference between purchased and used materials. Alternatively:

$$\begin{aligned} \text{Materials purchase price variance} &= AQ(AP - SP) = (AQ \times AP) - (AQ \times SP) \\ &= (25\,000)(2.99 - 3.00) = 250\text{€ (F)} \end{aligned}$$

$$\begin{aligned} \text{Materials usage quantity variance} &= (AQ - SQ)SP = (20\,750 - 20\,000)(3.00) \\ &= 2\,250\text{€ (U)} \end{aligned}$$

8.3 LABOR VARIANCES

They are computed in a similar way to the materials variances. In the three-column model the terms *hours* and *rate* are used in place of the terms *quantity* and *price*. The production department is responsible for both **the prices paid for labor services** and the **quantity of labor services used**.

Example 30: DE Corporation uses a standard cost system. The standard variable costs for product Z are as follows (J. Shim & Siegel, 2007):

Table 69

Standard Variable Costs

Material (pounds):	2 @ 3€/pound
Labor (DLH):	1 @ 5€/DLH
Variable overhead:	1 @ 3€/DLH

During March, 25 000 pounds of material were purchased for 74 750€ and 20 750 pounds of material were used in producing 10 000 units of finished product. Direct labor costs incurred were 49 896€ (10 080 direct labor hours) and variable overhead costs incurred were 34 776€. Using the three-column general model, calculate the materials variances.

$$\begin{aligned} \text{Labor rate variance} &= AH(AR - SR) = (AH \times AR) - (AH \times SR) \\ &= (10\,080)(4.95 - 5.00) = 49\,896 - 50\,400 = 504\text{€} (F) \end{aligned}$$

$$\begin{aligned} \text{Labor efficiency variance} &= (AH - SH)SR = (10\,080 - 10\,000)(5.00) \\ &= 50\,400 - 50\,000 = 400\text{€}(U) \end{aligned}$$

AH = Actual Hour; SH = Standard Hour; AR = Actual Rate; SR = Standard Rate

Table 70 (J. Shim & Siegel, 2007)

Actual Hours of Inputs, at Actual Price ($AH \times AR$)	Actual Hours of Inputs, at Standard Price ($AH \times SR$)	Standard Hours Allowed for Output, at Standard Price ($SH \times SR$)
49 896 = 10 080 × 4.95	50 400 = 10 080 × 5.00	50 000 = 10 000 × 5.00
-540 = 49 896 - 50 400 (F)		
Rate Variance (1) - (2)		
400 = 50 400 - 50 000 (U)		
Efficiency Variance (2) - (3)		
-104 = 504 - 400 (F)		
Total Variance		

8.4 VARIABLE OVERHEAD VARIANCES

Computed in a way very similar to the **labour variances**, variances for **variable overheads are of questionable usefulness for control purposes**, since these variances are usually **beyond the control of the production department**.

Example 31: DE Corporation uses a standard cost system. The standard variable costs for product Z are as follows (J. Shim & Siegel, 2007):

Table 71

Standard Variable Costs

Material (pounds):	2 @ 3€/pound
Labor (DLH):	1 @ 5€/DLH
Variable overhead:	1 @ 3€/DLH

During March, 25 000 pounds of material were purchased for 74 750€ and 20 750 pounds of material were used in producing 10 000 units of finished product. Direct labor costs incurred were 49 896€ (10 080 direct labor hours) and variable overhead costs incurred were 34 776€. Using the three-column general model, calculate the materials variances.

Table 72

Actual Hours of Inputs, at Actual Rate ($AH \times AR$)	Actual Hours of Inputs, at Standard Rate ($AH \times SR$)	Standard Hours Allowed for Output, at Standard Rate ($SH \times SR$)
$34\,776 = 10\,080 \times 3.45$	$30\,240 = 10\,080 \times 3.00$	$530\,000 = 10\,000 \times 3.00$
$4\,536 = 34\,776 - 30\,240$ (U)		
Spending Variance (1)–(2)		
	$240 = 30\,240 - 30\,000$ (U)	
	Efficiency Variance (2)–(3)	
	$4\,776 = 504 - 400$ (U)	
Total Variance		

$$\begin{aligned} \text{Variable overhead spending variance} &= AH(AR - SR) \\ &= (AH \times AR) - (AH \times SR) = (10\,080)(3.45 - 3.00) \\ &= 34\,776 - 30\,240 = 4\,536\text{€ (U)} \end{aligned}$$

$$\begin{aligned} \text{Variable overhead efficiency variance} &= (AH - SH)SR \\ &= (10\,080 - 10\,000)(3.00) = 30\,240 - 30\,000 = 240\text{€ (U)} \end{aligned}$$

$$\text{Total variance} = (4\,536 + 240)\text{(U)} = (4\,776)\text{(U)}$$

AH = Actual Hour; SH = Standard Hour; AR = Actual Rate; SR = Standard Rate

8.5 FIXED OVERHEAD VARIANCES

The amount of **fixed overhead** per unit **varies inversely** with the **level of production**. To calculate variances for fixed overhead, it is necessary to determine a **standard fixed overhead rate**. This activity should be measured on the basis of **standard inputs allowed** (J. Shim, 1994):

$$\text{Standard Fixed Overhead Rate} = \frac{\text{Budgeted Fixed Overhead}}{\text{Budgeted Level of Activity}}$$

Total fixed overhead variance is **under- or over applied overhead**. It is the difference between **actual fixed overhead incurred** and **fixed overhead applied to production**. **Total fixed overhead variance** combines **fixed overhead spending** (*flexible budget*) **variance** and **fixed overhead volume** (*capacity*) **variance**. **Fixed overhead spending** (*flexible budget*) **variance**: Difference between **actual fixed overhead incurred** and **budgeted fixed overhead**. It is **not affected by the level of production**. **Fixed overhead volume** (*capacity*) **variance**: Difference between the **actual level of activity** differs from the **denominator activity** used in determining the standard fixed overhead rate: Measure of the cost of failure to operate at the denominator (budgeted) activity level. The volume variance is calculated as follows (Bisk, 2002):

$$\begin{aligned} \text{Fixed Overhead Volume Variance} \\ = \text{Budgeted Fixed Overhead} - \text{Fixed Overhead Applied} \end{aligned}$$

$$\begin{aligned} \text{Fixed Overhead Volume Variance} \\ = (\text{Denominator Activity} - \text{Standard Hours Applied}) \times \text{Standard Fixed Overhead Rate} \end{aligned}$$

When **denominator activity exceeds standard hours allowed**, the **volume variance is unfavorable** (U).

Example 32: (Siegel, Dauber, & Shim, 2011) The DM Company has the following standard cost of factory overhead at a normal monthly production (denominator) volume of 1 300 direct labor hours:

§ Variable overhead (1 hour @ 2€)

§ Fixed overhead (1 hour @ 5€)

Fixed overhead budgeted is 6 500€ per month. During the month of March, the following events occurred:

1. Actual overhead costs incurred (for 1 350 hours) were:
Variable: 2 853€; Fixed: 6 725€
2. Standard hours allowed were 1 250 hours (1 hour X 1 250 units of output).

Table 73

	Incurred Actual Hours * Actual Rate -1	Flexible Budget Based on Actual Hours -2	Flexible Budget Based on Standard Hours Allowed -3	Applied -4
Three-Way Analysis	Spending Variance (1)–(2)			
			Efficiency Variance (2)–(3)	
	Flexible Budget Variance (1)–(3)			
Two-Way Analysis				Volume Variance (3)–(4)
	Under or Overapplied (1)–(4)			

1. Flexible budget formula:
 - a. Variable overhead rate: 2€ per direct labor hour.
 - b. Fixed overhead budgeted: per month.
2. Standard overhead applied rates:
 - a. Variable: 2€ per direct labor hour.
 - b. Fixed: 5€ per direct labor hour.

Fixed overhead volume variance:

$$(DA - SHA) \times (SFOR) = (1\,300 \times 1\,350) \times 5 = 50 \text{ hours} \times 5\text{€} = 250 (U)$$

The **two-way analysis** computes two variances (Siegel et al., 2011):

1. **Budget variance** = Variable spending variance+Fixed spending (budget) variance+Variable efficiency variance
2. **Volume variance** = Fixed volume variance

The **three-way analysis** computes three variances (Jae K Shim & Siegel, 2009):

1. **Spending variance** = Variable spending variance+Fixed spending (budget) variance
2. **Efficiency variance** = Variable efficiency variance
3. **Volume variance** = Fixed volume variance

Table 74

Fixed Overhead Variances

	Incurred Actual Hours * Actual Rate 1 350 1	Flexible Budget Based on Actual Hours 1 350 2	Flexible Budget Based on Standard Hours Allowed 1 250 3	Applied 1 250 4
V	2 853	2 700	2 500	2 5000
F	6 725	6 500	6 500	6 250
T	9 578	9 200	9 000	8 750
<hr/>				
	V	153 (U)		
	F	225 (U)		
	T	378 (U)		
Three-Way Analysis	Spending Variance (1)–(2)			
		V	200 € (U)	
		F	0 (NA)	
		T	200 (U)	
	Efficiency Variance (2)–(3)			
		V	353 (U)	
	F	225 (U)		
	T	578 (U)		
Two-Way Analysis	Flexible Budget Variance (1)–(3)			
		V	0 (NA)	
		F	250 (U)	
		T	250 (U)	
	Volume Variance (3)–(4)			
		V	353 (U)	
	F	475 (U)		
	T	828 (U)		
Under or Overapplied (1)–(4)				

9. PERFORMANCE EVALUATION

Decentralization is accomplished by segmenting the company into divisions differentiated by the goods or services traded. In a decentralized structure, some interdependencies exist; otherwise, a company would be a group of separate units. The existence of these interdependencies generates the requisite for transfer pricing (Hansen et al., 2007). Why firms choose to decentralize (Siegel & Shim, 2006)?

1. Delegation of decision making to the subunits of an organization.
2. The lower the level where decisions are made, the greater is the decentralization.
3. Most effective in organizations where cost and measurement is necessary.
4. Most successful in organizations where subunits are totally independent and autonomous.

The benefits from decentralization are (Siegel & Shim, 2006):

1. Decisions are made by those who have the **most knowledge about local conditions**.
2. The burden of **decision making is distributed**. Top management is likely to have more time for the important strategic decisions.
3. Greater managerial input of decision making has a **motivational effect**.
4. Managers have more **control over results**.

The costs from decentralization are (Siegel & Shim, 2006):

1. Managers tend to look only at their division and **lose sight of overall company**.
2. There can be costly duplication of services.
3. **Costs** of obtaining enough information **increase**.

But there are two problems that arise from the decentralized organizations which are designated as the *performance evaluation* and the *transfer pricing*. A decentralized subunit can be an **investment center**, responsible for managing the operating assets and the related operating income. It allows to measure the results of each center; and to compare those results with some measure of expected or budgeted outcome. There are two widely used variables of performance for the centers: The *rate of return on investment (ROI)*

and *residual income (RI)*.

9.1 RETURN ON INVESTMENT

ROI is the most common measure of performance for an investment center and it relates net income to invested capital (Balakrishnan, Sivaramakrishnan, & Sprinkle, 2008).

$$ROI = \frac{\text{Operating Income}}{\text{Operating Assets}}$$

ROI can be expressed as a product of the following factors:

$$\begin{aligned} ROI &= \text{Margin} \times \text{Operating Assets Turnover} \\ &= \frac{\text{Operating Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Operating Assets}} \\ &= \frac{\text{Operating Income}}{\text{Operating Assets}} \end{aligned}$$

The Margin measures the profitability or operating efficiency. The *Turnover* evaluates the **management level of its assets**.

The advantages of the ROI are:

- a. Helps managers focus on the relationship between sales, costs and investment;
- b. Encourages cost efficiency;
- c. Discourages excessive investment in operating assets.

The disadvantages of the ROI are:

- d. Discourages managers from investing in projects decreasing divisional ROI but increasing profitability of the company overall;
- c. Encourages managers to focus on the short-term at expenses of the long-term.

Example 33: Consider the following financial data for a division and calculate the Return on Investment (J. Shim & Siegel, 2007):

Table 75

	Euros
Operating assets	100 000
Operating income	18 000
Sales	200 000

$$ROI = \frac{\text{Operating Income}}{\text{Operating Assets}} = \frac{18\,000}{100\,000} = 0.18$$

$$\text{Margin} = \frac{\text{Operating Income}}{\text{Sales}} = \frac{18\,000}{200\,000} = 0.09$$

$$\text{Turnover} = \frac{\text{Sales}}{\text{Operating Assets}} = \frac{200\,000}{100\,000} = 2 \text{ times}$$

For profit enhancement, management can do the following actions (Jae K Shim, Siegel, & Dauber, 2008):

1. Improve margin:
 - a. Reducing expenses.
 - b. Raising selling prices.
 - c. Increasing sales faster than expenses.
2. Improve turnover.
 - a. Increasing sales while holding the investment in assets relatively constant.
 - b. Reducing assets.
3. Improve both.
 - a. Increasing sales revenue
 - b. Any combinations of alternatives 1 and 2.

Example 34: Assume that management sets a 20 percent ROI as a profit target. It is currently making an 18 percent return on its investment: (J. Shim & Siegel, 2007).

$$ROI = \frac{\text{Operating Income}}{\text{Sales}} = \frac{\text{Sales}}{\text{Operating Assets}}$$

$$ROI = \frac{18\,000}{200\,000} \times \frac{200\,000}{100\,000} = 0.18$$

A1: Increase margin by reducing expenses

$$ROI = \frac{20\,000}{200\,000} \times \frac{200\,000}{100\,000} = 0.20$$

A2: Increase turnover by reducing investment in operating assets

$$ROI = \frac{18\,000}{200\,000} \times \frac{200\,000}{90\,000} = 0.20$$

A3: Increase both margin and turnover by disposing of obsolete and redundant inventories

$$ROI = \frac{19\,000}{200\,000} \times \frac{200\,000}{95\,000} = 0.20$$

9.2 RESIDUAL INCOME

The residual income (RI) of a department is the profit created that surpasses the value charged for funds dedicated to the center. This charged value equalizes a specified target rate of return multiplied by the asset base and is equivalent to an imputed rate of interest on the divisional assets. The rate can be updated to compensate for market rate fluctuations (Kinney & Raiborn, 2008). The difference between operating income and the minimum Euro return required on a company's operating assets (J K Shim & Siegel, 2008).

1. Alternative approach to measuring performance in an investment center.
2. RI is the **operating income** which an investment center is able to earn **above some minimum rate of return** on its operating assets.
3. An absolute amount of income rather than a specific rate of return.
4. When used to **evaluate divisional performance**, the objective is to **maximize the total amount of residual income**, not to maximize the overall ROI figure.

Residual Income

$$= \text{Operating Income} - (\text{Minimum rate of return} \times \text{Operating Assets})$$

Example 35: (Jae K Shim & Siegel, 2009) Assume the minimum required rate of return is 13 percent.

Table 76

	Euros
Operating assets	100 000
Operating income	18 000
Sales	200 000

Then the residual income of the division is: $18\,000 - (13\% \times 100\,000) = 18\,000 - 13\,000 = 5\,000\text{€}$

Comparison between ROI and RI (J K Shim & Siegel, 2008):

1. RI is as a better measure of performance than ROI. It **encourages investment in projects that would be rejected** under ROI.
2. RI cannot be used to compare divisions of different sizes. RI **tends to favour larger divisions** because of the larger amount involved.
3. **Under the ROI method**, division managers tend to accept only the **investments whose returns exceed the division's ROI**; Otherwise, the division's overall ROI would decrease.
4. **Under the RI method**, on the other hand, division managers would accept an **investment as long as it earns a rate in excess of the minimum required rate of return**. The addition of such an investment will increase the division's overall RI.

Example 36: (Siegel & Shim, 2006) Consider the following data:

Table 77

	Euros
Operating assets	100 000
Operating income	18 000
Minimum required rate of return	13%
<hr/>	
ROI = 18% AND RI = 5.000€	

Assume that the division is presented with a project that would yield 15 percent on a 10 000 investment. Analyze the investment proposal under ROI and RI.

- a) **Under the ROI approach:** The division manager would not accept this project, since the division is already earning 18%. Acquiring this project will bring down the present ROI to 17.73%.

Table 78

	Present	New Project	Overall
Operating assets	100 000	10 000	110 000
Operating income	18 000	1 500	19 500
ROI	18.00%	15.00%	17.73%
			Euros

- b) **Under the RI approach:** the manager would accept the new project, since it provides a higher rate than the minimum required rate of return (15% vs. 13%). Accepting the new project will increase the overall residual income to 5 200€:

Table 79

	Present	New Project	Overall
Operating assets	100 000	10 000	110 000
Operating income	18 000	1 500	19 500
Minimum required income at 13%	13 000	1 300	14 300
RI	5 000	200	5 200

Euros

Problem: Consider the following (Needles, Powers, & Crosson, 2013)

Table 80

	Division A	Division B
Operating assets	5 000	12 500
Operating income	1 000	2 250
ROI	20%	18%

000 Euros

1. Which is the more successful division in terms of ROI?
2. Using 16 percent as the minimum required rate of return, compute the residual income for each division. Which division is more successful under this rate?
3. Division A is more successful since it returns 20% of the invested capital (vs. 18% for division B).
4. The residual income at 16% for each division is computed as follows (Division B is more successful):

Table 81

	Division A	Division B	
Operating assets	5 000	12 500	16%
Operating income	1 000	2 250	
Minimum required income	800	2 000	
RI	200	250	

000 Euros

Problem: (Balakrishnan et al., 2008): Consider the following sales and operating data for the three divisions of a conglomerate:

Table 82

	Division A	Division B	Division C
Sales	140 000	180 000	250 000
Operating assets	5 000	6 300	14 400
Operating income	20 000	35 000	90 000
Minimum required rate of return	10%	19%	20%

Euros

1. Compute the return on investment (ROI) for each division.
 2. Assume that each division is provided with an investment opportunity that could produce 20% return on investment. Which divisions would accept or reject it?
 3. Compute the residual income (RI) for each division.
 4. Assume that each division is provided with an investment opportunity that would produce an 18% return on investment. Which divisions will accept or reject it?
1. Division A would reject this investment opportunity, since the addition would lower the present divisional ROI. Divisions B and C would accept it because they would look better in terms of their divisional ROI.

Table 83

	Division A	Division B	Division C
Inv.	5 000	6 300	14 400
	20 000	35 000	90 000
ROI	25%	18%	16%

Euros

2. Division A would accept this investment project, since an 18% ROI is greater than 10%. Thus, it will increase the divisional residual income. Divisions B and C would reject it, since their minimum required rates of return are both greater than the 18% return that the new project earns.

Table 84

Euros	Division A	Division B	Division C
Operating income	5 000	6 300	14 400
Require rate of return	10%	19%	20%
Operating assets	20 000	35 000	90 000
Minimum required income	2 000	6 650	18 000
RI	3 000	-350	-3 600

9.3 ECONOMIC VALUE ADDED (EVA)

EVA constitutes a comprehensive measure of operating performance and variation of the Residual Income. To maximize firm value, the firm must earn more than its cost of capital (require rate of return):

$$EVA = \text{After tax Operating Income} - [\text{Cost of Capital} \times (\text{Operating Assets})]$$

It focuses on an absolute value rather than a percentage. Therefore, larger firms will generally have higher EVA.

$$EVA = OP(1 - t) - k_m I$$

$$k_m = k_e \frac{E}{I} + k_d(1 - t) \frac{D}{I}$$

$$k_e = r_f + \beta_e(r_m - r_f)$$

EVA: Economic value added; *OP*: Operational Profit; *t*: Income tax rate; *k_m*: Weighted Average Cost of Capital; *k_e*: Cost of Equity; *k_d*: Cost of Debt; *E*: Equity; *D*: Debt; *I*: Invested Capital = *E* + *D*

Example 37: Calculate EVA with following data:

Table 85

	Euros	
Real State Investment	1 500 000	
Debt (%D×RSI)	525 000	35%
Shareholders (%E×RSI)	975 000	65%
Rent (Month) - Revenue	12 000	
Monthly Expenses (Insurance, etc)	3 500	
Depreciation Rate	2%	
Opportunity Cost of Capital	6%	
Interest Rate of Debt	5%	
Corporate Tax Rate	40%	

Table 86

Revenues	Euros	Average Cost of Capital	Euros
Rent	144 000	Estimated Income	43 200
Expenses		Equity Capital	975 000
Depreciation (2%×RSI)	30 000	Debt	525 000
Maintenance and Repairs (12×ME)	42 000	Opportunity Cost of Capital	6%
Operating Income	72 000	Interest Rate	5%
Net Operating Income $OI \times (1 - t)$	43 200	Corporate Tax rate	40%
		$WACC [\%EC \times CC + \%D \times IR \times (1 - t)]$	4.98%
Fixed Assets	Euros		
Real State Investment	1 500 000		Euros
Depreciation (2%×RSI)	30 000	Net Operating Income	43 200
Net Fixed Assets	1 470 000	Invested Capital	1 470 000
Working Capital Requirements	0	Cost of Capital	73 197
Invested Capital	1 470 000	EVA	-29 997

10. TRANSFER PRICING

The price charged affects the revenues of the transferring division and the costs of the receiving division. Goods and services are exchanged between various divisions of a decentralized organization.

What prices should be assigned to these exchanges (Hansen et al., 2007)?

The decision includes consideration of the following:

1. **Goal congruence:** Will the transfer price promote the goals of the company as a whole?
2. **Performance evaluation:** Will the transfer price hurt the performance of the selling division?
3. **Autonomy:** Will the transfer price preserve autonomy, the freedom of the selling and buying division managers to operate their divisions as decentralized entities?
4. **Other factors:** such as minimization of tariffs and income taxes and observance of legal restrictions.

10.1 ALTERNATIVE TRANSFER PRICING SCHEMES

1. **Market price:** Maximize the profits of the company, meeting necessarily two conditions:
 - a. There exists a competitive market price;
 - b. Divisions are independent of each other.
2. **Cost-based price-variable** or full cost: There are some disadvantages:
 - a. **Inefficiencies of selling divisions are passed on** to the buying divisions with little incentive to control costs. The use of **standard costs is recommended** in such a case.
 - b. The cost-based method treats the divisions as **cost centers rather than profit** or investment centers. Measures such as ROI and RI cannot be used for evaluation purposes.
 - c. The **variable cost-based transfer price has an advantage over the**

full cost method. In the short run, the fixed costs do not change. Any use of facilities without incurrance of additional fixed costs **will increase the company's overall profits.**

3. **Negotiated Price:** Widely used when no intermediate market price exists for the product transferred and the selling division is assured of a normal profit.

Example 38: (Siegel & Shim, 2006) Company PT has just purchased a small company that specializes in the manufacture of a certain part. PT is a decentralized organization and will treat the newly acquired company as an autonomous division called Division B, with full profit responsibility. Division B's fixed costs total 30 000€/ month, and variable costs per unit are 18€. Division B's operating capacity is 5 000 units. The selling price per unit is 30€. Division A of Company X is currently purchasing 2 500 units of this part per month from an outside supplier as 29€ per unit, which represents the normal 30€ price less a quantity discount. Top management of the company wishes to decide what transfer price should be used. Top management may consider the following alternative prices:

- a. 30€ market price.
- b. 29€, the price that Division A is currently paying to the outside supplier.
- c. 23.50€ negotiated price, which is 18€ variable cost plus one-half of the benefits of an internal transfer $[(29-18)*0,5]$.
- d. 24€ full cost, which is 18€ variable cost plus 6€ $(30\ 000 + 5\ 000\ \text{units})$ fixed cost per unit.
- e. 18€ variable cost.

We will discuss each of these prices:

- a. 30€ **would not be** an appropriate transfer price. Division B cannot charge a price more than the price that Division A is paying now (29€).
- b. 29€ **would be** an appropriate transfer price if top management wishes to treat the divisions as autonomous investment centers. This price would cause **all the benefits of internal transfers to accrue to the selling division**, with the **buying division's position remaining unchanged.**
- c. 23,50€ **would be** an appropriate transfer price if top management wishes to treat the divisions as investment centers. It shares the benefits equally between them, as follows:

Table 87

Variable costs of Division B	18 €
Market Price	29 €
Difference	11 €
Half of the difference	5.5 €
Transfer price	23.5 €

- d. 24€ [24 = 18 + (30 000/5 000 units)] **would be** an appropriate transfer price if top management treats the divisions like **cost centers with no profit responsibility**.
- i. All benefits from both divisions will accrue to the **buying division**. This will **maximize the profits** of the company **as a whole**. But **affect the performance** of the **selling division**.
 - ii. Another disadvantage is that inefficiencies of the selling division are passed on to the buying division.
- e. 18€ **would be** an appropriate transfer price. Since 18€ is less than the outside purchase price of the buying division, and the selling division has excess capacity, the transfer should take place.
- i. It will maximize the profits of the company as a whole.
 - ii. All of the benefits of the internal transfer accrue to the buying division, and it will hurt the performance of the selling division.

10.2 GENERAL FORMULA

It is generally agreed that some form of **competitive market price is the best approach** to the transfer pricing problem. The following formula may be helpful (J K Shim & Siegel, 2008):

Transfer price = Variable costs per unit + Opportunity costs per unit for the company as a whole

1. Opportunity costs: Net revenue forgone by the company as a whole if the goods and services are transferred internally.
2. The reasoning behind this formula is that the selling division should be allowed to recover its variable costs plus opportunity cost. **The selling department should not have to suffer lost income by selling within the company.**

The opportunity cost approach identifies (Hansen et al., 2007):

- The minimum price that a selling division would accept (Floor: leaves the selling division no worse off for having sold to an internal division)
- The maximum price that the buying division would be willing to pay (Ceiling: leaves the buying division no worse off for having purchased from an internal division)

Problem: (Jae K Shim & Siegel, 2009): Company Q has three divisions, B, S, and L. It also deals with two other companies, X and Y. Division B can buy a widget from division S or from company X, which will meet S's market price of 200€ per unit. If B buys from X, X in turn buys a component from division L for 40€ per unit; the outlay costs to division L of supplying this component are 20€ per unit. In filling B's order, S incurs outlay costs of 165€ per unit. Assume that division S is working at full capacity and can provide the widget to an outside buyer (i.e., company Y) at the same market price of 200€ per unit and with the same outlay costs of 165€ per unit.

- What alternative would be the best for company Q as a whole-B buying from company X or division S? Draw the boxes. Show supporting calculations.
- What transfer price should be used to guide the managers of divisions B and S to maximize overall company net income (cash inflow)?
- Suppose that division S has enough extra capacity to supply the widget to both division B and the outside buyer at the same time. How would this change your answers to parts 1 and 2? Show supporting calculations.

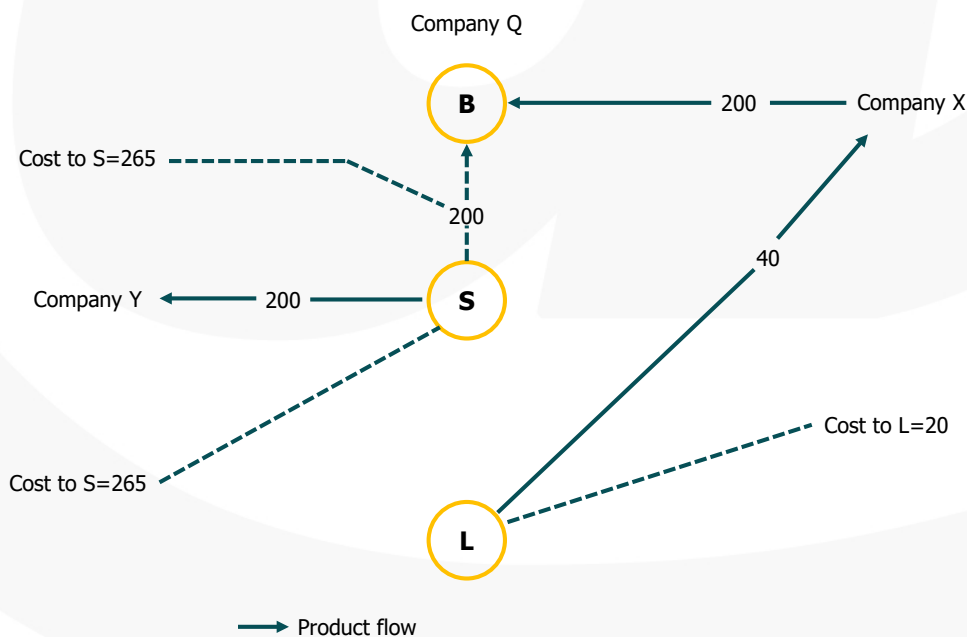


Figure 19: Financial and product flows

1. The optimal action from the standpoint of company Q as a whole can be analyzed as follows:

Table 88**Division B's Action**

	Buy from Division S	Buy from Company X
Outflow to the company as a whole	-165 €	-200€
Cash inflows		To division L: (40€-20€) 20
		To division S: (200€-165€) 35
Net cash outflow to the company as a whole	-165 €	-145€

As a net outflow of 145€ is less than a net outflow of 165€, division B should buy from company X.

2. $TP = VC + OC = 165 + 20 + 35 = 220€$ per unit

TP: Transfer Price; VC: Variable Costs; OC: Opportunity Costs

3. In question 1, it was assumed that division S could supply either division B or company Y, but not both.

For this reason, an opportunity cost of $35€ = 200(\text{revenue from Y}) - 165$ (cost to division S) was included in the calculations. Since division S can now supply both division B and company Y, the 35€ appears on both alternatives as follows:

Table 89**Division B's Action**

	Buy from Division S	Buy from Company X
Outflow to the company as a whole	-165 €	-200€
Cash inflows	35	To division L: (40€-20€) 20
		To division S: (200€-165€) 35
Net cash outflow to the company as a whole	-130 €	-145€

Since a net outflow of 130€ is less than a net outflow of 145€, division B should buy inside, from division S, to benefit company Q as a whole. The transfer price will also not reflect the 35€. $TP = VC + OC = 165 + 20 = 185€$. Since 185€ is less than the 200€ company X charges division B, division B will choose to buy from division S.

11. BALANCED SCORECARD

The organizations become **more strategically focused**. People at all levels have relied heavily on **tactical performance measurements** (number of maps submitted, number of land structures in flow, and % of supply vendor contracts in place) and need more **balanced approach to looking at performance** (tactical and strategic). Only 5% of a workforce tends to understand their company's strategy but 86% of executive teams spend less than one hour per month discussing strategy. The Balanced Scorecard should be **the strategic view of performance for the agency, balancing out our current tactical view of performance** (Cokins et al., 2010).

11.1 THE ORGANIZATION'S INFORMATION RESOURCE PLANNING SYSTEM (IRPS)

It is the **system for how we will evaluate success**: division read outs, data turnarounds, global partnerships, etc. It must be **integrated** into all organization components (such as region and global offices) and should be designed around the **Balanced Scorecard** framework. The Balanced Scorecard will be the **strategic view of performance for the organization**, balancing out current tactical view of performance. The **Balanced Scorecard** framework requires to (Pangarkar & Kirkwood, 2012):

1. Develop long-term **Strategic Plans** ("SP");
2. Specify general **Goals and Objectives**;
3. Develop **Annual Performance Plans** ("APP");
4. Specify **measurable performance goals**;
5. Elaborate an **Annual Performance Report** ("APR")
6. Demonstrate actual **results**; and
7. Show how **expected progress** of APPs is meeting the **long-term goals** of the SP.

The BSC framework permits to quantify the organization **strategy in measurable terms**. The strategy is summarized on a **Strategy Map over four views** of performance (perspectives). The framework must capture a **cause-effect relationship** between

strategic objectives over the **four perspectives** on the Strategy Map. **Critical components** should include:

1. Measurements;
2. Targets; and
3. Initiatives.

All parts must be linked:

1. Goals to Objectives;
2. Objectives to Measurements; and
3. Measurements to Targets.

Thus, the framework consists of an **integrated set of performance measures** that are derived from and **support the company's strategy**. Top management **translates its strategy into performance measures** that employees can understand and influence. For instance, the amount of time passengers that have to wait in line to have their baggage checked can be the performance measure for the supervisor in charge of the Southwest Airlines check-in. This is an example of a **performance measure that is easily understood** by the supervisor, and that **can be improved** by the supervisor's actions.



Figure 20: Strategic objectives (Evans, 2010)

1. Performance measures used in the balanced scorecard approach tend to fall into the four groups: Financial, Customer, Internal Business Processes, and Learning and Growth.
2. Internal business processes: What the company does to satisfy customers (in a manufacturing company, assembling a product is an internal business process).

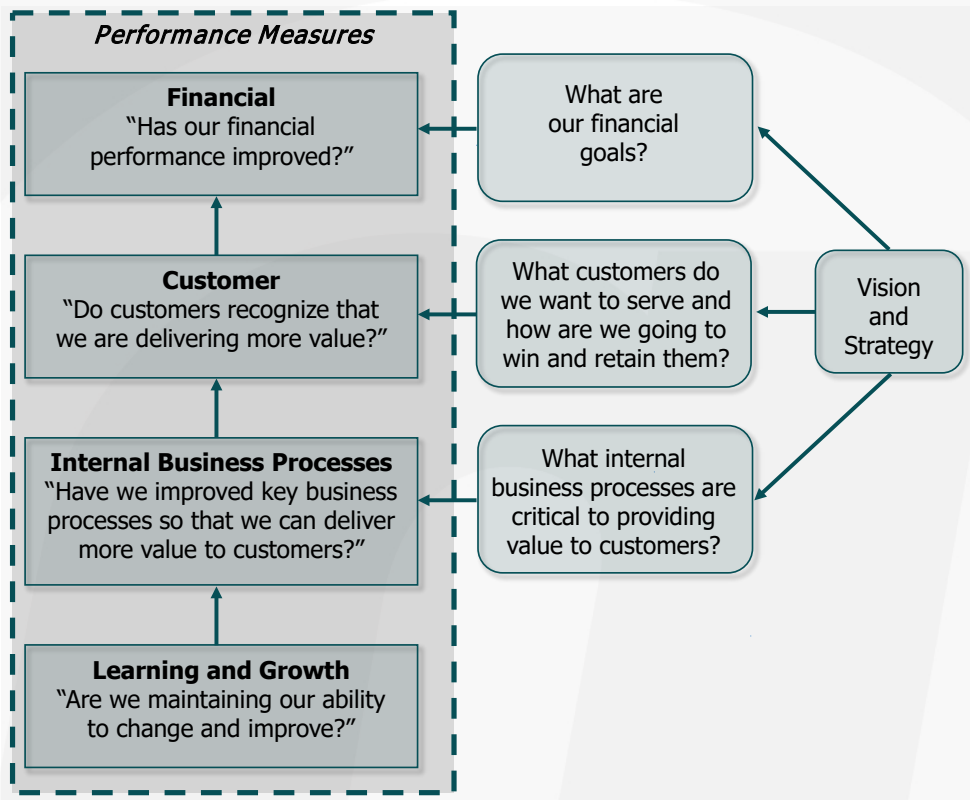


Figure 21: Strategic objectives (R H Garrison & Noreen, 1997)

11.2 THE RELEVANCE OF ALIGNMENT

The Balanced Scorecard when used as strategic planning and management system, can help align an organization behind a shared vision and get people working on the right track and focusing on results. A Balanced Scorecard is a way of integrating people, strategy, processes, and technology (Perry, 2011).

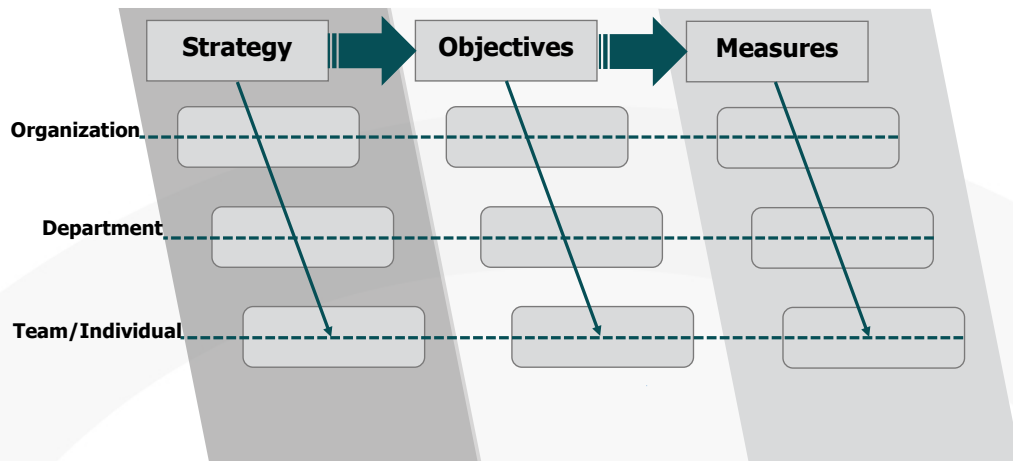


Figure 22: Balanced scorecard (Evans, 2010)

Example 39: Considering an organization with the following characteristics:

Goal: Improve environmental health

Performance Gap: Less than Organization watershed water quality

Initiative: Data Mining

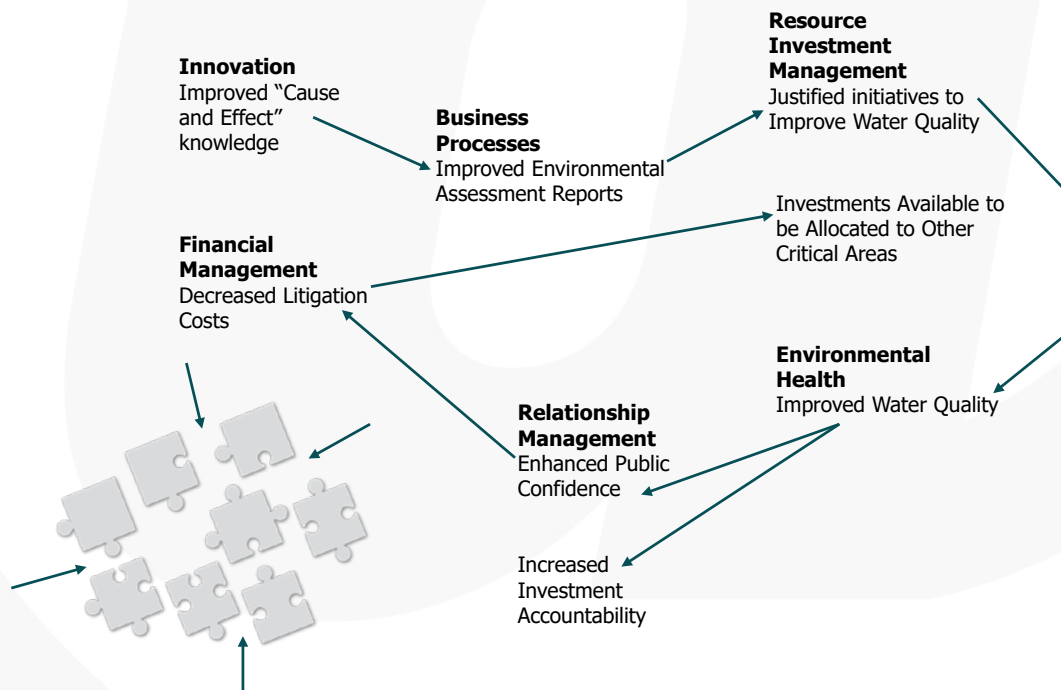


Figure 23: Characteristics of an organization (Evans, 2010)

Example 40: Consider a Government Agency. In order to be successful, it needs to:

1. Be comprised of a **balanced set** of a limited **vital few measures**;
2. Produce **timely and useful reports** at a **reasonable cost**;

3. Make **readily available** information that is **shared and used** by the Agency; and
4. Support the **organization's values** and the relationship the organization has with **customers, suppliers, and stakeholders.**

Before we can **map the organization strategy**, we should get down to a set of **quantifiable strategic objectives** (examples):

- a. **Improve Customer Service: Too vague**
- b. **Reduce average customer wait times by 30% by year end: More precise**

We must make sure the objectives have a direct relationship to the goals and you're the goals have a direct relationship to the mission and values:

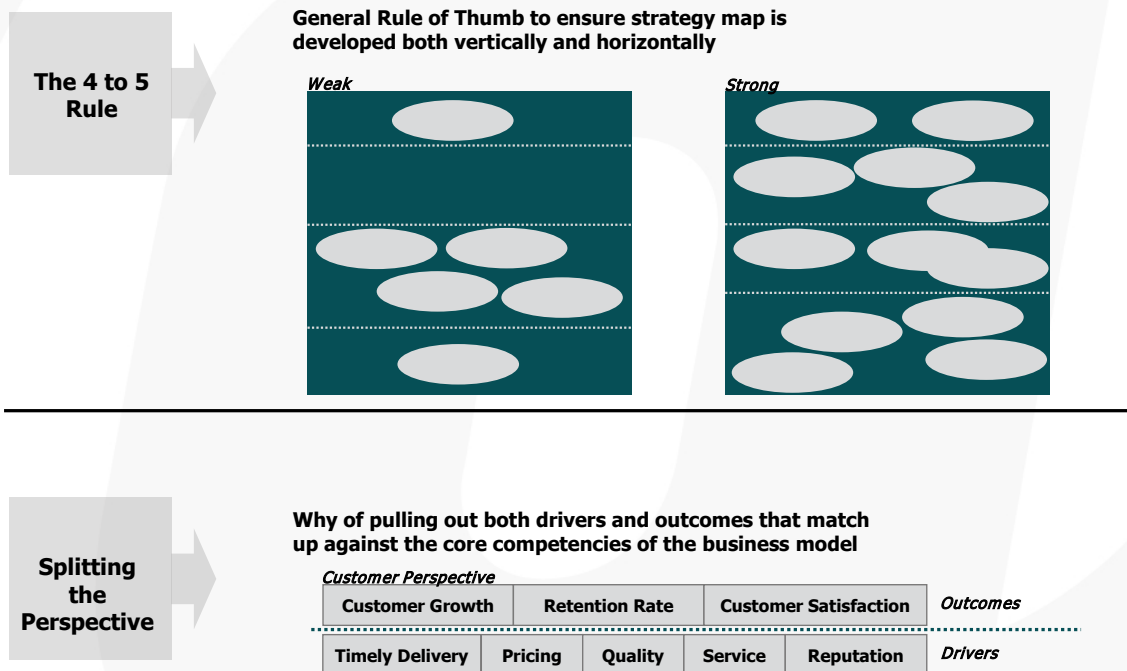


Figure 24: General rule of thumb (Evans, 2010)

In order to construct the Strategy Map, we need to capture cause effect Relationships between the different perspectives:

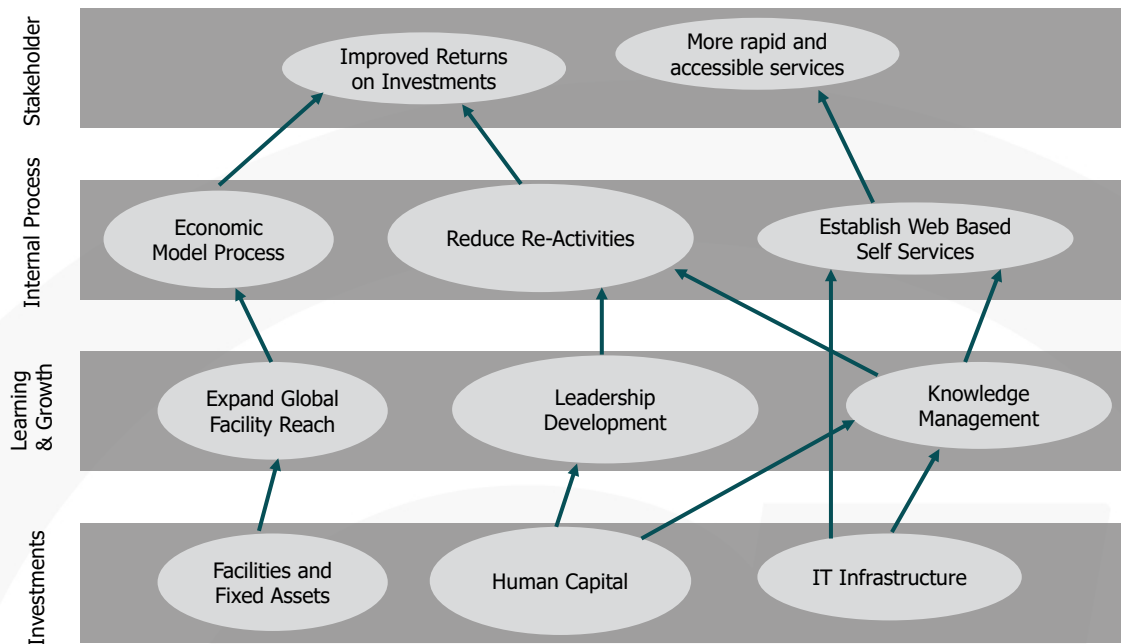


Figure 25: Strategy Map (Evans, 2010)

Next, each Cause Effect Relationship is extended into Measurements, Targets and Initiatives:

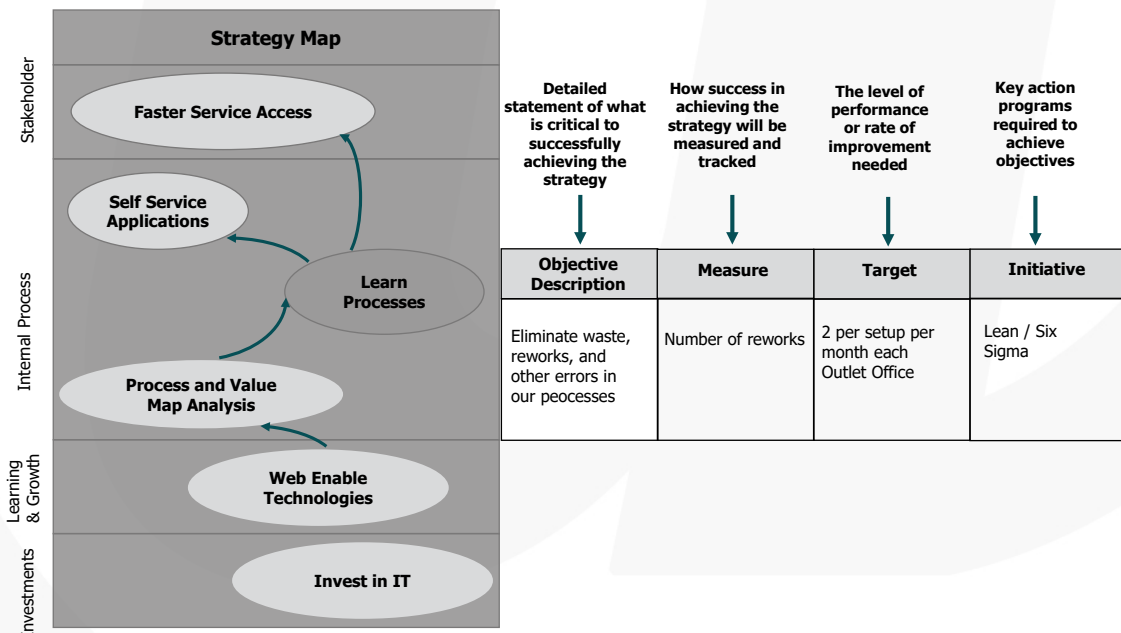


Figure 26: Strategy map (Dumas, 2009)

The choice of the measurements must ensure the components of the scorecard fit together in order to maintain the alignment of scorecard components. The following table gives the type of measures:

Measure Type	Definition	Example
Leading	Intermediate outcomes that predicts or drive bottom-line performance results	Employee turnover rate
Lagging	Bottom-line performance results resulting from actions taken	Employee satisfaction rating
Input	Amount of Investments, assets, equipment, labor hours, or budget dollars used	Number of cashiers
Output	Units of a product or service rendered - a measure of yield	Number of Value Meal orders fulfilled
Outcome	Resulting effect (benefit) of the use or application of an output	Customer satisfaction rating
Objective / Quantitative	Empirical indicators of performance	Wait time
Subjective / Qualitative	Perceptions and evaluations of major customers and stakeholders	Customer complaints received as a % of total customers served

Figure 27: Type of measures (Evans, 2010)

Additionally, the following boxes contain some examples of performance Measures distributed by Perspectives:

Stakeholder / Customer

- Current customer satisfaction level
- Improvement in customer satisfaction
- Customer retention rate
- Frequency of customer contact by customer service
- Average time to resolve a customer inquiry
- Number of customer complaints

Internal Processes

- Number of unscheduled maintenance calls
- Production time lost because of maintenance problems
- Percentage of equipment maintained on schedule
- Average number of monthly unscheduled outages
- Mean time between failures

Learning and Growth

- Percentage employee absenteeism
- Hours of absenteeism
- Job posting response rate
- Personnel turnover rate
- Ratio of acceptances to offers
- Time to fill vacancy

Investments / Financial

- % of facility assets fully funded for upgrading
- % of IT infrastructure investments approved
- # of new hire positions authorized for filling
- % of required contracts awarded and in place
- Mean time between failures

Figure 28 (Dumas, 2009)

Additional examples of performance measures for the customer perspective of Balanced Scorecards can be:

Customer Perspective	
Performance Measure	Desired Change
Customer satisfaction as measured by survey results	+
Number of customer complaints	-
Market share	+
Product returns as a percentage of sales	-
Percentage of customers retained from last period	+
Number of new customers	+

Figure 29 (Ray H Garrison et al., 2005)

and for the learning and growth perspective:

Learning and Growth Perspective	
Performance Measure	Desired Change
Suggestions per employee	+
Employee turnover	-
Hours of in-house training per employee	+

Figure 30 (Ray H Garrison et al., 2005)

Subsequently, the following steps should be followed for setting Targets (Evans, 2010):

- Calculate past performance trends from historical data.
- Establish performance levels of similar organizational units at a comparable level.
- Define the best practices across the organization (public sector or private sector).
- For newly launched services, establish a baseline per a prototype test.
- For major strategic shifts, may have to set directly per the plan itself without regard for hard data.

The following table contains examples of Targets, defined for performance measures:

Table 90 (Evans, 2010)

Average Turnaround Times at Docking Sites	8 days FY05	7.5 days FY06	6.8 days FY07
Utilization Rate for Self Serve Web Portal	10% FY05	18% FY06	25% FY07
Rotation Internship Participation Rates	1,800 FY05	2,500 FY06	3,900 FY07
Glider integration mapping tool used for geo-sets	Establish baseline	8 per sets	10 per sets
% of agency SES Levels following IRPS from end to end for the entire year	30% FY05	40% FY05	65% FY05
% funding through SEPCO for space mapping	30% FY05	35% FY06	45% FY07

Balanced Scorecard usually considers two types of measures:

- *Trailing measures*: Look backward at historical data
- *Leading measures*: Provide some idea of what to expect currently

Example 41: A chain of bagel shops might have a balanced scorecard like the one above. It uses **four categories** and includes **financial and nonfinancial information**. It has information from the **current and previous periods** and the **standard** related to the category:

Table 91 (Ray H Garrison et al., 2005)

	Standard	Prior Period	Current Period
Key financial indicators			
Cash flow (€)	25 000	28 000	21 000
Return on investment (ROI)	0.18	0.22	0.19
Sales (€)	4 400 000	4 494 000	4 342 000
Key customer indicators			
Average customers per hour	75	80	71
Number of customer complaints per period	22	21	17
Number of sales returns per period	10	8	5
Key operating indicators			
Bagels sold/produced per day ratio	0.96	0.93	0.91
Daily units lost (burned, dropped, etc.)	25	32	34
Employee turnover per period	0.10	0.07	0.00
Key growth and innovation indicators			
New products introduced during period	1	1	0
Products discontinued during period	1	1	1
Number of sales promotions	3	3	2
Special offers, discounts, etc	4	5	3

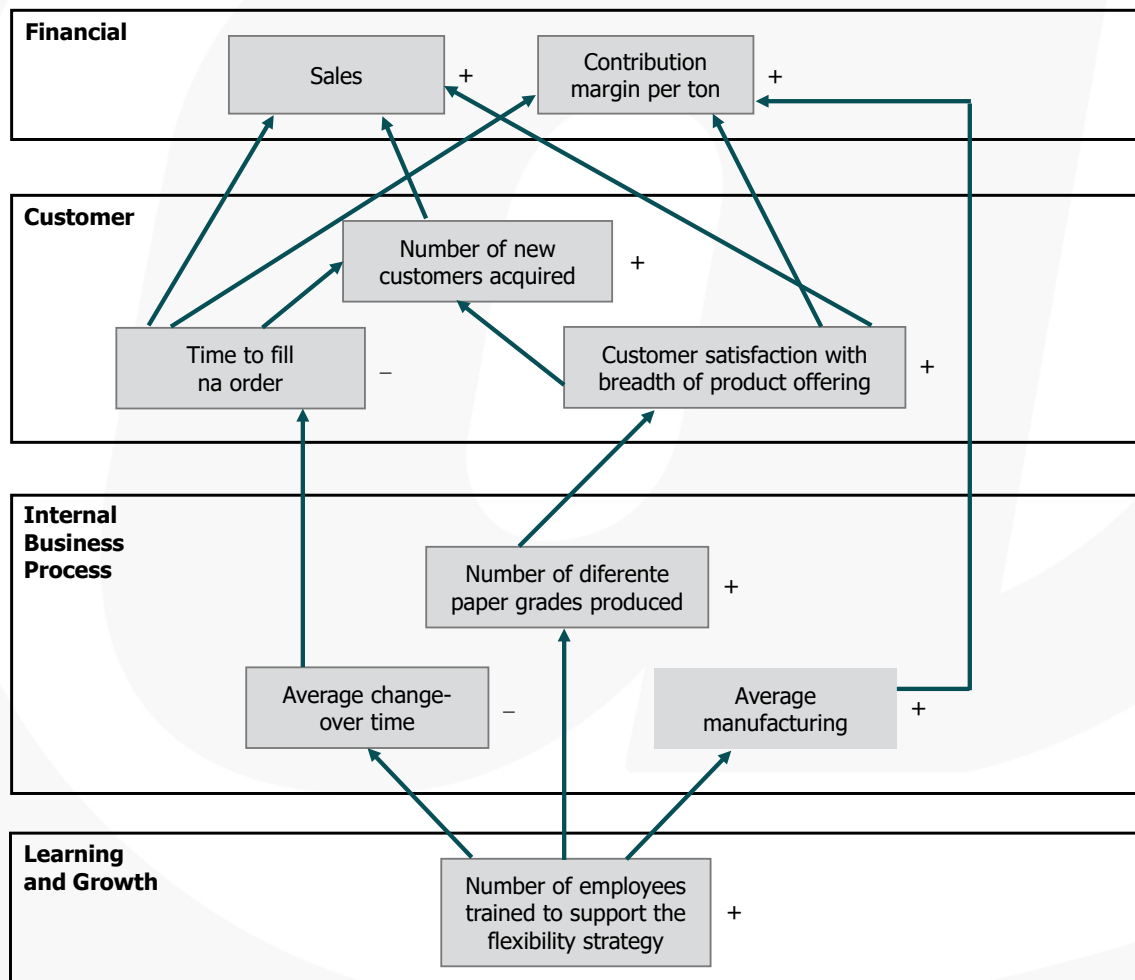
Considering the table of indicators, indicate one trailing measure and one leading measure for the financial and customer categories.

1. Financial Category
 - a. TI - ROI
 - b. LI - Budget of production Units and Costs for the next period
2. Customer Category
 - a. TI - Number of sales invoices per store might
 - b. LI - Number of product complaints per 1000 invoices might be a leading indicator of customer satisfaction, quality control problems, and future sales

Example 42: Considering the following relationships, build a strategy map (Balakrishnan et al., 2008).

1. If the number of employees trained to support the flexibility strategy increases, then the average changeover time will decrease, and the number of different paper grades and the average manufacturing yield will increase.
2. If the average changeover time decreases, then the time to fill an order will decrease.

3. If the number of different paper grades produced increases, then the customer satisfaction with breadth of product offerings will increase.
4. If the average manufacturing yield increases, then the contribution margin per ton will increase.
5. If the time to fill an order decreases, then the number of new customers acquired, sales, and the contribution margin per ton will increase.
6. If the customer satisfaction with breadth of product offerings increases, then the number of new customers acquired, sales, and the contribution margin per ton will increase.
7. If the number of new customers acquired increases, then sales will increase.

Answer:**Figure 31:** Strategy map (Balakrishnan et al., 2008)

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