

PAPER SOLUTION

Sub: Financial accounting & management of technology innovation (FAMT)
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Q.1 (a) Explain the following:

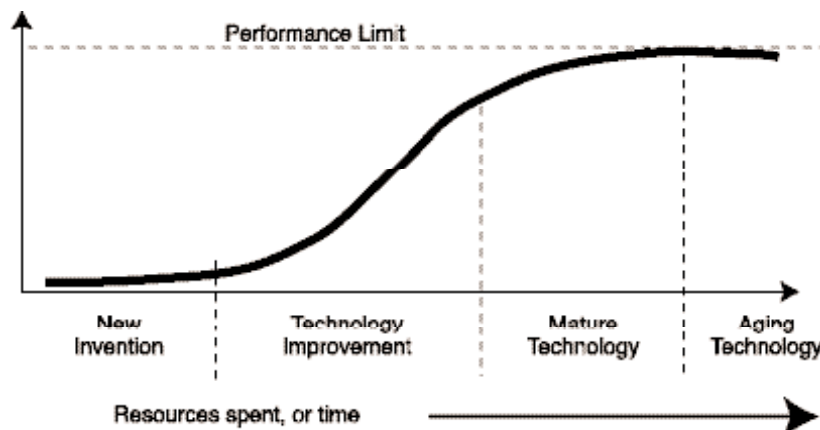
(i) Concept of technology S curve

(05)

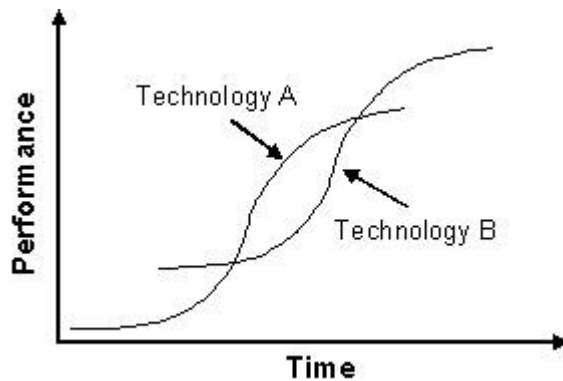
Ans:

The S-Curve Framework

In the innovation management field the S-Curve illustrates the introduction, growth and maturation of innovations as well as the technological cycles that most industries experience. In the early stages large amounts of money, effort and other resources are expended on the new technology but small performance improvements are observed. Then, as the knowledge about the technology accumulates, progress becomes more rapid. As soon as major technical obstacles are overcome and the innovation reaches a certain adoption level an exponential growth will take place. During this phase relatively small increments of effort and resources will result in large performance gains. Finally, as the technology starts to approach its physical limit, further pushing the performance becomes increasingly difficult, as the figure below shows.



Consider the supercomputer industry, where the traditional architecture involved single microprocessors. In the early stages of this technology a huge amount of money was spent in research and development, and it required several years to produce the first commercial prototype. Once the technology reached a certain level of development the know-how and expertise behind supercomputers started to spread, boosting dramatically the speed at which those systems evolved. After some time, however, microprocessors started to yield lower and lower performance gains for a given time/effort span, suggesting that the technology was close to its physical limit (based on the ability to squeeze transistors in the silicon wafer). In order to solve the problem supercomputer producers adopted a new architecture composed of many microprocessors working in parallel. This innovation created a new S-curve, shifted to the right of the original one, with a higher performance limit (based instead on the capacity to co-ordinate the work of the single processors).



Usually the S-curve is represented as the variation of performance in function of the time/effort. Probably that is the most used metric because it is also the easiest to collect data for. This fact does not imply, however, that performance is more accurate than the other possible metrics, for instance the number of inventions, the level of the overall research, or the profitability associated with the innovation.

One must be careful with the fact that different performance parameters tend to be used over different phases of the innovation, as a result the outcomes may get mixed together, or one parameter will end up influencing the outcome of another. Civil aircraft provides a good example, on early stages of the industry fuel burn was a negligible parameter, and all the emphasis was on the speed aircrafts could achieve and if they would thus be able to get off the ground safely. Over the time, with the improvement of the aircrafts almost everyone was able to reach the minimum speed and to take off, which made fuel burn the main parameter for assessing performance of civil aircrafts.

Overall we can say that the S-Curve is a robust yet flexible framework to analyze the introduction, growth and maturation of innovations and to understand the technological cycles. The model also has plenty of empirical evidence; it was exhaustively studied within many industries including semiconductors, telecommunications, hard drives, photocopiers, jet engines and so on.

(ii) Impact of technological innovation on society.

Ans:

In the past few decades there has been a revolution in computing and communications, and all indications are that technological progress and use of information technology will continue at a rapid pace. Today, innovations in information technology are having wide-ranging effects across numerous domains of society, and policy makers are acting on issues involving economic productivity, intellectual property rights, privacy protection, and affordability of and access to information.

One of the most significant outcomes of the progress of information technology is probably electronic commerce over the Internet, a new way of conducting business. Though only a few years old, it may radically alter economic activities and the social environment. Already, it affects such large sectors as communications, finance and retail trade and might expand to areas such as education and health services. It implies the seamless application of information and communication technology along the entire value chain of a business that is conducted electronically. The following sections will focus on the impacts of information

technology and electronic commerce on business models, commerce, market structure, workplace, labour market, education, private life and society as a whole.

Private Life and Society

Increasing representation of a wide variety of content in digital form results in easier and cheaper duplication and distribution of information. This has a mixed effect on the provision hand, distribution of content outside of channels that respect intellectual property rights can reduce the incentives of creators and distributors to produce and make content available in the first place. Information technology raises a host of questions about intellectual property protection and new tools and regulations have to be developed in order to solve this problem. Many issues also surround free speech and regulation of content on the Internet, and there continue to be calls for mechanisms to control objectionable content. However it is very difficult to find a sensible solution.

What is the Impact of Technology on Our Society?

Think of the days when there were no computers and no modern means of transport. Human life was highly restricted due to the unavailability of technological applications. Daily life involved a lot of physical activity. The life of the common man of those times was not as luxurious as that of the modern times, but he was more active. Daily exercise was integrated in the routine physical activities. It was contrary to the lifestyle of today, which carries no time slot for rigorous exercise and carries laze and inactivity.

We think of technology as a boon to society. I am afraid; this is not completely true. The Internet has bred many unethical practices like [hacking](#), spamming and [phishing](#). [Internet crime](#) is on the rise. The Internet, being an open platform for expression, lacks regulation. There is no regulation on the content displayed over websites. [Internet gambling](#) facilities have brought [casinos](#), a click away. Exposure to the Internet technology from an early age has resulted in children and youngsters addicted to it.

Think of the days when there were no online messengers, no emails and no [cell phones](#). Indeed the cellular technology created the miracle of enabling communication over the wireless media. The communication facilities provided by the Internet worked wonders in speeding long-distance communication but also deprived mankind of the warmth of personal contact. Emails replaced handwritten letters and communication lost its personal touch. With the means of communication available a few clicks away, the tendency of taking pains to reach the loved ones has vanished.

Moreover, we have become excessively dependent on technology. Is so much of a dependency desirable? Is it right to rely on machines? Is it right to depend on computers rather than relying on human intellect? Computer technology and [robotics](#) have almost replaced human brains. With the developing technology, we have started harnessing [artificial intelligence](#) in many fields. Where is this [digital divide](#) going to take us? How will our 'tomorrow' be? 'Machines replacing human beings' does not portray a rosy picture. It can lead to severe issues like unemployment and crime. An excessive use of machines in every field can result in an under utilization of human brain. Due to under utilization of intelligence for a prolonged period of time, man may lose his intellectual abilities and may not even be able to think.

(b)

(i) Annual report

Definition: a report produced annually by companies comprising both financial and non-financial information.

An **annual report** is a comprehensive report on a [company's](#) activities throughout the preceding year. Annual reports are intended to give [shareholders](#) and other interested people information about the company's activities and financial performance. Most jurisdictions require companies to prepare and disclose annual reports, and many require the annual report to be filed at the company's registry. Companies listed on a [stock exchange](#) are also required to report at more frequent intervals (depending upon the rules of the stock exchange involved).

Typically annual reports will include:

- [Chairman's](#) report
- [CEO's](#) report
- [Auditor's](#) report on corporate governance
- [Mission statement](#)
- [Corporate governance](#) statement of compliance
- Statement of directors' responsibilities
- Invitation to the company's AGM

as well as [financial statements](#) including:

- [Auditor's report](#) on the financial statements
- [Balance sheet](#)
- [Statement of retained earnings](#)
- [Income statement](#)
- [Cash flow statement](#)
- [Notes to the financial statements](#)
- Accounting policies

Other information deemed relevant to stakeholders may be included, such as a report on operations for manufacturing firms or [corporate social responsibility](#) reports for companies with environmentally- or socially-sensitive operations. In the case of larger companies, it is usually a sleek, colorful, high gloss publication.

The details provided in the report are of use to investors to understand the company's financial position and future direction.

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(ii) Balance sheet

Ans:

Definition: A financial statement which is a snapshot of a business at a particular point in time. It records the assets, liabilities and capital of a business. Assets less liabilities equal capital. Capital is the owners' interest in the business.

Balance Sheets are the most important aspect of accounts handling, management and calculation. The end result of the analysis of an organization's success is achieved out of the tallying amounts of their balance sheet. Success of an organization has many aspects, but there have to be certain tangible ways to measure it and view it. The balance sheet is a spot on method to view, prove, and measure an organization's financial position. It

takes into consideration all the tangible assets and liabilities as well as a few intangible ones. Balance sheets are also used as effective budgeting and control measures.

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A [balance sheet](#) is a financial statement that depicts a company's current financial status. It basically depicts assets and liabilities of the company. The balance sheet can be used as a tool in order to forecast the company's income projection, growth and development. The process of financial analysis and balance sheet analysis is used to derive concrete figures about the company's revenue, assets and liabilities. The balance sheet analysis helps investors, share brokers, investment bankers and financial institutions, to check the profitability of investment for a particular company. The balance sheets of companies are available in the annual reports of the company. The elements of balance sheets are at times also disclosed on websites of the company. Before we proceed to the analysis of balance sheets, it is important to know the meaning of the elements of balance sheets.

Elements: Balance Sheet Analysis

It must be noted that a balance sheet can be prepared by any type of business organization. The balance sheet and nature of financial statements depend on the form of business organization. The following are some of important elements that one must thoroughly analyze before making an investment.

Assets: An asset is any property owned by the company, that has monetary value and can be sold. Assets are generally divided into fixed assets and current assets. Real estate and machinery are examples of fixed assets, whereas the bank balance and investments are examples of current assets.

Liabilities: A liability of a company is any sum of money that the company owes to other people and organizations. A loan is very prominent example of a liability. The amount of equity share capital is also an important liability, as the company raises its capital with the issue of shares. Amount of liabilities exceeding amount of assets is not a very good sign.

Return over Assets: The return over assets means the value of returns and revenue in proportion with the assets and liabilities of the company. This figure is expressed either in ratios or percentages.

Expected Payments: Many a times, it so happens that a customer of the company is unable to make timely payments. Such payments are charged with an interest and are included in the assets. These assets are included in the calculation of return over assets.

Credit Rating: The current [credit rating](#), [credit scores](#) and [credit history](#) are depicted in the final accounts. It is necessary to analyze credit rating while making a balance sheet analysis, as it reflects a company's credit worthiness and ability to raise credit for a new project.

How to Do a Balance Sheet Analysis?

Doing a balance sheet analysis is not a very difficult task. The following balance sheet analysis guide will help you to review a given balance sheet very quickly. The procedure also describes some specific ratios which depict [financial management](#) and general [cash flows](#) of the company.

Step 1: The first step is to add the liabilities and paid up equity share capital. The total

must tally with that of the assets. After tallying, the next step is to compare the total assets with liabilities. In this comparison, do not include the amount of issued shares in the liabilities. If the total number of assets exceed the total number of liabilities, then the financial standing of the company and its performance is very good.

Step 2: The next step is to have a look at the current assets and liabilities. More current unsecured liabilities is sometimes considered to be good sign. However, if the amount of total liabilities exorbitantly exceed the asset total, then it is not a very good sign.

Step 3: The third step is a very important one, as one needs to calculate the ROA, return over assets. The ROA can be calculated very easily by dividing the net income by assets. Some companies also depict their forecasted ROA in their annual reports. The rate of ROA depends on the type of business that the company follows. For example, producer companies have a high ROA, leasing and real estate companies have a lower ROA. Consultancy companies have a mammoth ROA as they have less capital investment but a very high wage rate. It is essential to take these factors in consideration.

Step 4: This step involves special consideration for patents and copyrights. Every company invests huge amounts in research and development, which is of course rather costly. One must take into consideration the ratio between the amount invested for the research and the returns over it.

Step 5: The debt asset ratio signifies the ratio between the amounts payable in comparison to the assets of the company. This ratio can be effectively calculated by dividing the total liabilities with total assets. The lesser the liability dimension, the better is the company's performance.

Step 6: The receivables turnover ratio is a ratio between sales and accounts receivable. This ratio basically signifies the relation between the investments in sales and money receivable. The more money receivable, the better is the financial status of the company.

Step 7: The inventory turnover is another very important ratio that establishes the relationship between sales and value of inventory. This ratio is particularly important for producer companies, as it signifies the company's ability to produce goods with available assets.

Step 8: The last step is to analyze miscellaneous features of the company such as goodwill, current projects and credit ratings. This analysis would help you to analyze the companies actives of the near future.

Q.3(a)

(i) **Assets:** Items owned by the University, such as, cash, accounts receivables, inventory, equipment, stocks, bonds, etc.

(ii) **Debits & Credits:**

The second equation that comes into play when talking about accounting is:

$$\text{Debits (DR)} = \text{Credits (CR)}$$

FRS is a double entry accounting system, meaning that for every debit transaction there is an offsetting credit transaction.

To better understand the monthly FRS reports, you will need to know what the normal balance is or how a part of the accounting equation is increased. **Knowing the normal balances will also help you to identify possible problems in your accounts.**

NOTE: Debit transactions and debit balances are normally shown without a symbol and credit balances are shown with a "-" symbol. "-" **does not mean negative, it means credit.** For example, Cash with a debit balance of \$1,000, would be shown as \$1,000. Cash with a credit balance of \$1,000 would be shown as \$1,000-.

Q.6
(b)

Bookkeeping:

-**Bookkeeping** is the record of monetary business transaction. It is a record of sales, purchases, depreciation and stock. It helps in financial analysis of a company.

- **Bookkeeping** is the recording of financial transactions. Transactions include sales, purchases, income, and payments by an individual or organization. Bookkeeping is usually performed by a bookkeeper.

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-There are two methods of bookkeeping, 1) single entry bookkeeping and 2) double entry bookkeeping.

Bookkeeping Help - How Much Do You Need?

Should your business hire a bookkeeper? This article has some tips on how to know if the job is too big for you to handle anymore.

Every office today has a computer, and every office-supply store has accounting software you can load onto your computer. Each year, these software packages become more intuitive and easier for the beginner to learn and understand. Why then, should any small business hire a bookkeeper or other accounting professional? And, even if they decide to hire one - how much help do they actually need?

No matter how astute accounting software has become, it still takes a real person sitting at the computer entering information. It's also important to realize that what you get out of your accounting software is only as good as what was put into it. Some business owners are completely comfortable in dealing with money. They have enough of an understanding of finance and accounting, that they truly have no reason to hire a bookkeeper.

Others, however, feel quite differently. They worry they'll make a mistake and are far more comfortable hiring someone else to handle those areas. The question is – how much bookkeeping help do you need? The answer will very much depend on each business and each business owner. Here are a few tips that will help you sort it out:

1. If you keep your own books and are comfortable doing so, you'll probably only need accounting help occasionally. For example - filing taxes, responding to IRS notices, and the like.

2. Do you feel like you need someone to bounce ideas off of? If so, an accountant or bookkeeper might make sense, as they'll have the knowledge (hopefully) to steer you in the right direction - at least as far as financial decisions go.

3. Do you need financial statement compiled and need something more than the basic ones your software will deliver? If so, you'll want to turn to an expert to take care of this for you.

4. How well do you understand federal and state tax laws? If you feel you have a firm grip on what your business needs to do in order to not be in trouble tax-wise, than you can probably handle taxes on your own. On the other hand, if you receive notice of an audit, you'll likely want an accounting professional on your side to handle it.

5. Are you comfortable dealing with payroll and payroll taxes? What about accounts receivable and accounts payable? Each of these areas is critical to your business's bottom-line. If you operate a small business with less than five employees, you can probably deal with payroll on your own.

The above questions are just guidelines to help you understand your own comfort with your business's accounting and bookkeeping needs. You're the only one who can truly decide how much, or how little, bookkeeping help you require.

Bookkeeping Service

Bookkeeping is a fundamental function for every business. It provides the general manager and controller with a position report for the business. A good bookkeeper is accurate and timely.

Four important features of competent bookkeeping are:

- **Timeliness:** It's generally important to record transactions on a timely basis. This means that invoices and bills are posted by the next business day. However, on some instances similar transactions are processed in batches.
- **Account Reconciliations:** It's also critically important for accounts to be reconciled monthly to assure accuracy. For the cash to be right, for example, check books must be reconciled to the bank statements and outstanding checks must be identified.
- **Analyzing Accounts:** For payables and receivables, it's important to know the age of the bills and invoices. How much is "current" and "overdue" is basic to staying on top of your credit rating and vendor relations. For receivables it's important to know how you are doing in collecting funds from each of your customers.
- **Matching:** Revenues in a fiscal period must be matched to expenses incurred in that same period. When items don't match in the same period, inaccurate income statements are the result. This leads the general manger to miscalculate the direction of the business.

Q.6(b)

(i) Budgeting as a planning measure

Definition:

A **Budget** is a plan that outlines an organization's financial and operational goals. So a budget may be thought of as an action plan; planning a budget helps a business allocate resources, evaluate performance, and formulate plans.

While planning a budget can occur at any time, for many businesses, planning a budget is an annual task, where the past year's budget is reviewed and budget projections are made for the next three or even five years.

The basic process of planning a budget involves listing the business's fixed and variable costs on a monthly basis and then deciding on an allocation of funds to reflect the business's goals.

A budget is a quantitative plan for the future that assists the organization in coordinating activities. All large organizations budget. Many organizations prepare detailed budgets that look one year ahead, and budgets that look further into the future that contain relatively less detail and more general strategic direction.

The budget assists in the following activities:

- **Planning.** A budget helps identify the resources that are needed, and when they will be needed.
- **Control.** A budget helps control costs by setting spending guidelines.
- **Motivating Employees.** A budget can motivate employees and managers. Budgets are more effective motivational tools if employees and managers “buy into” the budget, which is more likely to occur if they participate in the preparation of the budget in a meaningful way.
- **Communication.** A budget can provide either one-way (top-down) or two-way communication within the organization.

A company's overall budget, which is sometimes called a **master budget**, consists of many supporting budgets. These supporting budgets include:

- Sales budget
- Pro forma income statement
- The production budget and supporting schedules
- Budgets for capital assets and for financing activities
- Budgets for individual balance sheet accounts and departmental expenses
- Cash budget, including cash disbursements and cash receipts budgets
- Pro forma balance sheet
-

<http://classes.bus.oregonstate.edu/winter-06/ba321/Caplan/Management%20Accounting%20Chapter%2020.htm>

Companies realize many advantages / Benefits from a budgeting program. Among these benefits are the following:

1. Budgets provide a means of communicating management's plans through the [organization](#).
2. Budgets force [managers](#) to think about and plan for the future. In the absence of the necessity to prepare a budget, many managers would spend all of their time dealing with daily emergencies.

3. The **budgeting process** provides a means of allocating resources to those parts of the organization where they can be used most effectively
4. The budgeting process can uncover many potential [bottlenecks](#) before they occur .
5. Budgets coordinates the activities of the entire organization by integrating the plans of the various parts of the organization. Budgeting helps to ensure that everyone in the organization is pulling in the same direction.
6. Budgets provide goals and objectives that can serve as [benchmark](#) for evaluating subsequent performance.

(ii) **Standard Cost Sheet:**

Standard Costs:

A **standard**, as the term is usually used in management accounting, is a budgeted amount for a single unit of output. A **standard cost** for one unit of output is the budgeted production cost for that unit. Standard costs are calculated using engineering estimates of standard quantities of inputs, and budgeted prices of those inputs. For example, for an apparel manufacturer, standard quantities of inputs are required yards of fabric per jean and required hours of sewing operator labor per jean. Budgeted prices for those inputs are the budgeted cost per yard of fabric and the budgeted labor wage rate.

Standard quantities of inputs can be established based on ideal performance, or on expected performance, but are usually based on **efficient and attainable** performance. Research in psychology has determined that most people will exert the greatest effort when goals are somewhat difficult to attain, but not extremely difficult. If goals are easily attained, managers and employees might not work as hard as they would if goals are challenging. But also, if goals appear out of reach, managers and employees might resign themselves to falling short of the goal, and might not work as hard as they otherwise would. For this reason, standards are often established based on **efficient and attainable** performance.

Hence, a standard is a type of budgeted number; one characterized by a certain amount of rigor in its determination, and by its ability to motivate managers and employees to work towards the company's objectives for production efficiency and cost control.

There is an important distinction between standard costs and a standard costing system. Standard costs are a component in a standard costing system. However, even companies that do not use standard costing systems can utilize standards for budgeting, planning, and variance analysis.

Example of a Standard Cost Sheet:

ZFN Apparel Company, Standard Costing Example:

We continue with the ZFN example from the previous two chapters. The ZFN apparel company in Albuquerque, New Mexico makes jeans and premium chinos. Each product line has its own assembly line on the factory floor. The following table shows actual and budgeted information for the year. There was no beginning or ending work-in-process.

	Budgeted Information	Actual Results
Units produced		
Jeans	500,000	500,000
Chinos	<u>500,000</u>	<u>400,000</u>
Total	<u>1,000,000</u>	<u>900,000</u>

Direct Costs:		
Jeans:		
Materials (denim)		
Price per yard	\$ 4.80	\$ 5.00
Yards per jean	<u>x 1.10</u>	<u>x 1.00</u>
Material cost per jean	<u>\$ 5.28</u>	<u>\$ 5.00</u>
Direct labor		
Wage rate	\$15.00	\$14.00
Hours per jean	<u>x 0.50</u>	<u>x 0.40</u>
Labor cost per jean	<u>\$ 7.50</u>	<u>\$ 5.60</u>
Chinos:		
Materials (cotton twill)		
Price per yard	\$ 4.40	\$ 4.50
Yards per chino	<u>x 1.10</u>	<u>x 1.20</u>
Material cost per chino	<u>\$ 4.84</u>	<u>\$ 5.40</u>
Direct labor		
Wage rate	\$15.00	\$14.00
Hours per chino	<u>x 0.70</u>	<u>x 0.75</u>
Labor cost per chino	<u>\$10.50</u>	<u>\$10.50</u>
Factory Overhead	\$3,600,000	\$3,300,000

Most of this information is available from the previous chapter. Also, the ZFN example in the previous chapter derived the budgeted overhead rate of \$6.00 per direct labor hour, and that same overhead rate is used by the standard costing system. Based on this information, the standard costing system would debit the finished goods inventory account as follows:

	<u>Jeans</u>	<u>Chinos</u>
Standard cost per unit:		
Materials	\$5.28	\$4.84
Labor	\$7.50	\$10.50
Overhead	<u>\$6.00 x 0.50 = \$3.00</u>	<u>\$6.00 x 0.70 = \$4.20</u>
	\$15.78	\$19.54
Actual units produced	<u>x 500,000</u>	<u>x 400,000</u>
Total	<u>\$7,890,000</u>	<u>\$7,816,000</u>

Recall from the previous chapter that 400,000 jeans and 350,000 chinos were sold. The entries to record the movement of inventory from the finished goods inventory account into the cost-of-goods-sold account would multiply these sales volumes by \$15.78 per jean and \$19.54 per chino.

Reasons for using a Standard Costing System:

There are several reasons for using a standard costing system:

Cost Control:

- a standard costing system tracks inventory using budgeted amounts that were known before the first day of the period, and fails to incorporate valuable information about how actual costs have differed from budget during the period.
- actual costs *are* tracked by the accounting system in journal entries to accrue liabilities for the purchase of materials and the payment of labor, entries to record accumulated depreciation, and entries to record other costs related to production.
- Hence, a standard costing system records *both* budgeted amounts (via debits to work-in-process, finished goods, and cost-of-goods-sold) *and* actual costs incurred

-This information could be available to a company that uses an actual costing system or a normal costing system, but the analysis would not be an integral part of the general ledger system.

Smooth out short-term fluctuations in direct costs: the accounting system track the fact that jeans production on Tuesday cost a few cents more per unit than production on Wednesday, because the fabric used on Tuesday came from a different mill, and the negotiated fabric price with that mill was slightly higher? Many companies prefer to average out these small differences in direct costs.

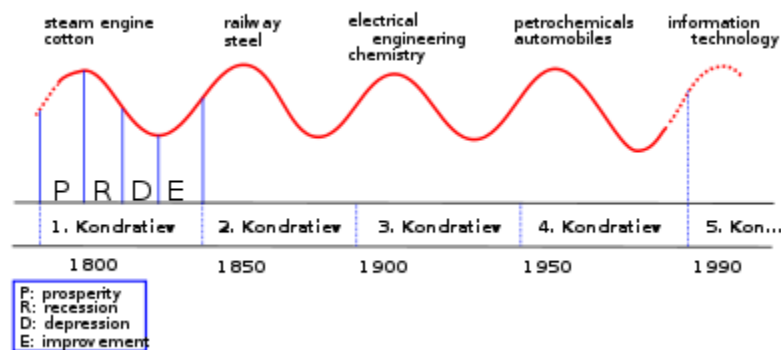
When actual overhead rates are used, production volume of each product affects the reported costs of all other products: This reason, which was discussed in the previous chapter on normal costing, represents an advantage of standard costing over actual costing, but does not represent an advantage of standard costing over normal costing.

Costing systems that use budgeted data are economical: Accounting systems should satisfy a cost-benefit test: more sophisticated accounting systems are more costly to design, implement and operate. If the alternative to a standard costing system is an actual costing system that tracks actual costs in a more timely (and more expensive) manner, then management should assess whether the improvement in the quality of the decisions that will be made using that information is worth the additional cost. In many cases, standard costing systems provide highly reliable information, and the additional cost of operating an actual costing system is not warranted.

Q.7(i)

(ii) The idea that the dynamics of economic life in the capitalist social order is not of a simple and linear but rather of a complex and cyclical character is nowadays generally recognized. Since, however, has fallen far short of clarifying the nature and the types of these cyclical, wave-like movements.

- When in economics we speak of cycles, we generally mean seven to eleven-year business cycles. Yet these seven to eleven-year movements are obviously not the only type of economic cycles. The dynamics of economic life is in reality more complicated. In addition to the above-mentioned cycles, which we shall agree to call 'intermediate', the existence of still shorter waves of about three and a half years' length has recently been shown to be probable.



A rough schematic drawing showing the "World Economy" over time according to the Kondratiev theory

More recently, [investment theorist Ian Gordon](#) has advocated a 4 season Kondratiev model in which spring is moderate growth from a [stock market](#) and inflationary bottom, summer is characterized by accelerating growth and high inflation, autumn is characterized by declining inflation and asset [bubbles](#), and winter involves the collapse of the asset bubbles.

A Kondratyev cycle consists of four distinct phases, or distinguishable, dramatic mood changes, the tone of which determines the actions of individuals involved in the economy.

The Growth Phase

A common premise among business cycle economists supposes inflation as an inevitable part of growth. Government becomes a passive participant in the inflation cycle. Growth begins from a depressed economic base and expands in an ever-increasing spiral. The interaction of the participants within the economy causes wealth, as represented by savings, and the production of capital equipment to be accumulated for the future. The expansion of production and affluence causes prices to rise, and the increased volume of goods requires a higher velocity of money, thus creating a higher price structure.

Historically, the growth phase requires 25 years to complete. During this time, unemployment falls, wages and productivity rise and prices remain relatively stable. The mood of the growth phase is one of accumulation and the desire for new product manufacture.

Primary Recession

Eventually, the continuation of exponential growth reaches its limits. Excess capital produces a shortage of key resources and the economy enters a period where growth creates a shortage of resources. An economy will only support expansion to the limits of its resources, both human and material.

The mood of affluence also brings a change in attitude towards work. As an economy gets closer to its limits inefficiencies build up

The imbalances of this period have been historically exaggerated by what can be labeled a "peak war". Examples such as War of 1812, the Civil War, World War I and Vietnam, came at the end of a very affluent period. These Wars produce strains on the economy increasing the impact of inflation. A dramatic drop in output, rapid rise in unemployment and unusually severe recession characterize this period. Although this primary recession is short lived lasting only three to five years, it is key in altering perceptions and the structure of the economy.

Plateau Period

The primary recession occurs out of an imbalance forced upon the economy by real limitations. The rapid rise in prices and changes in production correct this imbalance -- at least temporarily. The change in price structure, along with the mood of a population used to consumption accompanied by the vast accumulation of wealth from the past 30 years, causes the economy to enter a period of relatively flat growth and mild prosperity. Due to structural changes and the limits of the existing paradigm the economy becomes consumption oriented.

Excesses of an unpopular war, along with fiscal liberalism, cause popular reaction toward stability or normalcy. A mood of isolationism permeates. The plateau period generally lasts seven to ten years and is characterized by selective industry growth, development of new ideas (both technological and social) and a strong feelings of affluence, terminating in a feeling of euphoria. The inflated price structure from the primary recession, along with the desire for consumption, produces a rapid increase in debt. Eventually, wealth consumption expands beyond all practical limits, and economy slips into a severe and protracted depression.

Secondary Depression

Excesses of the plateau period effect a collapse of the price structure. This exhaustion of accumulated wealth forces the economy into a period of sharp retrenchment. Generally, the secondary depression entails a three year collapse, followed by a 15 year deflationary work out period. The deflation can best be seen in interest rates and wages that have shown a historic alignment with the timing of the Long Wave - peaking with and bottoming at the extremes.

Kondratyev viewed depressions as cleansing periods that allowed the economy to readjust from the previous excesses and begin a base for future growth.

Modern modifications of Kondratiev theory

These five cycles are:

- The Industrial Revolution—1771
- The Age of Steam and Railways—1829
- The Age of Steel, Electricity and Heavy Engineering—1875
- The Age of Oil, the Automobile and Mass Production—1908
- The Age of Information and Telecommunications—1971

According to this theory, we are currently at the turning-point of the 5th Kondratiev. A simplified and somewhat updated sequence of Kondratiev Waves can be seen as follows:

Period	Date	Innovation	Saturation point
First Industrial Revolution	Circa 1800–1850	Cotton based technology; spinning weaving, etc.	1810 –end of Napoleonic Wars
Second Industrial Revolution	Circa 1850–1900	Age of steam; railways, shipping, heavy industry, iron and steel, etc.	1870s
Third Industrial revolution	1908–1947	Petrochemicals, internal combustion engine, electrification.	Inter-war slump 1920s and 30s
Post-war Boom	1947–1991	Consumer goods, electronics, etc.	1973
Contemporary Era	1991 – present	Internet, wireless technology, biotechnology, etc.	2010s

Independently, the economists/physicists [Cesare Marchetti](#) and [Theodore Modis](#) have evidenced the cyclical Kondratiev pattern from physical variables such as energy consumption, the use of horsepower, the appearance of basic innovations, the discovery of stable elements, bank failures, homicides, and one-mile-run records. ^[4]

More recently the physicist and systems scientist [Tessaleno Devezas](#) advanced a causal model for the long wave phenomenon based on a generation-learning mode and a nonlinear dynamic behaviour of information systems. In both works a complete theory is presented containing not only the explanation for the existence of K-Waves, but also and for the first time an explanation for the timing of a K-Wave (~60 years = 2 generations).

For the era of the modern society and capitalistic economy he defined 6 long [economic waves](#) (cycles) and each of them was initiated by a specific [technological revolution](#):

- 1. (1600–1780) The wave of the Financial-agricultural revolution
- 2. (1780–1880) The wave of the Industrial revolution
- 3. (1880–1940) The wave of the Technical revolution
- 4. (1940–1985) The wave of the Scientific-technical revolution
- 5. (1985–2015) The wave of the Information and telecommunications revolution
- 6. (2015-2035?) The hypothetical wave of the post-informational technological revolution

Unlike original Kondratiev's and Schumpeter's views in Smihula's conception each new "wave" (due to acceleration of scientific and technological progress) is shorter than a

previous one. The main stress is put on *technological progress* and new technologies as decisive factors of any long-time economic development. Each of these waves has its *innovation phase* (there occur innovations in a form applicable in practical life and also their first real application) which is described as a [technological revolution](#) and an *application phase* in which the number of revolutionary [innovations](#) falls and attention focuses on exploiting and extending existing innovations. (As soon as an innovation or a "chain of innovations" becomes available, it becomes more efficient to invest in its adoption, extension and use than in creating new innovations.) Each wave (each cycle) of technological innovations can be characterized by the area in which the most revolutionary changes took place ("leading sectors").

Every wave of innovations lasts approximately until the profits from the new innovation or sector falls to the level of other, older, more traditional sectors. It is a situation when the new technology, which originally increased a capacity to utilize new sources from nature, reached its limits and it is not possible to overcome this limit without an application of another new [technology](#).

For the end of an application phase of any wave there are typical an economic crisis and [stagnation](#). The [economic crisis in 2007-2010](#) is a result of the coming end of the "wave of the Information and telecommunications technological revolution".

(iii)Frog's process of implementing innovative strategy: