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The Chartered Accountant STUDENT

The Institute of Chartered Accountants of India
(Set up by an act of Parliament)

Your monthly guide to CA news, information and events

Strategic Cost Management and Performance Evaluation
FINAL

Cost and Management Accounting
INTERMEDIATE

Business Mathematics & Logical Reasoning and Statistics
FOUNDATION

CONTENTS

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"Let me not pray to be sheltered from dangers, but to be fearless in facing them."

RABINDRANATH TAGORE

INSIDE

03 President's Communication

04 Chairman's Communication

05 CA Final: Strategic Cost Management and Performance Evaluation

18 CA Intermediate: Cost and Management Accounting

30 CA Foundation: Business Mathematics & Logical Reasoning and Statistics

33 Announcements

35 Glimpses

36 Crosswords

SWACHH BHARAT - A STEP TOWARDS CLEANLINESS

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My Dear Students,

As the December 2021 examinations are nearer, I extend my best wishes and good luck to the students appearing in the examination. It is the time when you must dedicatedly immerse yourself in studies and prepare wholeheartedly to emerge successful. Examination does not only test how knowledgeable you are, but also assess your perseverance, determination, and commitment. Achievements and accomplishments come when you are confident about your capabilities, consistent in your approach and positive with your attitude! ***Work is doing it; Discipline is doing it every day; and Diligence is doing it well every day!*** So, do the good work each day and you shall definitely attain success.

Empower Yourself with Self-Belief

As you reach the last leg of your preparation, plan each day well in advance with the objective to accomplish more in less time. Smart planning is your asset during exam time, which takes off stress during preparatory period. As you proceed further, your confidence will gradually rise, which stems from the ability to accomplish whatever you set out for. This sense of achievement will then propel you to work even harder towards your set goal.

Test your knowledge by attempting questions from various sources such as the study material, Revisionary Test papers (RTPs), Mock Test papers and also refer to the Suggested Answers to improve your performance in the examination.

CRET: The way forward

As you would know, the **Committee for Review of Education and Training (CRET)** has been constituted within ICAI to examine the existing schema, curriculum, article-ship training, specific skill development training programmes (ICITSS/AICITSS) and manner of assessment vis a vis leading accounting bodies, tenets of National Education Policy 2020 and paradigm shift due to disruptive technologies and emerging trends in global business, economy, and finance. Thereafter, ideate and deliberate upon the critical realms to transform the current structure. In order to exhaustively analyze each of the vital aspects/domains, four Sub-Groups have been formalized viz. **Academics, Practical Training, ICITSS/AICITSS (Training Programmes integrated into the curriculum) and Examination.** These sub-groups are currently engaged in fervently scrutinizing the existing regime to identify the issues, deliberate upon transformative changes and their implications on the other allied areas. In due course, these Sub-Groups will provide their discrete recommendations to elicit suggestions from the stakeholders, discerning students, esteemed members and subject experts to critically analyse their feedback.

ICAI BoS: Committed towards your growth

The BoS of ICAI has been proactively engaged in providing the necessary resources for active learning and timely guidance in your best interest. In this regard, recent and upcoming endeavours are:

- **Free Live Coaching Classes:** BOS is commencing the classes from **October 25, 2021** for our students of CA Intermediate and Final going to appear in May and November 2022 examinations. These include special sessions on certain subjects of CA Final comprising amendments until **October 31, 2021** for the **May 2022 examination**.
- **Mock Test Paper Series-2** is being organised in the current month to enable you to go through another round of revision before examinations so that you may fortify your preparation further and prep up for the D-day.

I am confident that you will take the Mock Test/Classes and derive maximum advantage with an objective to fulfil your goal.

Capsule Contents

As the latest edition to the Capsule series, the current issue features contents for **CA Foundation - Business Mathematics, Logical Reasoning and Statistics, CA Intermediate - Cost and Management Accounting and CA Final - Strategic Cost Management and Performance Evaluation.** The issue offers summarised material for these subjects making it relevant and tractable for revision. Reference to these capsules helps you for a quick revision before the exams.

With festivals galore in the current month, I extend my best wishes for **Diwali**. May the Goddess of lights and prosperity **Laxmi** enlighten your mind and Lord **Ganesha**, the symbol of wisdom, grant you the strength to overcome all the challenges, persevere to attain the sagacity to tread ahead on the path that leads you to success and embark on new beginnings. Have a positive attitude, believe in yourself, and do your best.

There are no secrets to success; it is the result of sheer hard work, dedication, and intense preparation. ***What the mind can conceive and believe and the heart desire, you can achieve with your hard work!*** With this in mind, go ahead and achieve what you desire!

All the Best,

CA. Nihar N Jambusaria
PRESIDENT, ICAI

"Happiness is not something readymade. It comes from your own actions." - Dalai Lama XIV

My Students,

At the outset, I would like to extend my best wishes to all of you, preparing for the forthcoming December 2021 Examinations. Since the exams are fast approaching, it is about time you went full throttle with your preparations. You are required to concentrate fervently on studies to be able to complete your daily targets to fully utilize your time, thereby maximising your productivity. Be cheerful calm and composed while you study as this would help improve retention. Keep yourself motivated by visualizing the positive outcome and desired results. You must remember always that ***firm discipline, consistent hard work, sharp focus along with strong determination are the facets that will lead you to the path to success.***

Do more to achieve more!

Just as the last lap of a race decides the winner, you must accelerate your efforts each day with a mission to improve your performance steadily to emerge a winner. You need to adopt a holistic approach, balancing all the subjects by allocating sufficient time to revise every subject in accordance with your strengths and capacity. In order to make the most of every minute of your productive time, you need to actively engage your mind to shift gears with minimum fatigue or downtime. This can be best achieved by alternating between theory and practical subjects. You can divide your time into numerous study-sittings with intermittent short breaks to invigorate your mind.

Create a customized study-bubble, an eco-system where you can study uninterruptedly with utmost concentration. This will help to maintain a steady momentum in studies enabling you to maximize your learning in minimal time. You can set daily targets, prioritize tasks, and allocate study-sittings accordingly. Make sure that you attain the daily target set for the respective subjects even if it requires to stretch your study-hours and strive beyond your comfort zone. This will bolster your confidence and foster a sense of achievement, inspiring you to look forward to repeating/outdoing your own performance every single day, gradually building up your capacity to excel in your efforts.

It is equally important to test your knowledge periodically. You should attempt a few unseen questions from practice exercises given in the study material, or other sources to check your comprehension and evaluate your presentation vis a vis the time taken. Maintain a daily log/index of questions with stepwise solutions, brief analysis including working notes so that you can categorize these in terms of complexity and easily access them later during the final revision.

Always remember, that it is not about the number of hours spent, but how you spend your hours. ***So do not just be busy with your time, but be productive with your time.***

BoS: Your Resource Partner

The Board of Studies of ICAI has been catering to your learning/knowledge needs/requirements by providing a wide array of duly updated printed and digital contents to help you to not just prepare but also revise concepts for the upcoming examination. These include the **Revised Study material, Guidance Notes, Revision Test Papers (RTPs) for the current and previous attempts, Suggested Answers for the previous attempts and Integrated Subject Capsules** that are a regular feature of this publication.

The study material that provides the knowledge content is the basis of preparation and defines the scope of the subject. While **Revision Test Papers, Mock Test Papers (MTPs) and Previous year Question papers** provide a broad range of questions for regular practice, Suggested Answers for previous examinations give you vital cues about how to answer questions from the examiner's standpoint in order to fetch maximum marks. These resources facilitate relevant knowledge compilation under one umbrella.

Digital resources comprise the:

- **Suggested Answers for July 2021 Examination** for all levels have been webhosted at the **BoS Knowledge Portal.**
- **E-Books** with audio enabled feature and annotations available on the **Digital Learning Hub**
- **Mobile App 'ICAI-BoS'** that serves as a one stop study station provides access to **Study Material, RTPs, Suggested Answers** along with **Guidance Notes, MCQs, Recorded Lectures** from the recently concluded **Live Coaching Classes** for all levels.

I urge you to utilize these resources to the fullest to score well.

I am sure that you must have attempted the **Mock Test Series-1,** assessed your preparedness and would already be looking forward to the Series-2 to be conducted in the current month. It would help to identify and fill the learning/knowledge gaps and fine-tune your preparation.

Free Live Coaching Classes (LCC)

Batch-3 continued: Commenced from 25th October 2021 to update the CA Final students (appearing in May 2022 examination) about amendments up to 31-10-2021 for May 2022 examination.

Batch-4 : Commenced from 25th October 2021 for Students appearing in CA Intermediate May 2022 examination and CA Final November 2022 examination.

These offer a wonderful opportunity for you to connect with experienced faculty to learn from them and prepare extensively for the next examination.

Capsules: Skimmed Knowledge

The highlight of this issue is an inclusive Capsule based on **Paper-3 for CA Foundation Business Mathematics Logical Reasoning and Statistics, Paper-3 for CA Intermediate Cost and Management Accounting and Paper-5 for CA Final Strategic Cost Management and Performance Evaluation.** It comprises major concepts, succinctly presented, complete with illustrations, amenable for revision.

You must push yourself to ***do more***; train to work hard from one goal to the next so as to become the best that you can be. ***Do more than think: Ideate; Do more than believe: Practice; Do more than dream: Work; Do more than learn: Apply!***

Wishing you Happy Diwali,

All the best,

CA. JAY CHHAIRA
CHAIRMAN, BOARD OF STUDIES (ACADEMIC)

"If we have the attitude that it's going to be a great day, it usually is." - Catherine Pulsifier

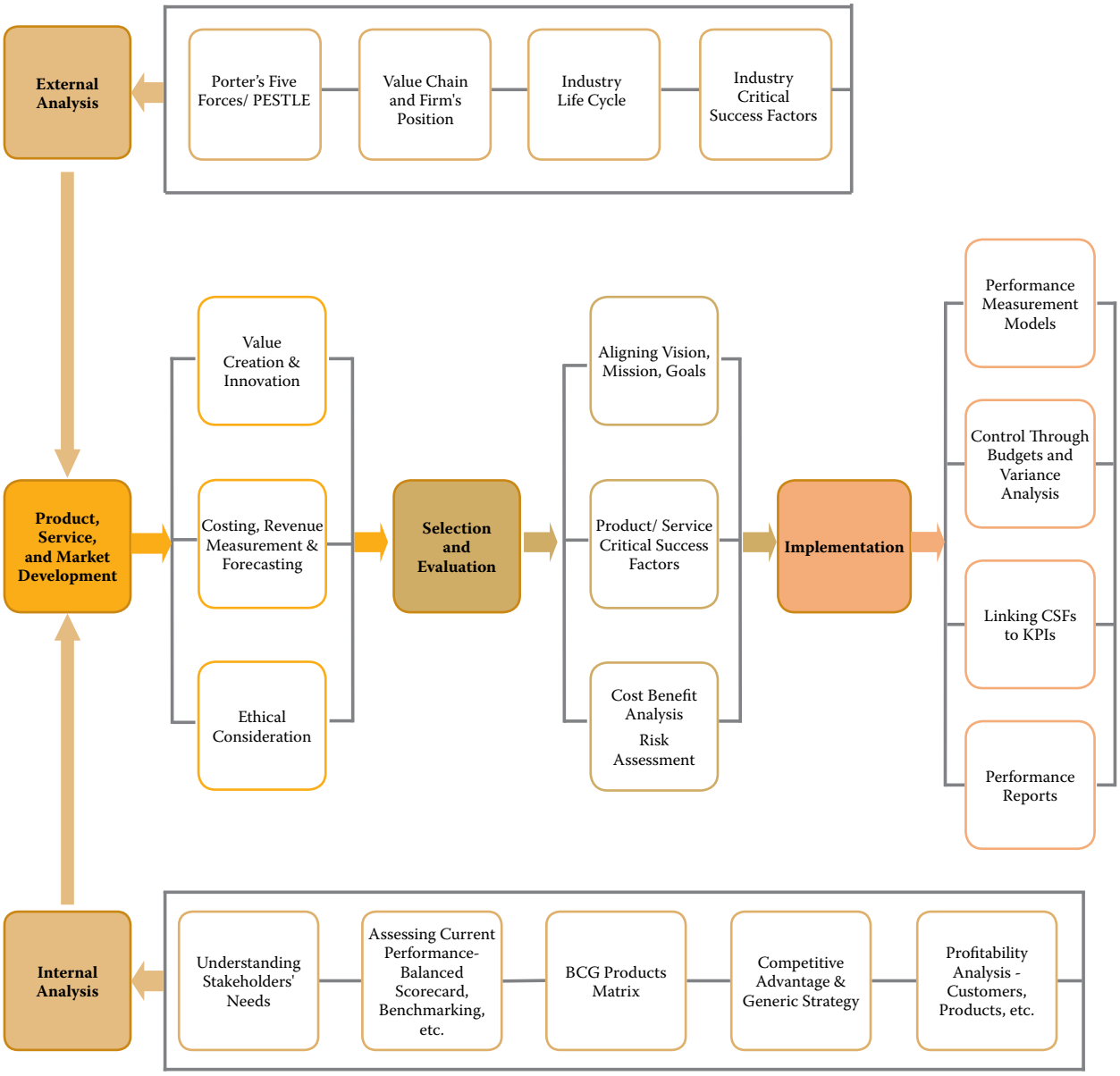
Strategic Cost Management and Performance Evaluation

"Strategy is about making choices and trade-offs; it's about deliberately choosing to be different"

– Michael Porter

With the increasing complexity, volatility, uncertainty, and pace of change in today's global marketplace; Chartered Accountants' position has moved to the **Center** in recent years, becoming more active and dynamic in defining and facilitating both strategy *development and implementation*. They play a more significant role in *driving* **"Value"** and determine *the future strategy of an organization*. The function of the CAs in the implementation of the strategy involves funding the organization's strategic options, as well as creating key performance indicators (KPIs) to measure the organization's progress against its strategy. The syllabus introduces students to the strategic role of "management accounting".

Strategic Role of Management Accounting- An Overview



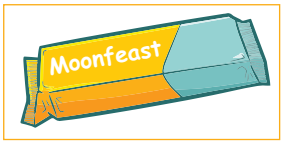
CASE STUDY

The basic objective of the case study is to allow the students to apply ideas and insights from theory to the *real life issues* and *problems*.

Pricing Strategy

ITB is a multi-brand diversified conglomerate corporation that deals in a wide range of industries, from hotels to FMCG; from paper to tobacco; from IT solutions to agro/agri (AGRO) business through its different divisions and departments, which are working independently. Managers of some of these divisions are accountable for their cost and revenue, while in others they are additionally accountable for the capital employed too. ITB is still diversifying its business.

FMCG Division



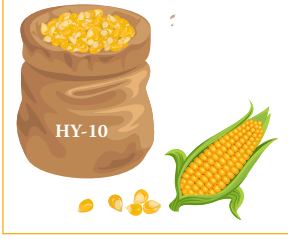
In the recent quarter, the FMCG Division of ITB launched ***moonfeast*** dream cream biscuits, which are flavoured twin cream biscuits. These biscuits are available in two different sizes of packing - price ₹5 for 35 grams and ₹10 for 80 grams. Division decided the price considering the cost it incurred and a preferred margin. The margin stipulated by manager for two years period.

The market segment relevant to such cream biscuits is highly competitive and hostile, customers are price sensitive too, but the segment has a turnover value of nearly ₹4.5 crores during such recent quarter. Response to ***moonfeast*** dream cream biscuits is merely reasonable. The Division is looking forward to launching a range of flavours. A report containing investment requirements regarding the new flavours sent to corporate head office for approval. As per market research report of a trade association, during the same quarter total of around 375 MT biscuit was sold in the relevant segment.

AGRO Division

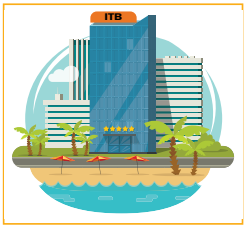
A high-yield variety of hybrid maize seed **HY-10** was developed after incurring the huge R&D cost, nearly ₹2.35 crores by AGRO Division. Maize is largely a Rabi crop and seed rate depends upon the factors like purpose, seed size, season, plant type, sowing method (For winter and spring maize seed rate of 8-10 kg/acre is desired, whereas for sweet corn, baby corn, and pop-corn seed rate of 8, 16, and 7 kg/acre is respectively desired). **HY-10** committed and provide high yield and big-deep grains; also reduces the seed rate requirements to 80%-90% of aforementioned. **CP-555** was a prominent seller prior to the lunch of **HY-10** and its 4 kg packing was sold for in the range of ₹1,450-1,500 generally. Other players are also working on developing HYV maize seeds.

AGRO Division has lined up many such more development projects which are duly approved by the divisional head, and some are in pipeline. **HY-10** approved by the regulator and government authorities three seasons ago and available for commercial sale thereafter in the market. **HY-10** sold in a pack of 2, 10, and 25 kgs only. Figures pertaining to these three seasons are tabled below–



Season	Revenue (thousand ₹)	Volume of sale (quintal)
First	7,460	149.2
Second	13,185	293.0
Third	12,460	311.5

ITB Hotels



ITB hotels are known for state of art amenities and great hospitality. The occupancy rate ranges from 70% to 80% on average, but for few metropolitan locations, the occupancy touches to 90% to 100%. ITB hotels follow tariff policy, wherein tariff is based upon the cost of living of individual city (wherein hotel is located) and occupancy rate (of the individual hotel) when customer check-in. Dr. Angel Gupta who is a regular guest at ITB in Mumbai (due to her medical conferences) surprised to see the variation between the tariffs. She was charged ₹5,400 per night when her stay during the trip falls on weekdays and ₹8,000 when it falls on weekends.

Required

(i) COMMENT on the ITB's organisational structure and its appropriateness.
(ii) DEFINE responsibility accounting and responsibility centre.
(iii) EXPLAIN profit centre and investment centre.
(iv) IDENTIFY the nature of FMCG and AGRO Divisions from the preview of responsibility accounting.
(v) EVALUATE the pricing strategies adopted (along with appropriateness, and set of advice where it seems inappropriate) by–
  a) FMCG Division
  b) AGRO Division
  c) ITB Hotels

[Support your answer with facts and figures (calculation thereof) given in the case]

Solution

(i) **Organisational Structure** outlines the roles of individuals in the organisation and decides the way in which authority and responsibility are allocated among them and how they are coordinating with each other to attain organisational objectives. ITB is following the **divisional structure** wherein various divisions operating autonomously. Since divisions are operating independently hence may be termed as **strategic business units (SBUs)**. Due to high autonomy, the ***decision-making process is usually decentralized***.

This type of organisation structure is fit for growing companies that are diversifying because it's easy to bolt on another division. Since ITB is a multi-brand diversified conglomerate corporation that deals in a wide range of industries and still diversifying its business hence the **divisional form of organisational structure best fits ITB**.

Mind it, in divisional structure too, some functional departments are working horizontally throughout the organisation and known as corporate function or shared/support services, such as Accounts and HR & Payroll, etc.

(ii) **Responsibility accounting** is that type of management accounting that collects and reports planned actual accounting information in terms of responsibility centers. A **responsibility centre** is a specific unit of an organisation assigned to a manager who is held responsible for its operation and resources. The division can be designate as either of **cost, profit, revenue, or investment centre** depending upon the responsibility (accountability) assigned to its manager (s)/ divisional manager.

(iii) **Profit Centre and Investment Centre.**
Wherein the manager of division is accountable for the cost and revenue of division, it shall be categorised as **profit centre**. Thus, the performance of such division shall be measured in terms of the **difference between the revenues and costs** (the absolute amount of profit).
But wherein manager is additionally (apart from cost and revenue) accountable for the capital employed too –categories

as **investment centre**. The performance of an investment centre can be measured by appraising profit/return in relation to the investment base of centre, **ROI, RI, and EVA** are some prominent financial performance measures.

(iv) FMCG Division is a **profit centre** because it decides its own prices as well as a cost but for investment, it has to take the *approval of the head office*, as it is mentioned in the case that a report containing investment requirement regarding the new flavours sent to corporate head office for approval. Moreover, the desired margin, which is used to determine the price also stipulated by the manager only.

AGRO Division is an **investment centre** because it takes investment decisions on its own, without the intervention of head office, as it is mentioned in the case that AGRO Division has lined up many such more development projects which are duly approved by the divisional head, and some are in pipeline.

(v) FMCG Division

FMCG Division determines the prices based upon the cost it incurred and desired margin stipulated by manager. Hence, pricing strategy (hence the decision) adopted is the **cost-plus margin** approach.

Concept Insight

It is important to note the **limitations of cost-plus margin** approach:

- It ignores the price charged by the competitors,
- It also ignores the price which customer ready to pay, and
- Enterprise not looking towards cost control and management.

FMCG Division determines the two different **prices of moonfeast dream cream biscuits;** ₹5 for 35 grams and ₹10 for 80 grams; hence the price ranges from **₹125 to ₹142.86 per kg** in **comparison** to **an average price of ₹120 per kg only** (see the working note below) charged by other players in the relevant segment.

It is mentioned in the case that the market segment relevant to such cream biscuits is highly competitive and hostile, customers are price sensitive too; hence selling them product at a **premium price** (which more than the average price) is not a good strategy to penetrate into the market and acquire market share. This is the reason that response to moonfeast dream cream biscuits is merely reasonable.

Hence it is **advisable** for divisional managers of the FMCG Division to pick the **penetration strategy,** which means **keep the prices low initially** (in comparison to average market price or near rival) to gain the market share (and product acceptance), once market share reach a reasonable level then prices can be reinstated to normal level (the average market price).

Note – FMCG Division can practice techniques like Target costing, Kaizen to bring the cost down to reduce the price and sell the product at or lower than market-led prices.

Working note– Determination of price charge by other players in the relevant segment during the said quarter.

Turnover – ₹4.5 crores

Quantity sold – 375 MT (Metric Ton) - since 1 MT is equal to 1,000 kg hence 3,75,000 kg biscuits were sold during the said quarter.

Average price per kg – ₹4.5 crores / 3,75,000 kg = ₹120 per kg.

AGRO Division

The price charged by the AGRO Division for HY-10 during three previous sessions are tabled below, which depicts AGRO Division use the strategy of **price skimming** in the case of HY-10 because the prices were initially high (₹500 per kg) and continually decline thereafter (₹450 then ₹400 per kg). The price initially charged for HY-10 was much more than the price range of ₹362.5-375 per kg that CP-555 charged which was a prominent seller prior to lunch of HY-10.

Season	Revenue (in thousand ₹)	Volume of sale (in quintal)	Volume of sale (in kg)	Price per kg (in ₹)
First	7,460	149.2	14,920	500
Second	13,185	293.0	29,300	450
Third	12,460	311.5	31,150	400

Price skimming seems an **appropriate strategy** for the AGRO Division because HY-10 was developed after incurring the **huge R&D cost** (nearly ₹2.35 crores), that need to be recovered in few early years because some **other players are also working** on developing HYV maize seeds; if once they developed HYV maize seeds then ITB may not be in a position to charge the high price to recover its R&D cost from the product.

Customer (formers) might not mind paying a high price for HY-10 because it committed and actually provide high yield and big-deep grains and also reduce the seed rate requirements to 80%-90% of normal requirement.

Hotels

The tariff charged by ITB hotels is based upon the cost of living of an individual city (wherein the hotel is located) and occupancy rate (of the individual hotel) when customers check-in. It means ITB is relying upon the strategy of **differential pricing**.

One of the factors that determine the price in the case of ITB hotels is occupancy rate. It means ITB considers the importance of capacity constraints. The practice of charging a higher price for the same product or service when the demand for it approaches the physical limit of the capacity to produce that product or service is known as **peak-load pricing**.

The pricing strategy **seems appropriate largely,** but for regular guests like Dr. Gupta, it may be annoying.

Peak–load pricing, on one hand, generates high profit for ITB at the same time it brings equilibrium in demand and supply. But guests like Dr. Gupta, who is a regular guest of ITB may not be happy with differential pricing (tariff ₹5,400 per night on weekdays and ₹8,000 per night on weekends) on account of the peak load factor. The impact of peak-load pricing will be more likely to be seen in those metropolitan locations when the occupancy rate touches 90% to 100%

CASE SCENARIO

Case Scenarios, as opposed to Case Studies, are *short cases*. Written in a more compact style with an appealing narrative, the Case Scenario's focus is on covering more depth in a specific area.

Profitability Analysis

"A" is a mid-size bank with a loan asset portfolio that primarily comprises of housing loans and commercial loans. Efforts are underway to identify business opportunities that can contribute positively to the bank's bottom line. As a management analyst, you are analyzing the interest income from loan portfolios, the main income portfolio for any bank. You notice interest income from two types of loan portfolios – student education loans and consumer durable loans. These loan portfolios have not been focused upon until date since the loans form a minor portion of the entire loan portfolio, each less than 1% of the total loan portfolio. Consequently, the interest income generated is also minor in terms of the entire interest income of the bank. The primary focus has always been on housing loans and commercial loans, which form a major portion of the loan segment.

Following is some information you have about the interest on the student education loan segment and the interest on consumer durable loan segment:

Interest income earned on student education loan segment and consumer durable loan segment.

(₹ in Lakhs)

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5
Interest earned on Student Education Loans	15	18	21	28	35
Interest earned on Consumer Durable Loans	30	28	22	16	12

Other information available to you:

Student Education Loans:

The bank recognizes around 150 educational institutions for the purpose of providing educational loans to students who need financing. These are premier institutes that are well recognized for their academic rigor. Due to the quality of their courses, 100% of the students get job placements immediately after graduation. Due to this the loan default on these loans has been very negligible, if any. Also, the bank has identified around 25 courses, predominantly post graduate courses, for which it has been extending education loans to students.

On the other hand, information from peer group banks shows that on an average each bank recognizes around 450 educational institutions. The number of courses recognized are both graduate and post graduate degrees, almost 100 courses. Not all institute are premier. The recognition of these degrees in the market varies. Therefore, only around 80% of the graduates to whom peer bank group offers financing, find job placements immediately after graduation.

Consumer Durable Loans:

The bank provides unsecured consumer durable loans for limited product purchase such as TVs, Refrigerators, mobile phones etc. It has a list of 15 products for which it provides loans to customers who need financing. The loan disbursement procedure is routed through sales personnel who are present in select branches of stores with whom the bank has tie up for such loans. Loan processing takes few days with due diligence done based on the loan application documents that the customer submits. Again, due to this due diligence, default rates have been negligible.

On the other hand, information from peer banks suggests that that on an average each bank recognizes about 45 products for which they provide customers financing when they want to purchase the consumer durable item. Also, loan processing is done online, with the help of the respective bank's inbuilt loan application system. Loan disbursement is immediate. The consumer durable can be purchased from any store, not just from recognized stores that have a tie up with the respective bank. This enables hassle free shopping experience to many.

Required

Put forward your inputs (**recommend**) based on the information provided above, to find business opportunities that can help Bank "A" grow its lending portfolio and interest income.

Solution

Student Education loans and Consumer Durable loans have been a very minor part of "A"'s business operations, each being less than 1% of entire loan portfolio. At the same time, these maybe segments that **can potentially grow** our lending portfolio and increase our interest income earning capacity.

Student Education Loans:

It can be seen that interest income from student education loans have increased steadily from ₹15 Lakh in Year 1 to about ₹35 Lakh in Year 5. This shows that the volume in this loan segment has been *steadily growing* in the recent years. It could be a *potential area to explore to expand our loan offering*. Currently, "A" recognizes 150 educational institutions for the purpose of providing education loan to students in need of financing *but* each bank in peer bank group on an average recognizes 450 such institutes for the same purpose. The number of courses "A" recognizes for which a loan is extended is 25 courses, mostly courses that are undertaken to earn a higher qualification like post-graduation degree. However, peers on the other hand each recognizes, a broader variety of 100 courses, both graduate and post-graduate degree for which they are willing to finance students. Therefore, it seems that "A" *can expand the range of courses* for which it provides student education loans. "A" can also recognize *more educational institutions to expand* its potential market volume. However, this comes at the ***risk of default***. Currently "A"'s approach to this segment has been *conservative*, limiting loans only to institutes and courses that enable the student with a very high possibility of finding a job immediately after qualifying. These may be courses that are sought out by potential job recruiters. Hence, students to whom loans were provided by "A", have not defaulted on any of the loan repayments. Its *loan default rate in almost negligible*. "A"'s peer banks have a *much broader market reach*, but at the same time, immediately after graduation only 80% of the students to whom loan financing was provided, have been able to find jobs. The job recruiters may not immediately require the some of the courses that some of the institutions offer. This increases the risk of loan default.

It is recommended to study the student education loan market segment more carefully. "A"'s strategy can be then laid out based on our internal benchmark requirements and risk profile.

Consumer Durable Loans:

The consumer durable loan segment has seen a steady decline in interest income from ₹30 Lakh in Year 1 to ₹12 Lakh in Year 5. "A" provides financing to customers to purchase from a list of 15 consumer durable products that it has identified including TVs, refrigerators, mobile phones. These are disbursed through its sales personnel present in the select stores with whom it has tie up for this purpose. Due to due diligence procedures, the loan default rate has been very low.

On the other hand, peer bank group have a much broader range of products, on an average of 45 products for which financing can be provided. There is no restriction on where the product is being purchased from. This widens the market range. Also, their customers can apply for these loans online. Disbursement of loan in immediate. This provides for hassle free shopping experience.

It is recommended to study "A"'s loan disbursement procedures further in order to increase the loan volume for consumer durables. Currently, it is restricted to purchases for specific products from select stores. Loan is being disbursed only after due diligence procedures, which have a time lag of few days. Increasing the range of products for which financing is offered and a dedicated bank system where the customer can apply for these loans may ramp up its volumes. ***At the same time, the downside risk to be addressed is the risk of fraud*** due to immediate loan disbursement or extending loans to customers whose credit worthiness might be lower. This would increase the risk of default.

Conclusion- By expanding customer base "A" has the advantage of tapping these customers for future ***cross selling*** of its home loan and commercial loan products. "A"'s current customer base especially from the home loan portfolio can also be researched to identify potential customers who may need either student education loans or consumer durable loans. Hence, the two customer segments may be considered for future expansion purpose. "A" needs to tailor its strategy based on internal benchmarks and risk profile capacity.

SKILL ASSESSMENT BASED QUESTIONS

The basis objective of the case study is to allow the students to apply ideas and insights from theory to the *real life issues* and *problems.*

Question 1

About Problem	Target Verb/ (s)
Pricing Strategy	Calculate, Elucidate

"Zinc" a brand of **Zink Pen and Plastic Limited (ZPPL)**, is a household name for stationery products. The R&D Division of "Zinc" developed a new pen **'Zentonic'** with assorted ink colours with the tagline ***'give your writing a Zen energy'.***

"Zinc" has used market research/ studies to determine that if price of ₹40 is charged for pen, demand will be NIL. It has also been established that demand will rise or fall by 2,000 units for every ₹1 fall/ rise in the selling price. The further information is also available in Annexure as a result of these studies.

The Board members in presence of functional heads at ZPPL are discussing the different pricing strategies that can be adopted in context to 'Zentonic'.

Dissension is clearly visible between the marketing head and the finance head. The marketing head is striving to keep the price as low as possible to capture the commercial space and maximise the revenue, whereas the finance head argued in favour of keeping the price high to maximise the profit because the design and R&D of 'Zentonic' will not be matched by the competitors currently. The distinct parameters (revenue and profit) of performance linked pay seem to be the major reason for contradiction between two functional heads. Board members consider both the thoughts and instruct you (management accountant) to drive the price(s).

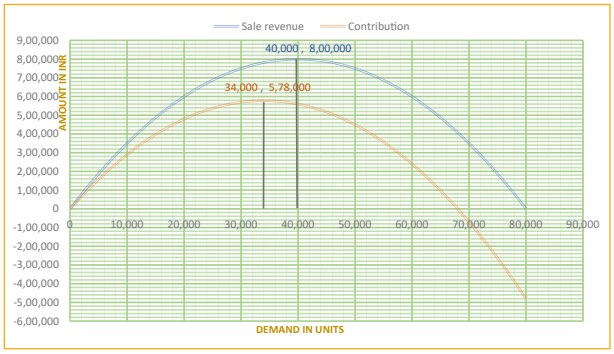
ZPPL ***diversifies*** itself into the online learning space and starts a web-based platform **'ZenZick',** which offers quality videos for competitive and professional exams such as JEE, NEET, UPSC, KVPY and etc. In order to attract the viewer, 'ZenZick' offers few lectures on fundamental concepts of curriculum after registration at the website without any cost, but for complete access, candidates need to have paid account.

Required

(i) CALCULATE the unit selling price of **'Zentonic'** that will maximise revenue and maximise profit.

(ii) ELUCIDATE the pricing strategy advocated by marketing head and finance head for **'Zentonic'** and pricing strategy adopted for **'ZenZick'**

Annexure



For Your Conceptual Understanding

Sale price per unit in ₹	Demand in units	Sale revenue in ₹	Variable cost in ₹ (@ ₹6 per unit)	Contribution in ₹
40	-	-	-	-
39	2,000	78,000	12,000	66,000
38	4,000	1,52,000	24,000	1,28,000
37	6,000	2,22,000	36,000	1,86,000
36	8,000	2,88,000	48,000	2,40,000
35	10,000	3,50,000	60,000	2,90,000
34	12,000	4,08,000	72,000	3,36,000
33	14,000	4,62,000	84,000	3,78,000
32	16,000	5,12,000	96,000	4,16,000
31	18,000	5,58,000	1,08,000	4,50,000
30	20,000	6,00,000	1,20,000	4,80,000
29	22,000	6,38,000	1,32,000	5,06,000
28	24,000	6,72,000	1,44,000	5,28,000
27	26,000	7,02,000	1,56,000	5,46,000
26	28,000	7,28,000	1,68,000	5,60,000
25	30,000	7,50,000	1,80,000	5,70,000
24	32,000	7,68,000	1,92,000	5,76,000
23	**34,000**	**7,82,000**	2,04,000	**5,78,000**
22	36,000	7,92,000	2,16,000	5,76,000
21	38,000	7,98,000	2,28,000	5,70,000
20	**40,000**	**8,00,000**	2,40,000	5,60,000
19	42,000	7,98,000	2,52,000	5,46,000
18	44,000	7,92,000	2,64,000	5,28,000
17	46,000	7,82,000	2,76,000	5,06,000
16	48,000	7,68,000	2,88,000	4,80,000
15	50,000	7,50,000	3,00,000	4,50,000
14	52,000	7,28,000	3,12,000	4,16,000
13	54,000	7,02,000	3,24,000	3,78,000
12	56,000	6,72,000	3,36,000	3,36,000
11	58,000	6,38,000	3,48,000	2,90,000
10	60,000	6,00,000	3,60,000	2,40,000
9	62,000	5,58,000	3,72,000	1,86,000
8	64,000	5,12,000	3,84,000	1,28,000
7	66,000	4,62,000	3,96,000	66,000
6	68,000	4,08,000	4,08,000	-
5	70,000	3,50,000	4,20,000	-70,000
4	72,000	2,88,000	4,32,000	-1,44,000
3	74,000	2,22,000	4,44,000	-2,22,000
2	76,000	1,52,000	4,56,000	-3,04,000
1	78,000	78,000	4,68,000	-3,90,000
0	80,000	-	4,80,000	-4,80,000

Answer

(i) The unit selling price of **'Zentonic'** that will maximise revenue and maximise p rofit can be easily derived through *demand function*. The graph shows sales revenue is maximised at 40,000 units and contribution **(so profit)** is maximised at 34,000 units.

Note – Fixed cost will be fixed irrespective of the level of activity (presuming fixed cost does not hold feature of step cost).

To calculate the selling price for these two levels of output, we can insert the number of units into the equation for the demand function.

Demand function **q = 80,000 – 2,000p** or **p = 40 – 0.0005q**

Whereas p represents selling price and q represents level of output.

Revenue will be maximum when the selling price will be **₹20**.

When q is 40,000 units of Zentonic pens,

⇨ 40,000 = 80,000 – 2,000p

⇨ 2,000p = 40,000

⇨ Then p will be **₹20**

Profit will be maximum when the selling price will be **₹23**

When q is 34,000 units of Zentonic pens,

⇨ 34000 = 80,000 – 2,000p

⇨ 2,000p = 46000,

⇨ Then p will be **₹23**

Accordingly, sales revenue at profit maximisation level would be ₹7,82,000 (₹23 × 34,000 units) and the expected profit at this level is already given i.e., 5,78,000 (refer graph). Therefore, variable cost will be ₹2,04,000 or ₹6 per unit. [not required in question]

(ii) The marketing head is striving to keep the price low as possible to make capture the commercial space and maximise the revenue. The pricing strategy advocated by him is **penetration pricing**. It includes setting the price low with the goals of attracting customers and gaining market share. The price will be raised later once this market share is gained.

The finance head argued in favour of keeping the price high to maximise the profit because the design and R&D of Zentonic will not be matched by the competitors currently. The pricing strategy advocated by him is **price skimming**. Under price skimming, high prices are set when a new product is launched so that fewer sales are needed to break even and to reimburse the cost of investment of the original research into the product. Since it involves selling a product at a high price, sacrificing high sales to gain a high profit is therefore called "skimming" the market. Price dropped to increase demand once the customers who are willing to pay more have been 'skimmed off'.

The pricing strategy adopted for **'ZenZick'** is **freemium**, freemium is a revenue model that works by offering a product or service free of charge (typically digital offerings such as software) while charging a premium for advanced features, functionality, or related products and services. The word "freemium" is a portmanteau combining the two aspects of the business model i.e., "free" and "premium".

Question 2

About Problem	Target Verb/ (s)
Service Level Agreement	Compute, Explain

Red Star Limited (RSL) is the largest manufacturer of Air-Conditioners. RSL is not good at attending the customer calls due to lack of capabilities, but it is an important activity from the aspect of the value chain. Hence, in order to improve customer experience (downstream supply chain), RSL decided to hire Krishna Infotech & BPO Services (KIBS) for attending the calls of their existing and prospective customer.

Service level agreement (SLA) was duly entered and **service level (SL) of 90/20 has been prescribed to keep a check on service quality.** Invoice will be generated monthly, and SL will also be observed on monthly basis. For the first month along with the invoice, KIBS provide the following details to RSL–

- Total calls offered 5,120
- Calls answered within threshold time 4,850
- Short or Abandon calls within threshold time 115

CFO while authorising the payment queues generated by the account executive in ERP, come across the KIBS payment; he immediately seeks a copy of SLA from legal but not able to understand the technical aspects hence he decided to calls you (management accountant) to EXPLAIN few terms (including SL) and certain COMPUTATIONS.

Required

(i) What is the SLA threshold and what is the threshold time in this case?

(ii) Explain the significance of 90/20 SL.

(iii) Compute the SL level for the first month.

(iv) Whether KIBS attained the SL level to full the terms of SLA?

(v) For how many calls KIBS can bill to RSL?

Answer

(i) A service-level agreement (SLA) threshold is the *activity response* time specified in a service level agreement. In the current case, the SLA threshold is the *number of seconds within which a call shall be responded* to by a tele-caller at KIBS. The threshold time, in this case, is 20 seconds it is represented by a service level (SL) of 90/20.

(ii) A **service-level agreement (SLA)** defines the *level of service you expect from a vendor, laying out the metrics by which service is measured.* **Service level** basically *measures the performance.* Service level (SL) of 90/20 signifies that 90% of the calls shall be answered within 20 seconds.

Concept Insight

SLA is the document that outlines the wider service agreements between a service provider and its customer, whereas SL is the acceptable level of service performance regarding which agreement has been entered.

Mind it, both the SLA and SL are **not the same.**

(iii) Service Level (SL) measure the performance and can be computed for voice calling BPO services using the following formula–

$$SL = \frac{\text{Total calls answered within threshold time}}{\text{(Total calls offered-Short or abondon calls within threshold time)}}$$

SL = 4,850/ (5,120 - 115)

SL = 4,850/ 5,005

SL = 96.90%

(iv) Against the expected service level of 90%, KIBS attain the service level of 96.90% which means out of each 100 calls nearly 97 class are answered within 20 seconds (threshold time), whereas the requirement was minimum requirement is 90%; hence KIBS attain the SL level to full the terms of SLA.

(v) No, doubt SL used for measuring the performance which relies upon the calls answered within the threshold time, but the calls answered beyond threshold time also cause costs and resources at end of the BPO vendor (KIBS in this case) hence **billing shall be for total calls responded/answered** (rather only those which are answered in threshold time). Hence, in a given case, the KIBS can raise an invoice for 5,005 calls i.e., 5,120 (total calls offered) – 115 (short or abandon calls within threshold time).

Question 3

About Problem	Target Verb/ (s)
Cost of Quality	Analyse

NZ Ltd. implemented a quality improvement programme and had the following results:

Particulars	2020	2021
	(Figures in ₹ '000)	
Sales	6,000	6,000
Scrap	600	300
Rework	500	400
Production Inspection	200	240
Product Warranty	300	150
Quality Training	75	150
Materials Inspection	80	60

Required

ANALYSE the quality costs

Answer

Analysis

The total cost of quality in the year 2020 was ₹17,55,000. The total cost of quality in the year 2021 was ₹13,00,000. Therefore, over all the cost of quality decreased by ₹4,55,000 from 2020 to 2021. Given the same scale of operations in both years (annual turnover being 60,00,000), the profits therefore would have increased by ₹4,55,000. The break-up is summarized in the table (refer workings).

In the year 2021, more emphasis was given to **Quality Training**, the spend increased by 75,000 p.a. Quality training is a *preventive cost* that is aimed at improving the quality of output / performance of the employees. The benefit of this spend can be seen in the reduction of internal failure costs (scrap and rework costs).

The total *internal failure costs* of **Scrap and Rework** was ₹11,00,000 in the year 2020 that reduced to just ₹7,00,000 in the year 2021, this reduction of ₹4,00,000 per year is directly on account of the quality training given to employees. *Better quality output* resulted in reduced scrap and need for rework.

Material Inspection Costs decreased by ₹20,000 from 2020 and 2021. Appraisal costs check for conformance with accepted standards for production. The reduction in material inspection costs could be due to *better understanding with the vendors about material requirements needed for production, better quality of materials procured* etc. When the input material is of good quality and conforms with the production requirements, material inspection costs can be reduced substantially.

Better quality input material may also be a reason for the drastic reduction in rework and scrap costs highlighted above.

Product Inspection Costs increased by ₹40,000 from 2020 to 2021. This *appraisal cost* checks for conformity of the product with accepted standards of production. Quality checks on the production line is important to detect defects at the earliest. Product inspections during the manufacturing process (in-line product inspection) help in detecting defects while the product is being made. Defects can be corrected / rectified, or the unit produced can be scrapped.

Pre-shipment product inspection ensures that the product conforms with the specifications agreed with the customer. This control prevents defective units / non-conforming units from reaching customers, an external quality failure. External quality failure has costs in the form of product returns, warranty expenses etc. **Product Warranty** expenses reduced significantly by ₹1,50,000 from the year 2020 to 2021. This improvement can be attributed to *better quality production and increased product inspection.*

External quality failure has *hidden costs* in the form of shrinkage of market share, negative impact on brand image etc. Quality reassurance ensures that the goodwill of the company is maintained and there is no negative impact on the company's future business prospects.

Workings

Figures in ₹'000

Sr. No	Particulars	2020	2021	Savings / (extra spend)
1.	**Prevention Costs**			
(a)	Quality Training	75	150	(75)
2.	**Internal Failure Costs**			
(a)	Scrap	600	300	300
(b)	Rework	500	400	100
	Total	1,100	700	400
3.	**Appraisal Costs**			
(a)	Product Inspection	200	240	(40)
(b)	Materials Inspection	80	60	20
	Total	280	300	(20)
4.	**External Failure Costs**			
(a)	Product Warranty	300	150	150
	Total (1+2+3+4)	**1,755**	**1,300**	**455**

Question 4

About Problem	Target Verb/ (s)
Make or Buy	Comment, Assess

Mr. Venkatesh, who recently joined the Tirupati Casting and Forge Limited (TCFL) as assistant manager in the management accounting division is collecting, estimating, and arranging the information required for make vs. buy decision and pricing decision; using which chief management accountant can consider the best way to go while taking uncertainties into account and advise the management accordingly.

X-104

Balaji Enterprises (BE) ready to deliver product X-104 (in a semi-furnished state) for ₹40 under a continuous supply agreement. TCFL insists on inserting a stable price clause in the supply agreement, to which BE responds that variation will be pass on to TCFL. Finally, it was decided if the agreement entered then the price (which is currently ₹40/-) shall be subject to periodical (after each quarter) review.

Y-29

TCFL is producing the product Y-29 (at full capacity) and able to sell the entire production through a network of distributors (and through retailers, in those areas where there is no distributor appointed). TCFL contacted by an e-retail platform, with a proposal; wherein the platform shows interest in offering the product Y-29 to its customers (members/ subscribers). The E-retail platform has two types of customers, "the plus" category and others. The E-retail platform will charge ₹1,300/- from "plus" category and ₹1,350/- from others, E-retail platform has the policy to keep margin (to meet its cost and earn a profit) of 8.3$\bar{3}$% and 12.50% on the procurement cost for the sale made to "plus" category and other customers respectively. In the proposal, the E-retail platform also states the price which it can pay to TCFL; according to the requirements stated above.

Mr. Venkatesh compiled the following tables, for product X-104 and Y-29 respectively on a per unit basis–

X-104

Particulars	In-house production	Purchased from BE, there-after furnishing and re-labelling at TCFL
Selling price of product	115	112
Variable costs	73	25
Fixed costs	18	18
External purchase cost	NA	40

Y-29

Particulars	Amount in ₹
List Price	1,400
Price charge from distributors	1,225
Variable cost incurred by TCFL	870

Required

(i) COMMENT how TCFL should respond to the proposal of the e-retail platform regarding product Y-29 and ASSESS the sensitivity of such decision.

(ii) COMMENT on the make vs. buy decision regarding product X-104 and ASSESS the sensitivity of such decision to the external purchase price.

Answer

(i) Pricing (Decision on the proposal by E-retail platform) & Sensitivity

Decision on the proposal by E-retail platform – Since the TCFL is producing the product Y-29 at **full capacity** and able to sell **entire production** through a network of distributors at **₹1,225** (results in a contribution of ₹355), hence **shall not accept the proposal** of the E-retail platform at the stated price of **₹1,200** (results in a contribution of ₹330) (see the statements below for the calculations).

Price stated by E-retail platform

Particulars	Plus Customer	Others
Sale price	1,300	1,350
Less- margin kept on the procurement cost	100 (i.e.8.3$\bar{3}$%)	150 (12.5%)
Procurement cost (price stated by E-retail platform)	1,200	

Comparable Contribution

Particulars	If sold through distributors	If sold through E-retail platform
Selling price for TCFL	1,225	1,200
Less- Variable costs	870	870
Contribution	355	330

Sensitivity of the decision on the proposal by E-retail platform

If the contribution from each unit of Y-29 sold to the E-retail platform increased to 355 and beyond then TCFL will be indifferent, among the distributors and E-retail platform. Thus, the price stated by the E-retail platform needs to increase by ₹25 per unit (from ₹1,200 to ₹1,225) i.e., 25/1,200 which come out to be **0.0208$\bar{3}$ or 2.08$\bar{3}$%** (25/1,200×100)

Hence, **if the price stated by the E-retail platform in the proposal increase by more than 2.08$\bar{3}$% then the original decision would be reversed** (because beyond that point selling through the E-retail platform will become more profitable for TCFL).

(ii) Make vs. Buy Decision & Sensitivity Analysis

Make vs. Buy Decision – Since the contribution is ₹47 when the product X-104 is purchased from BE and then furnishing and re-labelling done at TCFL, in comparison to ₹42 when it is produced in-house (see the calculation below); hence it is beneficial to buy the product X-104.

Comparable Contribution

Particulars	In-house production	Purchased from BE, there-after furnishing and re-labelling at TCFL
Selling price of product	115	112
Less- Variable costs	73	25
Less- External purchase cost	-	40
Contribution	42	47

Sensitivity to the external purchase price

To be indifferent, among the in-house production and buying from BE, the contribution from the product X-104 when it is purchased from BE needs to fall to ₹42 per unit. Thus, the external purchase cost needs to increase by ₹5 per unit (from ₹40 to ₹45) i.e., 5/40 which come out to be **0.125 or 12.5%** (5/40×100). Hence, **if the external purchase price increased by more than 12.5% the original decision would be reversed** (because beyond that point buying from BE will not remain beneficial).

Concept Insight

Sensitivity analysis is capable to incorporate **uncertainty** into **decision making** (by taking each uncertain factor in turn), and also calculates the change (**percentage change** – relative measure hence comparison of importance among factors become easy) that is **minimally required** in factor(s) before the **original decision is reversed**.

Since sensitivity analysis considers uncertainly related to each factor in turn, hence where **multiple factors changing simultaneously; it has no utility**. Apart from this, sensitivity analysis only calculates the change that is **minimally required** in factor before the decision is reversed; but it **does not consider or calculates the probability** of such a change.

Question 5

About Problem	Target Verb/ (s)
Transfer Pricing	Comment, Recommend

AB Cycles Ltd. has 2 divisions, A and B which manufacture bicycle. Division A produces bicycle frame and Division B assembles rest of the bicycle on the frame. There is a market for sub-assembly and the final product. Each division has been treated as a profit centre. The transfer price has been set at the long-run average market price. The following data are available to each division:

	₹
Estimated selling price of final product	3,000 p.u.
Long run average market price of sub-assembly	2,000 p.u.
Incremental cost of completing sub-assembly in division B	1,500 p.u.
Incremental cost in Division A	1,200 p.u.

Required

(i) If Division A's maximum capacity is 1,000 p.m. and sales to the intermediate are now 800 units, should 200 units be transferred to B on long-term average price basis? COMMENT.

(ii) What would be the transfer price, if manager of Division B should be kept motivated? Substantiate your RECOMMENDATIONS with suitable reasons.

(iii) If outside market increases to 1,000 units, should Division A continue to transfer 200 units to Division B or sell entire production to outside market? COMMENT.

Answer

(i) In this case there are two options available –

Option A	₹
Sell at the sub assembly stage (after completion of Division A)	2,000
Less: Incremental cost in Division A	1,200
Contribution	800

Option B	₹
Sell at the final product stage	3,000
Less: Cost at Division A and Division B (₹1,200 + ₹1,500)	2,700
Contribution	300

Therefore it is profitable to sell at the subassembly stage because of higher contribution, provided there is a market.

Hence, if there is market at intermediate stage, first priority is to sell intermediary (sub assembly).Therefore, 800 units should be sold as sale of intermediary.

The balance capacity available of (1,000 – 800) = 200 units should be transferred to B and B should complete the assembly and sell as final product, since the company can earn ₹300 per unit for each unit of such sale.

(ii) Recommendation

If B Div. receives the subassembly at market price of ₹2,000, plus its own incremental cost of ₹1,500 will give total cost of ₹3,500, thereby yielding a loss of ₹3,500 – ₹3,000 = ₹500 per unit, whereas the company makes a profit of ₹300 per unit.

The loss of ₹500 per unit would demotivate the manager of Division B. This would impact the company as inhouse production of the bicycle does yield a positive result, a profit of ₹300 per unit. In order to keep the manager of Div. B motivated, the company can adopt a **dual rate transfer pricing** policy. Division A can record the transfer price at the long run average market price of ₹2,000 per unit for each bicycle transferred to Division B. This lets Division A show reasonable revenue based on current market conditions, not constraining the "departmental profit center approach" towards operations.

Division B on the other hand can record the transfer price at the marginal cost of production for Division A. The marginal cost for Division A is ₹1,200 per unit. If Division B is allowed to record the transfer price at ₹1,200 unit per sub-assembly unit purchased from Division A, it would show a profit of ₹300 per unit of bicycle sold.

	₹
Sell at the final product stage	3,000
Less: Transfer Price for each sub assembly purchased from Division A	1,200
Less: Incremental cost for Division B to process further	1,500
Contribution	300

The problem with Dual transfer pricing system is that it can complicate the records since Division A records the transfer price at ₹2,000 per sub-assembly unit transferred to Division B. Division B records its transfer price at ₹1,200 per sub assembly unit it purchases from Division A. This can lead to errors in the company's overall records.

(iii) Both Divison A and the Company make higher contribution by selling to intermediate market. If the market demand increases to 1,000 units, the full quantity should be sold outside as intermediary and nothing should be transferred to Divison B.

Question 6

About Problem	Target Verb/ (s)
Transfer Pricing	Discuss

A manufacturer of Cell Phones has many operating units within its organization structure. The 'assembly plant' that assembles parts to make the final product. The others are mainly units that manufacture 'component parts' for the cell phone. The management promotes decentralized system of working, where the manager of each unit has the power to take decisions independently. The management only oversees that the impact of major operating decisions such that they promote "goal-congruence" that will benefit or not adversely impact the company.

'Max' is the head of the 'battery manufacturing' division. The division

sells *most of its output* to its final 'assembling plant' division headed by 'Ruby'. Battery is an important component of a cell phone. The company has an ***overall mission to sell only products that are of good quality,*** for which long lasting life of the battery component is critical. In March this year, the engineers of both the previously mentioned divisions created an innovative design to improve battery life. These newly designed batteries will be used in ***a new range of cell phones*** that the company plans to produce. The 'battery' division had spent ₹50 lakhs developing a suitable prototype that was acceptable to the engineers from the 'assembly plant' division. The managers are discussing a suitable transfer price for these newly developed batteries.

As mentioned before, part of the sales from the 'battery' division is also to external customers. However, at the current levels the 'battery' division is operating only at 60% capacity producing 60,000 units annually. Its annual capacity is 1,00,000 units. The annual demand for the newly developed batteries would be an additional 40,000 units. By accepting this internal order, the entire annual capacity of the 'battery' division can be utilized.

It is now close to the year end for the company. ***A very important metric*** to determine the payout is the *division's financial performance*. Therefore, there is intense pressure to sell more and cut costs. Each division maintains separate accounting records.

'Max' wants to charge a transfer price of ₹300 per unit of battery. Total manufacturing cost is ₹250 per unit of battery while the variable cost is ₹230 per unit.

'Ruby', the manager of the 'assembly plant' has been trying to convince 'Max' to reduce the transfer price to ₹275 per unit. 'Ruby' argues that the additional production for the new range of cell phones would help utilize unused capacity. In line with the current arrangement, she wishes to get all her batteries from the in-house department due to their higher quality level. However, she finds the cost of ₹300 per unit very high. She shares quotes from other vendors for similar quality batteries where the average market price is ₹275 per unit. She wishes 'Max' to provide her the batteries at this rate, which she feels is a more competitive price.

As per the company's policy, if a cell phone is found defective within 1 year from date of sale, it will be completely replaced by a new phone. Cost of replacement of a cell phone is ₹3,000 per cell phone. The annual demand for the newly developed cell phone range is expected to be 40,000 units per year. Batteries procured from outside vendors could result in 0.1% of sales becoming defective. These will require replacement of the entire cell phone by the company. 'Ruby' argues that this is a miniscule portion of the annual sales. All the same, to keep this at a minimum threshold, quality inspection procedures are in place that costs the company ₹5,00,000 per year. Batteries manufactured in-house have always met the required quality standards. It would not result in any defective products.

'Max', the manager of the 'battery' division justifies the internal transfer price rate of ₹300 per unit on these counts:

1. The *quality of in-house batteries is superior* compared to the external market providers. They will not result in any sale returns due to defective batteries.
2. *Sales policy* of the 'battery' division for both external and internal sales is –

   Selling price / transfer price = Total Cost + 20% mark up. Therefore, based on a total cost of ₹250 per unit, the transfer price is arrived as ₹300 per unit.
3. The division has spent ₹50 lakhs to *develop prototype* as per the assembly line requirements. Being a profit center 'Max' insists that this cost be recouped by charging a higher rate.

Both 'Max' and 'Ruby' decide to approach senior management whom they report to in order to resolve their dispute by **examine in detail.** Assume that currently the opportunity cost of excess capacity is zero. There are no pending sales orders that help utilize the excess capacity. Also given, that the demand for cell phones has been increasing, so the industry is in the cusp of a *growth phase*.

Required

(i) Impact on the company's financials if (i) Batteries are procured at ₹275 each from external market and (ii) Batteries are procured in-house at ₹300 each.

(ii) As a member of the senior management committee, with the idea of goal congruence of the divisions and the company as a whole:

   (a) How would you convince 'Ruby' to buy the batteries from the in-house division?

   (b) How would you convince 'Max' to reduce his transfer price from ₹300 for each battery?

Hint: For examine in detail use verb 'DISCUSS'.

Answer

(i) Impact on the company's financials:

Amount in ₹

Department	Case a: Batteries procured from outside at ₹275 per unit	Case b: Batteries procured in house at ₹300 per unit
'Battery' Division	---	28,00,000
'Assembly Plant' Division	(1,16,20,000)	(1,20,00,000)
Overall Company	(1,16,20,000)	(92,00,000)

Case a: Batteries procured from outside at ₹275 per unit

Cost outflow to the company, incurred by the 'assembly plant' division would be ₹1.162 crores. This comprises of the following:

1. Procurement cost: 40,000 units procured at ₹275 per unit = ₹1.1 crores.
2. Additional quality inspection cost: ₹5 lakhs or ₹0.05 crores.
3. Cost of replacement of defective units at a defect rate of 0.1% of annual sales
   = 40,000 units × 0.1% × ₹3,000 per unit = ₹1.2 lakh or ₹0.012 crores

Total outflow = ₹1.1 crore + ₹0.05 crore + ₹0.012 crore = ₹1.162 crores.

When batteries are procured from outside, 'battery' division will not incur any cost outflow. However, the unit has unused / excess capacity. Since currently the opportunity cost of unused capacity is zero, this is a *non-quantifiable waste*. The company may have to consider scaling down capacity / activities in this division by shutting down some of its machines. However, since it is given that the **cell phone industry is in the cusp of a growth phase**, it is possible to bring in orders from the external market, to utilize the balance 40% unused annual capacity.

The company should however be cautious since the 'battery' division would be catering to its rival cell phone manufacturers. While the 'assembly plant' would be procuring batteries externally from the battery unit's rivals. It could lead to a situation where the company is working against itself for the sake of maintaining profitability of its individual units. This goes **against the concept of goal congruence** that could affect the company's ability to sustain business in the long run. This would be a separate study that would need inputs from other senior management executives.

Case b: Batteries procured in house at ₹300 per unit

Net cost outflow to the company will be ₹92 lakhs.

The 'battery' division would earn a revenue of ₹300 per unit while incurring a variable cost of ₹230 per unit. Total cost of production is ₹250 per unit, that includes a fixed cost of ₹20 per unit. However, this has been ignored since it is a sunk cost. Therefore, each internal sale to the assembly plant division would net revenue of ₹70 per unit. The total additional revenue earned from this internal transfer would be 40,000 units × ₹70 per unit = ₹28 lakhs. This comes with the additional benefit, that the unit is operating at full capacity, producing high quality component for another unit within the company. Thereby, **aiding goal congruence**.

The 'assembly plant' division would incur a cost outflow of ₹1.2 crores because of the internal transfer. (40,000 units × ₹300 per unit). Although this is costlier than the option of procuring from the external vendors, it comes with high quality assurance. Sale of defective cell phones can be avoided, thereby **improving the company's brand image and customer loyalty**.

Net outflow to the company = cost to the 'assembly plant' division – additional revenue for 'battery' division = ₹1.2 crores - ₹0.28 crores = ₹0.92 crores or ₹92 lakhs.

At the overall company level, this can also be simply calculated as the marginal cost of producing additional 40,000 batteries = 40,000 units × ₹230 per unit = ₹92 lakhs. Fixed cost of manufacture, a sunk cost, is ignored.

Conclusion: It is better to manufacture the batteries in-house due to the following reasons–

1. ***External procurement cost*** is ₹275 per unit while the marginal cost of manufacturing a battery is only ***₹230 internally***.
2. ***Quality of in-house production is higher***, requiring no additional quality control checks.
3. ***Promotes goal congruence,*** where each division will work towards sustaining the company's business growth.

(ii) Negotiating with managers of individual units:

Negotiating with 'Ruby', the manager of 'assembly plant' division:

Ruby argues in favor of procuring similar batteries from the external market at a price of ₹275 per unit that is much lower than the internal transfer price quote of ₹300 per unit. Overall it costs ₹1.162 crore per year to procure the components as against her division bearing an internal transfer cost of ₹1.2 crore. However, by using external batteries, replacement of defective units would be 0.1% out an annual sale of 40,000 units that is 40 units need to be replaced. 'Ruby' may argue that this is a miniscule portion of the annual sales. However, the company's **image of providing quality products may take a hit**. For the company, procurement cost, along with the cost of replacement and additional quality inspection cost makes it costlier than producing the batteries in-house.

Cost of external procurement = ₹1.162 crore / 40,000 units = ₹290.50 per unit.

Cost of manufacturing in-house = marginal cost of production = ₹230 per unit.

The fact internal transfer is the better option has to be reasoned out with 'Ruby'. She in turn should be given the assurance, ***the company would give importance to other non-financial metrics while evaluating her unit's performance for bonus payouts***. One of these could be the number of successful innovative designs collaborated along with other departments such as the 'battery' division. This would have a more positive impact on the employee morale. Excessive emphasis on financial metrics could lead to decisions that may benefit the unit but may be detrimental to the company.

Negotiating with 'Max', the manager of the 'battery' division:

The 'battery' division is currently operating at 60% capacity. With the additional order to produce 40,000 units, the capacity can be utilized completely. This avoids wastage of resources. Quality of components is another positive feature that the company should give credit to 'Max's' division. Therefore, he is justified in charging a premium for quality. At the same time, the following points need to be reasoned out with him:

→ Development cost of new design of ₹50 lakh is a sunk cost for the company. It need not be passed onto the 'assembly plant' division. Instead during performance appraisal, 'Max' ***can highlight this as an investment*** that has paid off in the form a successful design for the new range of products that the company is planning to manufacture. ***Such project initiative outflows need to viewed investments and not as costs against the unit.*** During performance appraisal for bonus payout, the management can consider the payoffs from such project initiatives, how successful they have been and how many did not yield any result. This is Research and Development that is important for the long-term sustainability of the company.

→ It is given that the opportunity cost for excess capacity is nil. Therefore, the unit's excess capacity is waste. Therefore, for determining the transfer price, 'Max' should consider only the marginal cost of producing a battery unit rather than following a cost-plus mark-up pricing policy. As explained above, fixed cost is again a sunk cost to the company.

Therefore, as a senior management committee member, 'Max' has to reasoned out in reducing the transfer price from ₹300 per unit. **Ideally**, the transfer price should ***include only the marginal cost of production*** of ₹230 per unit. Given the decentralized working of the organization, ***leverage can be given for 'Max' to charge a premium for the quality of his products***. Overall, it would not affect the company's financials. However, there has to be a check on how reasonable this premium is since it could lead to decisions that are detrimental to the company. Also, ***performance evaluation should also include non-financial metrics*** like quality of products produced, innovative designs and production techniques that are factors that will sustain business in the long run.

Question 7

About Problem	Target Verb/ (s)
Relevant Cost Concepts	Analysis

An apparel manufacturing company has raw material inventory of polyester fabric bales that was initially procured to be used in manufacture of shirts. Later, keeping in mind the current fashion trend, the design department suggested manufacture of cotton shirts instead. Therefore, the bales of polyester fabric are now not required. It was procured at ₹1,00,000 few months back, the scrap value if sold in the external market would be ₹45,000 **(alternative 1)**. The fabric has alternative uses:

Alternative 2:

The material can be used to make polyester jackets. This would require the following **additional work and materials:**

Material A	500 bales of material
Material B	1,000 units
Direct Labor	3,000 hours unskilled
	2,000 hours semi-skilled
	1,000 hours highly skilled
Extra selling and delivery expenses	₹50,000
Extra advertising	₹25,000

This conversion can produce 1,000 units of polyester jackets that can be sold at ₹400 each. Material A is already in stock and widely used within the company. Although present stock will be sufficient to meet normal production requirements, extra material used to facilitate alternative will need to be replaced immediately. This will avoid any loss due to stock out of Material A for the products under regular production. Material B is an imported dye item, which cannot be very easily procured due to import restrictions. At present Material B is used in the production of high-end fashion clothing that on an average gives a gross contribution of ₹750 per unit of such clothing (without the cost of Material B). Each unit high-end fashion clothing requires 5 units of Material B.

	Material A	Material B
Acquisition cost at the time of purchase	₹87 per bale	₹75 per unit
Net realizable value	₹85 per bale	₹45 per unit
Replacement cost	₹90 per bale	---

Alternative 3:
The company also manufactures curtains for which it uses polyester fabric of a different variety and texture. The bale of polyester fabric currently lying as obsolete inventory can also be used as a substitute to the regular polyester material that is used to make curtains. For this, certain modifications to the texture are required to be done along with certain other procedures that will make the material suitable for utilization in curtain production.

The substitute will contribute towards production of about ~10% of the monthly curtain production. The following would be the **additional work and material** required:

Material C	1,000 units
Direct Labor	1,500 hours unskilled
	500 hours semi-skilled
	500 hours highly skilled

In a month, 15,000 bales of regular polyester fabric used for curtain production is procured at a rate of ₹80 per bale. This month, due to the substitution, only 13,000 bales of regular polyester fabric would be required. With reduced procurement for the current month, the supplier will reduce the bulk discount given on regular purchases. Accordingly, the procurement rate of regular polyester fabric will be at a rate of ₹85 per bale for the current month.

Material C has to be made in-house since it cannot be procured as such from the external market. The **standard cost per unit of Material C** would be as follows:

Direct labor, 2 hours unskilled labor	₹10
Raw materials	₹09
Variable overhead: 1 hours at ₹1 per hour	₹01
Fixed overhead: 1 hours at ₹3 per hour	₹03
Total standard cost of production	₹23

The wage rate and overhead recover rates for the company are as follows:

Variable overhead	₹1 per direct labor hour
Fixed overhead	₹2 per direct labor hour
Unskilled labor	₹5 per direct labor hour
Semi-skilled labor	₹10 per direct labor hour
Skilled labor	₹15 per direct labor hour

The unskilled labor can be procured on contract basis to meet the exact production requirements. The contract expires once the work is done. Semi-skilled labor is part of the permanent labor force, but the company has excess supply of this type of labor at the present time. Highly skilled labor is in short supply and cannot be increased significantly in the short term. This labor force is presently engaged in the manufacture of upholstery. Each unit of upholstery requires 4 hours of highly skilled labor. The contribution from sale of each unit of upholstery is ₹36. To cater Alternative 2 or 3, they need to discontinue production of upholstery until the work is completed.

Required

Present cost information by giving detailed ANALYSIS whether the obsolete bale of polyester fabric should be sold (Alternative1), used production of jackets (Alternative2) or used as a substitute for curtain cloth production (Alternative 3).

Answer

The textile company has to take a decision whether to–
(i) sell the bale of obsolete polyester fabric;
(ii) produce jackets by using this obsolete polyester fabric; or
(iii) use obsolete polyester fabric as substitute for curtain cloth production.

To make a decision, the company has to consider the relevant cost for each option, along with any additional expenses that need to be incurred. The alternative that yields the highest cash contribution/ benefit should be chosen.

Alternative 1: If obsolete bale of polyester fabric is sold as scrap in the external market it would yield cash return of ₹45,000. The original procurement cost is a sunk cost that needs to be ignored.

Alternative 2: Utilize the obsolete polyester fabric to make jackets. In addition to the polyester material, Material A and B would be added to the production process. It would also require the work of additional labor.

Calculation of net cash contribution from Alternative 2:

Particulars	**Amount (₹)**
Sales Proceeds (1,000 jackets × ₹400 each)	4,00,000
Material A (note 2.1)	45,000
Material B (note 2.2)	1,50,000
Direct Labor - unskilled (note 2.3)	15,000
Direct Labor - semi skilled (note 2.4)	-
Direct Labor - highly skilled (note 2.5)	24,000
Variable Overhead (note 2.6)	6,000
Extra selling and delivery	50,000
Extra advertising	25,000
Net contribution	**85,000**

Note 2.1: Material A is already in stock and widely used within the company. However, if this is used to make jackets as per alternative 2, it has to be replaced immediately so that other normal production activities are not impacted. Therefore, the relevant cost for Material A would be its current replacement cost at ₹90 per bale. Alternative 2 uses 500 bales of Material A. Therefore, relevant cost = 500 bales × ₹90 per bale = ₹45,000.

Note 2.2: Material B is a scarce material due to import restrictions. It can alternatively be used to make high-end fashion apparel. Gross contribution from high-end apparel clothing is ₹750 per unit sold. Each unit requires 5 units of Material B. Therefore, the gross contribution per unit of Material B would be ₹750 / 5 = ₹150.

Alternative 2 uses 1,000 units of Material B. Therefore, relevant cost = 1,000 units × ₹150 per unit of Material B = ₹1,50,000.

Note 2.3: Unskilled labor is hired on contract basis to meet exact production requirements. The contract expires once the work is done. Relevant cost = payment made to labor hired specially for this purpose = 3,000 hours × ₹5 per hour = ₹15,000.

Note 2.4: Semi-skilled labor is part of the permanent labor force, but the company has excess supply of this type of labor at the present time. This means that there is spare capacity within this workforce, their idle time can be used towards making jackets as per Alternative 2. Therefore, there is no additional cost incurred for the 2,000 hours of work needed for Alternative 2. Therefore, relevant cost = nil.

Note 2.5: Skilled labor is a scarce resource, additional labor cannot be hired easily in the short term. Therefore, relevant cost will include the payment made for the current work plus opportunity cost incurred due to diverting this scarce resource. Each unit of upholstery requires 4 hours of highly skilled labor. The contribution from sale of each unit of upholstery is ₹36. Therefore, the contribution per hour of highly skilled labor is ₹36 / 4 = ₹9 per hour of skilled labor. Alternative 2 requires 1,000 hours of skilled labor. Therefore, opportunity cost = 1,000 hours × ₹9 per hour = ₹9,000. In addition, the skilled labor is paid ₹15 per hour, the pay for making jackets as per alternative 2 = 1,000 hours × ₹15 per hour = ₹15,000. Relevant cost = opportunity cost + pay = ₹9,000 + ₹15,000 = ₹24,000.

Note 2.6: Variable overhead cost will be ₹1 per direct labor hour. Direct labor hours will equal the hours spent by unskilled, semi-skilled and highly skilled labor = 3,000 + 2,000 + 1,000 hours = 6,000 hours. Therefore, variable overhead cost = 6,000 hours × ₹1 per hour = ₹6,000.

Alternative 3: Use the obsolete bales of polyester fabric as a substitute to make curtain cloth material.

In addition to the obsolete bales of polyester fabric, this would require in-house manufacture of Material C, in addition to extra labor. The change in procurement rate of input regular polyester material should also be considered.

Calculation of net cash contribution from Alternative 3:

Particulars	Amount (₹)
Net savings in procurement cost for the current month (note 3.1)	95,000
Material C (note 3.2)	20,000
Direct Labor - unskilled (note 3.3)	7,500
Direct Labor - semi skilled (note 3.4)	-
Direct Labor - highly skilled (note 3.5)	12,000
Variable Overhead (note 3.6)	2,500
Net contribution	**53,000**

Note 3.1: In a month, 15,000 bales of regular polyester fabric used for curtain production are procured at a rate of ₹80 per bale. This month, due to the substitution, only 13,000 bales of regular polyester fabric would be procured at a higher procurement rate of ₹85 per bale for the current month.

The original cost of procurement = 15,000 bales × ₹80 per bale = ₹12,00,000

Cost of procurement for current month = 13,000 × ₹85 per bale = ₹1,05,000

Therefore, savings in procurement cost due to substitution = ₹95,000

Note 3.2: Cost of in-house production of Material C. Material C costs ₹23 per unit to be produced internally. Fixed overhead cost of ₹3 per unit has to be ignored since it is a sunk cost for this decision. Therefore, for analysis, the in-house cost of production of Material C would be ₹20 per unit. Alternative 3 requires 1,000 units of Material C. Therefore, the cost of Material C = 1,000 units × ₹20 per unit = ₹20,000.

Note 3.3: Unskilled labor is hired on contract basis to meet exact production requirements. The contract expires once the work is done. Relevant cost = payment made to labor hired specially for this purpose = 1,500 hours × ₹5 per hour = ₹7,500.

Note 3.4: As explained in note 2.4 above, there is no additional cost in the utilization of semi-skilled labor force. Their idle time is used towards this extra production as per Alternative 2 or Alternative 3. Therefore, there is no additional cost incurred for the 500 hours of work needed for Alternative 3. Therefore, relevant cost = nil.

Note 3.5: As explained in note 2.5 above, skilled labor is paid at ₹15 per hour for this work. The opportunity cost of diverting this scarce resource from regular production of upholstery material is ₹9 per hour. Therefore, relevant cost for alternative 3 = 500 hours × (₹15 + ₹9) per hour = 500 × ₹24 per hour = ₹12,000.

Note 3.6: Variable overhead cost will be ₹1 per direct labor hour. Direct labor hours will equal the hours spent by unskilled, semi-skilled and highly skilled labor = 1,500 + 500 + 500 hours = 2,500 hours. Therefore, variable overhead cost = 2,500 hours × ₹1 per hour = ₹2,500.

To summarize the net cash contribution from various alternatives:

Alternative 1: sell as scrap→ ₹45,000.

Alternative 2: Make of 1,000 jackets→ ₹85,000

Alternative 3: Substitute in curtain cloth production→ ₹53,000.

Conclusion: Alternative 2 yields the highest net cash contribution. Therefore, the obsolete inventory should be used to make polyester jackets.

"Every effort has been made to include all possible elucidations for a given case/ question aided by outline and well chosen photographs for quick industry reference / concept reference."

CROSSWORD SOLUTION – OCTOBER 2021

[1]A	[2]C	[3]Q	U	[4]I	[5]S	[6]I	[7]T	[8]I	[9]O	N	
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CA INTERMEDIATE (NEW) PAPER 3- COST AND MANAGEMENT ACCOUNTING

Different Industries follow different method of Costing as the nature of their work varies. A Chartered Accountant will be associated with various industries, hence it is of paramount importance that a CA student must be familiar with method of costing followed by these Industries. This edition of Cost and Management Accounting capsule covers the topic Unit & Batch Costing, Job & Contract Costing, Activity Based Costing (ABC), Joint Products & By-products. Brief overview of the topics is given as follows for quick recapitulation: Industries like paper, cement, mining, etc. follows unit costing where output produced is identical and each unit of output requires identical cost, while batch costing is followed where products are manufactured in predetermined lots known as batches like in case of pen manufacturing industry, vaccine manufacturing etc. The job costing method is also applicable to industries in which production is carried out to accomplish a specific Job, while contract costing is followed where job is relatively at larger scale and takes longer than a year to complete like in case of construction of building, setting up plants. ABC is an approach followed while allocating cost to cost object based on cost drivers. The joint product costs are the expenditures incurred up-to the point of separation, however, its apportionment may be done based on different methods like physical units method, net realisable value at split-off point, etc.

UNIT & BATCH COSTING

Points of Discussion

- **Methods of Costing**
  - **Unit Costing**
    - Meaning
    - Process of Cost Accumulation and Calculation
  - **Batch Costing**
    - Meaning
    - Process of Cost Accumulation and Calculation
    - Determination of Economic Batch Quantity (EBQ)
    - Difference between Job and Batch Costing

UNIT COSTING

Meaning of Unit Costing

UNIT COSTING

- **where the output produced is identical and each unit of output requires identical cost.**
- **also known as single or output costing.**
- **applied in industries like PAPER, CEMENT, STEEL WORKS, MINING, BREWERIES ETC.**

Here, costs are collected and analysed element wise and then total cost per unit is ascertained as follows:

$$\textbf{Cost per unit} = \frac{\text{Total cost of production}}{\text{No. of units produced}}$$

COST COLLECTION PROCEDURE IN UNIT COSTING

Collection of Materials Cost

- It is collected from Material Requisition notes.
- Accumulated material cost is then posted in cost accounting system.

Collection of Employees (labour) Cost

- **Direct employee cost:** It is collected from job time cards or sheets.
- The time booked/ recorded is valued at appropriate rates and entered in the cost accounting system.
- **Indirect employee costs:** These are collected from the payrolls books and posted against standing order or expenses code numbers in the overhead expenses ledger.

Collection of Overheads

- These are collected under suitable standing orders numbers, and selling and distribution overheads against cost accounts numbers.
- Total expenses so collected are apportioned to service and production departments on some suitable basis.
- The expenses of service departments are finally transferred to production departments.
- The total overhead of production departments is then applied to products on some realistic basis, e.g. machine hour; labour hour etc.

Image source: https://metry.io/en/cost-collection-from-invoices/

TREATMENT OF SPOILED AND DEFECTIVE WORK

Loss due to normal reasons

- Actual number of defectives is **within the normal limit** → Cost of rectification or loss will be **charged to the entire output**
- Number of defective units substantially **exceeds the normal limits** → Cost of rectification or loss beyond normal limits are **written off in Costing Profit and Loss Account**

Loss due to abnormal reasons

- Cost of rectification and loss is treated as abnormal cost and is **written off as loss in Costing Profit and Loss Account**.

BATCH COSTING

Meaning of Batch Costing

BATCH COSTING

- is a type of specific order costing where articles are manufactured in predetermined lots, known as batch.
- the cost object for cost determination is a batch for production.
- example PEN MANUFACTURING INDUSTRY

A batch consists of certain number of units which are PROCESSED SIMULTANEOUSLY. Under this method of manufacturing, the inputs are accumulated in the assembly line till it reaches minimum batch size. Soon after a batch size is reached, all inputs in a batch is processed for further operations.

COSTING PROCEDURE IN BATCH COSTING

Material cost	On the basis of material requisitions for the batch.
Labour cost	Multiplying the time spent on the batch by direct workers as ascertained from time cards or job tickets.
Overheads	Absorbed on some suitable basis like machine hours, direct labour hours etc.

ECONOMIC BATCH QUANTITY (EBQ)

Primarily, the total production cost under batch production comprises of two main costs, namely,

Machine Set Up Costs + Inventory holding costs

Balancing Machine set up cost and Inventory holding cost

Higher lot size

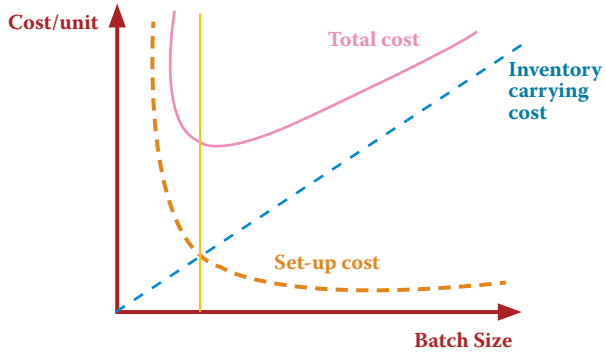
- **Set up cost** may **decline** due to lesser number of set ups.
- But units in inventory will go up leading to **higher holding costs**

- **Lower inventory holding costs.**
- But **higher set up costs** due to high number of set ups.

Lower lot size

ECONOMIC BATCH QUANTITY (EBQ)

- It is the size of a batch where total cost of set-up and holding costs are at minimum.



Determination of EBQ

By calculating the total cost for a series of possible batch sizes and checking which batch size gives the minimum cost.

Mathematical formula:

$$EBQ = \sqrt{\frac{2DS}{C}}$$

Where, D = Annual demand for the product
S = Setting up cost per batch
C = Carrying cost per unit of production

DIFFERENCE BETWEEN JOB AND BATCH COSTING

Sr. No	Job Costing	Batch Costing
1	Used for **non- standard and non- repetitive products** produced as per customer specifications and against specific orders.	**Homogeneous products** produced in a continuous production flow in lots.
2	**Cost determined for each Job.**	**Cost determined in aggregate** for the entire Batch and then arrived at on per unit basis.
3	Jobs are different from each other and independent of each other. **Each Job is unique.**	Products produced in a batch are homogeneous and **lack of individuality**.

JOB AND CONTRACT COSTING

POINTS OF DISCUSSION

Methods of Costing

- **Specific Order Costing**
- **Job Costing**
- **Contract Costing**

JOB COSTING

MEANING OF JOB COSTING

JOB COSTING

- **It is applicable where the work consists of separate contracts, jobs or batches, each of which is authorised by specific order or contract.**
- **Industry example: PRINTING; FURNITURE; HARDWARE; SHIP-BUILDING; HEAVY MACHINERY; INTERIOR DECORATION.**

PRINCIPLES OF JOB COSTING

- **Analysis and ascertainment of cost of each unit of production**
- **Control and regulate cost**
- **Determine the profitability**

PROCESS OF JOB COSTING

Prepare a **separate cost sheet** for each job

Disclose cost of **materials** issued for the job

Employee costs incurred (on the basis of bill of material and time cards respectively)

When job is completed, **overhead charges** are added for ascertaining total expenditure

SUITABILITY OF JOB COSTING

- **When jobs are executed for different customers according to their specifications.**
- **When no two orders are alike and each order/ job needs special treatment.**
- **Where the work-in-progress differs from period to period on the basis of the number of jobs in hand.**

JOB COST CARD/ SHEET

JOB COST CARD/ SHEET

A cost sheet where,
- **quantity of materials issued,**
- **hours spent by different class of employees,**
- **amount of other expenses and share of overheads**

are recorded.

Format of Job Cost Sheet:

JOB COST SHEET

Description: _____	Job No.: _____
Blue Print No.: _____	Quantity: _____
Material No.: _____	Dateofdelivery: _____
Reference No.: _____	Datecommenced: _____
	Datefinished: _____

Date	Reference	Details	Material	Labour	Overhead
		Total			

Summary of costs	*Estimated (₹)*	*Actual (₹)*
Direct material cost		
Direct wages		
Production overhead		
PRODUCTION COST		
Administration and Selling & Distribution Overheads		
TOTAL COST		
PROFIT/LOSS		
SELLING PRICE		

For the job _____
Units produced _____
Cost/unit _____
Remarks _____
Prepared by: _____
Checked by: _____

COLLECTION OF COSTS FOR A JOB

Materials cost

- Traced to and identified with specific job or work order
- Posted to individual job cost sheets or cards in the work-in-progress ledger
- If the surplus material is utilised on some other job, instead of being returned to the stores first, a material transfer note is prepared.

Labour cost

- Booked against specific jobs in the job time cards or sheets
- Posted to the appropriate job cost card or sheet in work-in-progress ledger

Image source: https://www.dreamstime.com/job-costing-text-paper-sheet-chart-dice-spectacles-pen-laptop-blue-yellow-push-pin-wooden-table-business-banking-image197323655

Overheads

- Manufacturing overheads are collected under suitable standing order numbers
- Selling and distribution overheads are collected against cost accounts numbers
- Total overhead expenses are apportioned to service and production departments on some suitable basis.
- The expenses of service departments are finally transferred to production departments.
- The total production overhead is then applied to products on some realistic basis.

SPOILED AND DEFECTIVE WORK

Meaning

Spoiled work – It is the quantity of production that has been totally rejected and cannot be rectified.

Defective work – It refers to production that is not as perfect as the saleable product but is capable of being rectified

Treatment

- **Where a percentage of defective work is ALLOWED in a particular batch AS IT CANNOT BE AVOIDED.** → The cost of rectification will be charged to the whole job and spread over the entire output of the batch
- **Where defect is DUE TO BAD WORKMANSHIP.** → The cost of rectification shall be written off as a loss being an abnormal cost
- **Where defect is due to the inspection department WRONGLY ACCEPTING INCOMING MATERIAL OF POOR QUALITY.** → Cost of rectification will be charged to the department and will not be considered as cost of manufacture of the batch

ACCOUNTING OF COSTS FOR A JOB

1.	**For purchase of materials**	
	Stores Ledger Control A/c	**Dr.**
	To Cost Ledger Control A/c	
2.	**For the value of direct materials issued to jobs**	
	Work-in-Process Control A/c	**Dr.**
	To Stores Ledger Control A/c	
3.	**For return of direct materials from jobs**	
	Stores Ledger Control A/c	**Dr.**
	To Work-in-Process Control A/c	
4.	**For return of materials to suppliers**	
	Cost Ledger Control A/c	**Dr.**
	To Stores Ledger Control A/c	
5.	**For indirect materials**	
	Factory Overhead Control A/c	**Dr.**
	To Stores Ledger Control A/c	
6.	**For wages paid**	
	Wages Control A/c	**Dr.**
	To Cost Ledger Control A/c	

7.	**For direct wages incurred on jobs**	
	Work-in-Process Control A/c	**Dr.**
	To Wages Control A/c	
8.	**For indirect wages**	
	Factory Overhead Control A/c	**Dr.**
	To Wages Control A/c	
9.	**For any indirect expense paid**	
	Factory Overhead Control A/c	**Dr.**
	To Cost Ledger Control A/c	
10.	**For charging overhead to jobs**	
	Work-in-Process Control A/c	**Dr.**
	To Factory Overhead Control A/c	
11.	**For the total cost of jobs completed**	
	Cost of Sales A/c	**Dr.**
	To Work-in-Progress Control A/c	
12.	**The balance of Cost of Sales A/c is transferred to Costing Profit and Loss A/c;** For such transfer	
	Costing Profit and Loss A/c	**Dr.**
	To Cost of Sales A/c	
13.	**For the sales value of jobs completed**	
	Cost Ledger Control A/c	**Dr.**
	To Costing Profit and Loss A/c	

ADVANTAGES AND DISADVANTAGES OF JOB COSTING

Advantages

- **Details of Cost of material, labour and overhead for all job is available to control.**
- **Profitability of each job can be derived.**
- **Facilitates production planning.**
- **Budgetary control and Standard Costing can be applied in job costing.**
- **Spoilage and detective can be identified and responsibilities can be fixed accordingly.**

Dis-advantages

- **It is costly and laborious method.**
- **Chances of error is more as lot of clerical process is involved.**
- **This method not suitable in inflationary condition.**
- **Previous records of costs will be meaningless if there is any change in market condition.**

DIFFERENCE BETWEEN JOB COSTING AND PROCESS COSTING

Job Costing	Process Costing
A Job is carried out by specific orders.	Process of producing the product has a continuous flow and the product produced is homogeneous.
Costs determined for each job.	Costs are compiled on time basis i.e., for each process or department.
Each job is separate and independent.	Products lose their individual identity.
Each job has a number and costs are collected against the same job number.	The unit cost of process is an average cost for the period.
Costs are computed when a job is completed.	Costs are calculated at the end of the cost period.
More managerial attention is required for effective control.	Control here is comparatively easier.

CONTRACT COSTING

MEANING OF CONTRACT COSTING

CONTRACT COSTING

- **It is a form of specific order costing where job undertaken is relatively large and normally takes period longer than a year to complete.**
- **Adopted by the contractors engaged in contracts like CONSTRUCTION OF BUILDING, ROAD, BRIDGE, ERECTION OF TOWER ETC.**

FEATURES OF CONTRACT COSTING

- **Work in contract is ordinarily carried out at the site of the contract.**
- **Separate account is usually maintained for each contract.**
- **Bulk of the expenses incurred are considered as direct.**
- **Number of contracts undertaken by a contractor at a time is usually few.**
- **Indirect expenses mostly consist of office expenses, stores and works.**
- **Cost unit in contract costing is the contract itself.**

TERMS USED IN CONTRACT COSTING

(i) Work-in-Progress

Work-in-Progress

The contract which is not complete at the reporting date. It includes:

- **Cost of work completed (certified and uncertified)**
- **Cost of work not yet completed**
- **Amount of estimated/ notional profit**

(ii) Cost of Work Certified or Value of Work Certified

Expert, based on his assessment, certifies the work completion in terms of percentage of total work.
Cost or value of certified portion is calculated and is known as Cost of work certified or Value of work certified respectively.

(a) Value of Work Certified = Value of Contract × Work certified (%)
(b) Cost of Work Certified = Cost of work to date – (Cost of work uncertified + Material in hand + Plant at site)

(iii) Cost of Work Uncertified

Cost of the work carried out but not certified by the expert.

Always shown at cost price.

The cost of Work Uncertified may be ascertained as follows:

	(₹)	(₹)
Total cost to date		xxx
Less: Cost of work certified	xxx	
Material in hand	xxx	
Plant at site	xxx	xxx
Cost of work uncertified		xxx

(iv) Progress Payment

Progress payment = Value of work certified – Retention money – Payment to date

(v) Retention Money

Retention Money = Value of work certified – Payment actually made

(vi) Cash Received

Cash received = Value of work certified – Retention money

(vii) Notional Profit

Notional profit = Value of work certified – Cost of work to date – Cost of work not yet certified

(viii) Estimated Profit

Estimated Profit = Contract price – Estimated total cost

SPECIMEN OF CONTRACT ACCOUNT (with few items)

The cost of Work Uncertified may be ascertained as follows:

	Particulars	(₹)		Particulars	(₹)
To	Materials	xxx	By	Plant at site c/d	xxx
”	Wages	xxx	”	Work-in-progress c/d:	xxx
”	Direct expenses	xxx		- Work certified	xxx
”	Indirect expenses	xxx		- Work uncertified	xxx
”	Plant and Machinery	xxx	”	Costing P&L A/c (b/f) (If Loss)	xxx
”	Cost of Sub-Contract	xxx			
”	Costing P&L A/c (b/f) (If Profit)	xxx			
		XXX			XXX

COST PLUS CONTRACT

Cost- Plus Contract: When the value of the contract is determined by adding an agreed percentage of profit to the total cost.

ADVANTAGES AND DISADVANTAGES OF COST PLUS CONTRACT

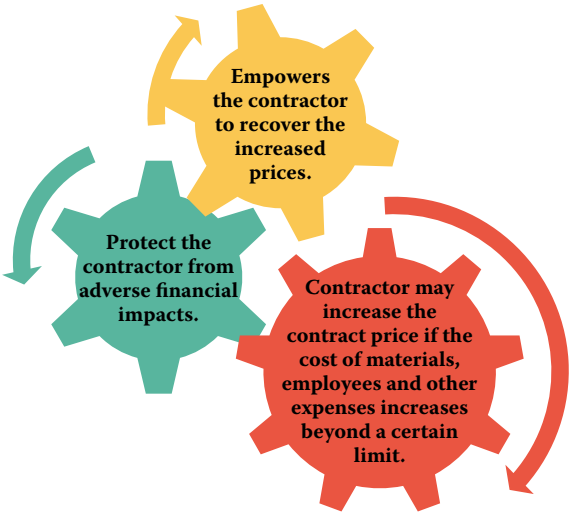
ADVANTAGES

- Contractor is assured of a fixed percentage of profit.
- Useful when work to be done is not definitely fixed at the time of making the estimate.
- Contractee can ensure himself about 'the cost of the contract', as he is empowered to examine the books and documents of the contractor.

DISADVANTAGES

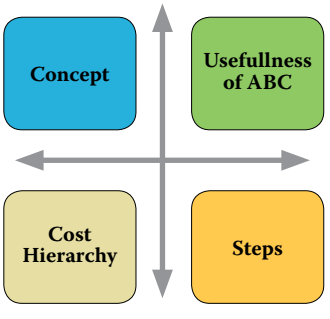
- Contractor may not have any inducement to avoid wastages and effect economy in production to reduce cost.

ESCALATION CLAUSE



ACTIVITY BASED COSTING

POINTS OF DISCUSSION

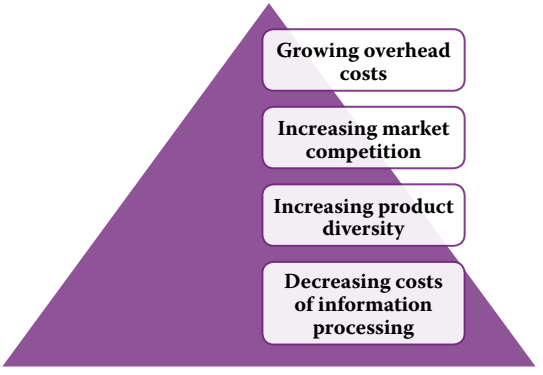


MEANING OF ACTIVITY BASED COSTING

ACTIVITY BASED COSTING (ABC)

- Accounting methodology that assigns costs to activities rather than products or services.
- Costs are assigned based on their use of resources.
- Creates a LINK BETWEEN THE ACTIVITY (resource consumption) and the COST OBJECT.
- Useful to the ORGANIZATION WITH MULTIPLE PRODUCTS.

FACTORS PROMPTING DEVELOPMENT OF ABC



USEFULNESS/SUITABILITY OF ABC

ABC is particularly needed in the following situations:			
High amount of overhead	Wide range of products	Presence of non-volume related activities	Stiff competition

ADVANTAGES AND DISADVANTAGES OF ABC

ADVANTAGES

- More accurate costing.
- Overhead allocation is done on logical basis.
- Enables better pricing policies.
- Utilizes unit cost rather than just total cost.
- Help to identify non-value added activities.
- Helpful to the organizations with multiple products.
- Highlights problem areas which require attention of the management.

DISADVANTAGES

- Expensive.
- Not helpful to the small organizations.
- May not be applied to organizations with limited products.
- Selection of the most suitable cost driver may be difficult or complicated.

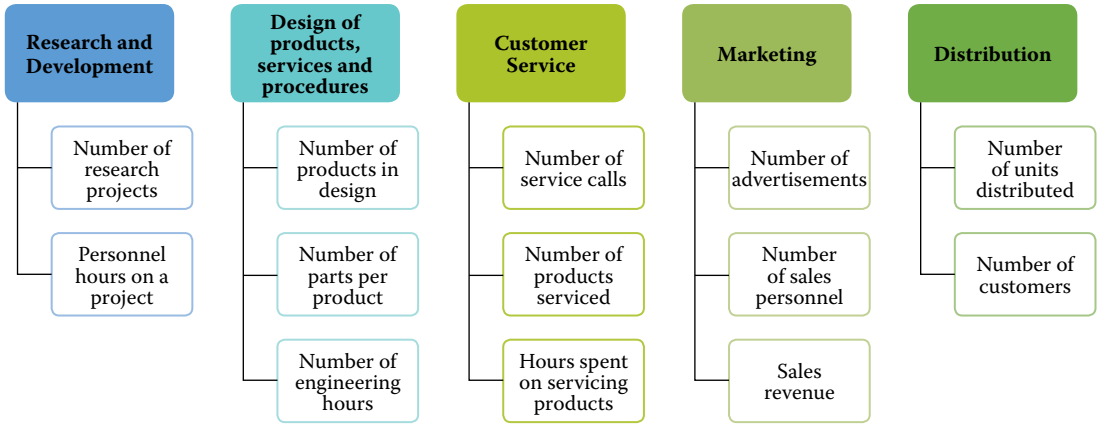
TERMS USED

(i) Activity
- Event that incurs cost.

(ii) Cost Object
- An item for which cost measurement is required

(iii) Cost Driver
- Factor that causes a change in the cost of an activity-
  - **Resource cost driver:** Measure of the quantity of resources.
  - **Activity cost driver:** Measure of the frequency and intensity of demand.

Examples of Cost Driver business function wise:

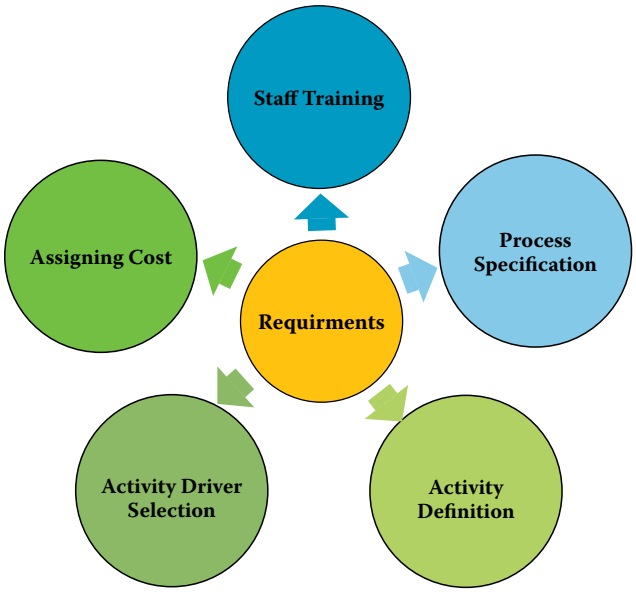


(iv) Cost Pool

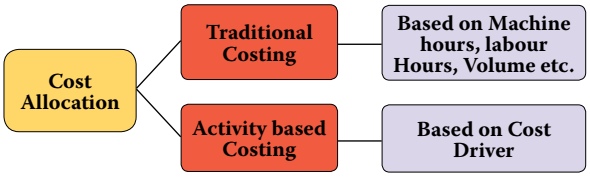
- Group of various individual cost items.
- Example machine set-up.

COST ALLOCATION

REQUIREMENTS IN ABC IMPLEMENTATION



TRADITIONAL ABSORPTION COSTING VS ABC



Activity Based Costing	Traditional Absorption Costing
Related to activities	Related to cost centers
More realistic	Not realistic
Activity–wise cost drivers	Time (hours) - only cost driver
Cost are assigned to cost objects	Costs are assigned to cost units
Aids cost control	Not suitable for cost control.

LEVEL OF ACTIVITIES UNDER ABC METHODOLOGY/COST HIERARCHY

Unit level activities	
Activities which can be identified with the number of units produced.	**- Indirect materials/ consumables** **- Inspection or testing of every item produced**

Batch level activities	
Activities which are performed each time a batch of goods is produced.	**- Material ordering** **- Machine set-up costs**

Product level activities	
Activities which are performed to support different products in product line.	**- Designing the product** **- Producing parts specifications**

Facilities level activities	
Activities which are common and joint to all products manufactured.	**- Maintenance of buildings** **- Plant security**

STAGES IN ACTIVITY BASED COSTING (ABC)

Identify different activities within the organisation

Break the organisation down into many very small activities.

Relate the overheads to the activities

This creates 'cost pools' or 'cost buckets'.

Support activities are then spread across the primary activities

Where base is the cost driver measuring, how the support activities are used.

Determine the activity cost drivers

To relate the overheads collected in cost pools to the cost objects.

Calculate activity cost driver rates

Calculate activity cost driver rates for each activity

$$\text{Activity cost driver rate} = \frac{\text{Total cost of activity}}{\text{Activity driver}}$$

EXAMPLES OF COST DRIVERS

Overhead Costs

ACTIVITY COST POOL	COST DRIVERS
Ordering and Receiving Materials cost	Number of purchase orders
Setting up machines costs	Number of set-ups
Machining costs	Machine hours
Assembling costs	Number of parts
Inspecting and testing costs	Number of tests
Painting costs	Number of parts
Supervising Costs	Direct labour hours
Delivery cost	Number of deliveries
Shelf-stocking cost	Shelf-stocking hours
Customer Support	Number of items sold

HOW TO CALCULATE COST PER PRODUCT USING ABC?

If it is given that,

Activity	Cost (₹)
Ordering	64,000
Delivery	1,40,000
Shelf stocking	80,000

Particulars	Product 1	Product 2
No. of Purchase Orders	30	50
No. of Deliveries	110	90
Shelf Stocking Hours	220	180

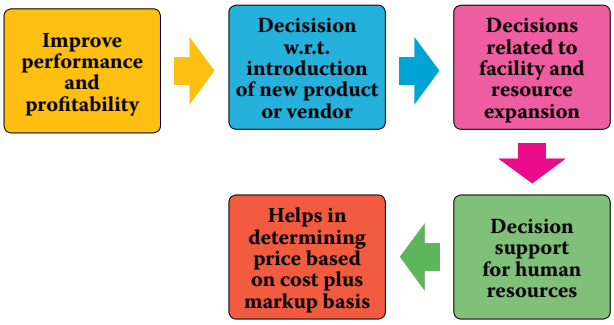
Image source: https://www.dreamstime.com/photos-images/activity-based-costing.html

Then, cost per product as per ABC

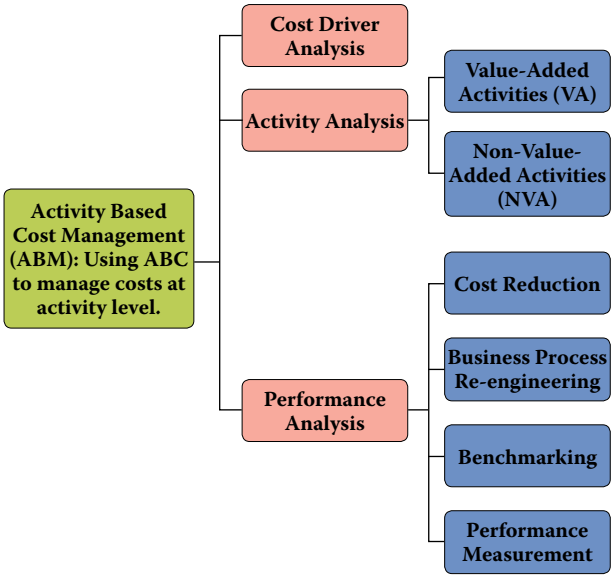
Activity	Total Cost (₹)	Cost Driver	Cost Driver Level	Cost Driver Rate (₹)	Product 1 (₹)	Product 2 (₹)
(a)	(b)	(c)	(d)	(e) = (b)/(d)	(f)	(g)
Ordering	64,000	No. of Purchase Orders	80 (30+50)	800	24,000 (800 x 30)	40,000 (800 x 50)
Delivery	1,40,000	No. of Deliveries	200 (110 + 90)	700	77,000 (700 x 110)	63,000 (700 x 90)
Shelf stocking	80,000	Shelf Stocking Hours	400 (220 +180)	200	44,000 (200 x 220)	36,000 (200 x 180)

PRACTICAL APPLICATIONS OF ACTIVITY BASED COSTING

As a Decision-Making Tool



As Activity Based Management



Facilitate Activity Based Budgeting (ABB)

It analyses the resource input or cost for each activity.
It is the reversing of the ABC process to produce financial plans and budgets.

Key Elements

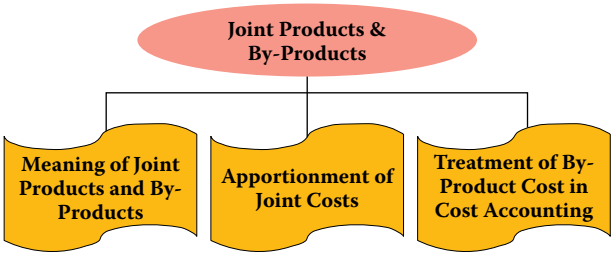
- Type of work to be done
- Quantity of work to be done
- Cost of work to be done

Benefits

- Enhance accuracy of financial forecasts
- Increasing management understanding
- Rapidly and accurately produce financial plans
- Eliminates much of the needless rework

JOINT PRODUCTS AND BY PRODUCTS

POINTS OF DISCUSSION

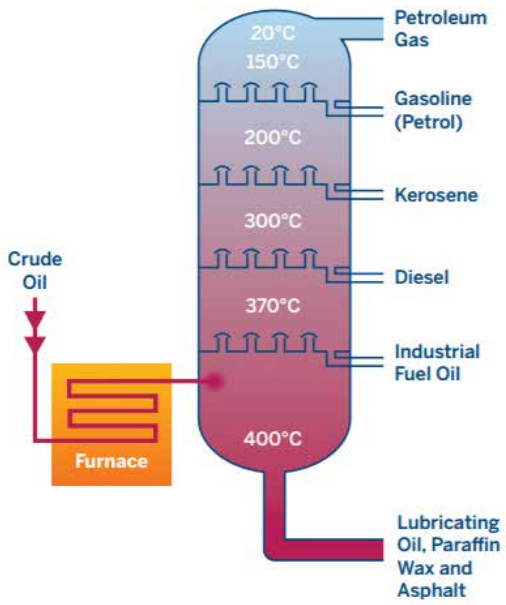


MEANING OF JOINT PRODUCTS AND BY-PRODUCTS

Joint Products* — Two or more products separated in the course of same processing operation.

By-Products# — Products recovered from-
- material discarded in main process.
- production of some major products.

*OIL INDUSTRY PRODUCING JOINT PRODUCTS using crude petroleum like gasoline, fuel oil, lubricants, paraffin, asphalt, kerosene etc.



Petroleum Refining Processes[1]

 # MOLASSES IS PRODUCED AS A BY-PRODUCT in the process of sugar manufacturing

Sugar Manufacturing Process[2]

Point at which products are separated from the main product is known as SPLIT-OFF POINT.

DISTINCTION BETWEEN JOINT PRODUCTS AND BY-PRODUCTS

JOINT PRODUCTS	BY-PRODUCTS
• Equal importance. • Produced simultaneously.	• Small economic value. • Incidental to the main product.

[1] *Image source: https://www.cmegroup.com/education/courses/introduction-to-refined-products/a-look-into-the-refining-process.html*

[2] *Image source: http://www.sustainablesugar.eu/molasses*

CO-PRODUCTS

CO-PRODUCTS

Joint products and co-products are used synonymously, but a **distinction is there**.

Co-products are the two or more products which are **contemporary but** do **not** emerge necessarily **from the same material in the same process**.

For instance,

wheat and gram produced in two separate farms with separate processing of cultivation are co-products.	**Timber boards** made from different trees are co-products.

METHODS OF APPORTIONMENT OF JOINT COST TO JOINT PRODUCTS

Methods for apportioning joint cost

- **Physical Units Method**
- **Net Realisable Value at split-off point**
- **Using Technical Estimates**
- **Other methods**
  - **Market value at the point of separation**
  - **Market value after further processing**
  - **Average unit cost method**
  - **Contribution margin method**

Physical Units Method:

Joint costs here are apportioned on the basis of some **physical base, such as weight, numbers etc.**

Net Realisable Value at Split-off Point Method:

Joint costs here are apportioned on the basis of **Net Realisable Value at Split-off Point.**

NET REALISABLE VALUE AT SPLIT-OFF POINT

- **sales value of joint products after processing**
- **Estimated profit margins**
- **Selling and distribution expenses**
- **Post split- off costs**

Using Technical Estimates:

This method is used WHEN-

Result obtained by above methods does not match with the resources consumed by joint products, or;

Realisable value of the joint products are not readily available.

Other Methods:

(i) Market value at the point of separation

Useful method where further processing costs are incurred disproportionately.

To determine the apportionment of joint costs over joint products, a multiplying factor is determined as follows:

$$\text{Multiplying factor: } \frac{\text{Joint Cost}}{\text{Total Sales Revenue}} \times 100$$

Alternatively, joint cost may be apportioned in the ratio of sales values of different joint products.

(ii) Market value after further processing

Basis of apportionment of joint cost is the total sales value of finished products.

Use of this METHOD IS UNFAIR WHERE-

Further processing costs after the point of separation are disproportionate, or;

All the joint products are not subjected to further processing.

(iii) Average Unit Cost Method

$$\text{Average unit cost} = \frac{\text{Total process cost (up to the point of separation)}}{\text{Total units of joint product produced}}$$

Physical unit method also follows the same steps of calculation as followed under Average unit cost method, ultimately giving the same outcome.

(iv) Contribution Margin Method

Joint costs segregated into two parts
- **Variable**
- **Fixed**

Variable costs

Apportioned on the basis of units produced (average method or physical quantities)	In case products are further processed after point of separation, then all variable cost incurred be added to the variable costs determined earlier.

Total variable cost is arrived which is deducted from their respective sales values to **ascertain their contribution**.

Fixed costs

Thereafter, fixed costs are **apportioned** over the joint products **on the basis of the contribution ratios**.

METHODS OF APPORTIONMENT OF JOINT COST TO BY-PRODUCTS

Methods for apportioning joint cost
- **Net Realisable Value method**
- **Standard cost in Technical Estimates**
- **Comparative price**
- **Re-use basis**

Net Realisable Value method:

No further processing required	Further processing required
Realisation on the disposal of the by-product deducted from the total cost of production.	Additional expenses so incurred be deducted from the total value realised from the sale of the by-product.

Only the net realisations be deducted from the total cost of production to arrive at the cost of production of the main product.

Standard cost in Technical Estimates:

This method may be adopted where by-product is not saleable.

It may be valued at standard costs.

Standard cost may be determined by averaging costs recorded in the past and making technical estimates of the number of units of original raw material going into the main product and the number forming the by-product; or by adopting some other consistent basis.

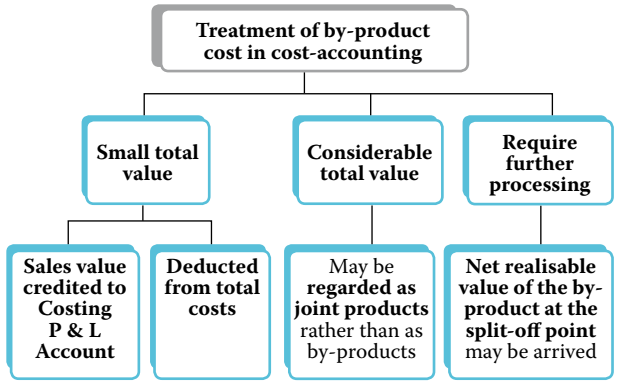
Comparative price:

Value of by-product is ascertained with reference to the price of -	
Similar material, or;	Alternative material

Re-use basis:

Sometimes, by-product may be of such a nature that it can be reprocessed in the same process as part of the input of the process.	
In that case, **value put on by-product should be same as that of the materials introduced into the process.**	However, **if the by-product can be put into an earlier process only**, the **value** should be the **same as for the materials introduced into the process**.

TREATMENT OF BY-PRODUCT COST IN COST-ACCOUNTING



FINANCE UPDATES

SEBI plans to come out with framework for SPACs

Capital market regulator Securities Exchange Board of India (SEBI) is planning to come out with framework on special purpose acquisition companies (SPACs), which will enable listing of startups on domestic stock exchanges.

https://www.moneycontrol.com/news/business/markets/sebi-plans-to-come-out-with-framework-for-spacs-7084751.html

SEBI approves framework for creating Social Stock Exchange

The SEBI approved the creation of a Social Stock Exchange and its framework in its board meeting held.

The SEBI said that it will engage with NABARD, SIDBI and stock exchanges to create a capacity-building fund of Rs. 100 crore.

https://economictimes.indiatimes.com/markets/stocks/news/sebi-approves-framework-for-creating-social-stock-exchange/articleshow/86586140.cms

SEBI board approves proposal to amend de-listing framework

The SEBI board has approved proposal to amend de-listing framework after open offer. The revised framework aims to make M&A transactions for listed companies a more rational and convenient exercise, balancing the interest of all investors in the process.

https://www.livemint.com/market/stock-market-news/sebi-board-approves-proposal-to-amend-de-listing-framework-11632826782740.html

New swing pricing norms for Debt Funds

In order to discourage large redemptions from open-ended debt mutual funds, the SEBI has now issued rules for swing pricing mechanism. It will prevent large investors from exiting a fund during market panic and prevent collapse in the scheme's Net Asset Value (NAV).

https://www.financialexpress.com/money/mutual-funds/mutual-funds-new-swing-pricing-norms-for-debt-funds/2342101/

SEBI notifies rules for entities with listed debt securities

The regulator had merged ILDS (Issue and Listing of Debt Securities) Rules and NCRPS (Non-Convertible Redeemable Preference Shares) Rules into a single Regulation to be called SEBI (Issue and Listing of Non-Convertible Securities) Regulations.

https://economictimes.indiatimes.com/markets/bonds/sebi-notifies-rules-for-entities-with-listed-debt-securities/articleshow/86049287.cms

SEBI tweaks norms for REITs, InvITs on exit option for dissenting unit holders

Markets regulator SEBI has tweaked regulations for Real Estate Investment Trusts (REITs) and Infrastructure Investment Trusts (InvITs) regulations with respect to exit option for dissenting unit holders in various scenarios, including acquisition and change in sponsors.

https://economictimes.indiatimes.com/markets/stocks/news/sebi-tweaks-norms-for-reits-invits-on-exit-option-for-dissenting-unit-holders/articleshow/86792343.cms

Axis Bank is the first Indian private bank to do a term SOFR trade finance deal

Axis Bank has become the first Indian private sector bank to arrange a term Secured Overnight Financing Rate (SOFR) linked trade financing deal, joining a select group of banks and financial institutions globally who have executed similar transactions.

https://www.livemint.com/companies/news/axis-bank-is-the-first-indian-private-bank-to-do-a-term-sofr-trade-finance-deal-11633431996239.html

SEBI paves way for launch of gold exchange, approves framework

The SEBI has approved a framework for the establishment of Gold Exchange during its board meeting.

The board approved the Gold Exchange and SEBI Vault Managers Regulations, 2021 that allow bourses to set up a gold exchange in India.

https://economictimes.indiatimes.com/markets/commodities/news/sebi-paves-way-for-launch-of-gold-exchange-approves-framework/articleshow/86585833.cms

Regulators, shareholders nudge companies to boost ESG scores

Indian businesses are racing to adopt environmental, social and governance (ESG) norms on rising pressure from investors and regulators.

https://www.livemint.com/companies/news/regulators-shareholders-nudge-companies-to-boost-esg-scores-11624820356251.html

CA FOUNDATION - PAPER 3 - BUSINESS MATHEMATICS, LOGICAL REASONING AND STATISTICS

This capsule on Foundation - Paper 3 - Business Mathematics, Logical Reasoning and Statistics , will enable the students to understand and apply the techniques of developing discrete and continuous probability distributions.

Chapter 17 : Theoretical Distributions

In this chapter we will discuss the probability theory by considering a concept and analogous to the idea of frequency distribution. In frequency distribution where to the total frequency to different class intervals, the total probability (i.e. one) is distributed to different mass points is known as theoretical probability distributions.

- Discrete Random variable.
- Continues Random variable.

Importance of theoretical probability distribution.☛:

(a) An observed frequency distribution, in many a case, may be regarded as a sample i.e. a representative part of a large, unknown, boundless universe or population and we may be interested to know the form of such a distribution.
For Example: By fitting a theoretical probability distribution.
- Length of life of the lamps produced by manufacturer up to a reasonable degree of accuracy.
- The effect of a particular type of missiles, it may be possible for our scientist to suggest the number of such missiles necessary to destroy an army position.
- By knowing the distribution of smokers, a social activist may warn the people of a locality about the nuisance of active and passive smoking and so on.

(b) Theoretical probability distribution may be profitably employed to make short term projections for the future.

(c) Statistical analysis is possible only on the basis of theoretical probability distribution.

A probability distribution also possesses all the characteristics of an observed distribution. We define population mean, population median, population mode, population standard deviation etc. exactly same way we have done earlier. These characteristics are known as population parameters.

A probability distribution may be either a discrete probability distribution or a Continuous probability distribution depending on the random variable under study.

Two important discrete probability distributions

(a) Binomial Distribution
(b) Poisson distribution.

Important continuous probability distribution

Normal Distribution

Binomial Distribution

One of the most important and frequently used discrete probability distribution is Binomial Distribution. It is derived from a particular type of random experiment known as Bernoulli process named after the famous mathematician Bernoulli. Noting that a 'trial' is an attempt to produce a particular outcome which is neither certain nor impossible, the characteristics of Bernoulli trials are stated below:

(i) Each trial is associated with two mutually exclusive and exhaustive outcomes, the occurrence of one of which is known as a 'success' and as such its non occurrence as a 'failure'. As an example, when a coin is tossed, usually occurrence of a head is known as a success and its non–occurrence i.e. occurrence of a tail is known as a failure.

(ii) The trials are independent.

We may note the following important points in connection with binomial distribution:

(a) As $n > 0$, $p, q \geq 0$, it follows that $f(x) \geq 0$ for every x
Also $\sum f(x) = f(0) + f(1) + f(2) + \ldots + f(n) = 1$

(b) Binomial distribution is known as biparametric distribution as it is characterised by two parameters n and p. This means that if the values of n and p are known, then the distribution is known completely.

(c) The mean of the binomial distribution is given by $\mu = np$

(d) Depending on the values of the two parameters, binomial distribution may be unimodal or bi- modal., the mode of binomial distribution, is given by μ_0 = the largest integer contained in $(n+1)p$
if $(n+1)p$ is a non-integer $(n+1)p$ and $(n+1)p - 1$ if $(n+1)p$ is an integer

(e) The variance of the binomial distribution is given by
$\sigma^2 = npq$
Since p and q are numerically less than or equal to 1, $npq < np$
variance of a binomial variable is always less than its mean.
Also variance of X attains its maximum value at $p = q = 0.5$ and this maximum value is $n/4$.

(f) Additive property of binomial distribution.
If X and Y are two independent variables such that
$X \sim \beta(n_1, P)$
and $Y \sim \beta(n_2, P)$
Then $(X+Y) \sim (n_1 + n_2, P)$

Applications of Binomial Distribution

Binomial distribution is applicable when the trials are independent and each trial has just two outcomes success and failure. It is applied in coin tossing experiments, sampling inspection plan, genetic experiments and so on.

Poisson Distribution

Poisson distribution is a theoretical discrete probability distribution which can describe many processes. Simon Denis Poisson of France introduced this distribution way back in the year 1837.

Poisson Model

Let us think of a random experiment under the following conditions:

I. The probability of finding success in a very small time interval (t, t + dt) is kt, where k (>0) is a constant.

II. The probability of having more than one success in this time interval is very low.

III. The probability of having success in this time interval is independent of t as well as earlier successes.

The above model is known as Poisson Model. The probability of getting x successes in a relatively long time interval T containing m small time intervals t i.e. T = mt. is given by

$$\frac{e^{-kt}.(kt)^x}{x!} \quad \text{for } x = 0, 1, 2, \ldots\ldots\ldots\ldots$$

Taking kT = m, the above form is reduced to

$$\frac{e^{-m}.m^x}{x!} \quad \text{for } x = 0, 1, 2, \ldots\ldots\ldots\ldots$$

Definition of Poisson Distribution

A random variable X is defined to follow Poisson distribution with parameter λ, to be denoted by X ~ P (m) if the probability mass function of x is given by

$$f(x) = P(X = x) = \frac{e^{-m}.m^x}{x!} \text{ for } x = 0, 1, 2, \ldots$$

$$= 0 \quad \text{otherwise}$$

Here e is a transcendental quantity with an approximate value as 2.71828.

Important points in connection with Poisson distribution:

(i) Since $e^{-m} = 1/e^m > 0$, whatever may be the value of m, m > 0, it follows that f (x)≥ 0 for every x.
Also it can be established that $\sum_x f(x) = 1$ i.e. f(0) + f(1) + f(2) +……. = 1

(ii) Poisson distribution is known as a uniparametric distribution as it is characterised by only one parameter m.

(iii) The mean of Poisson distribution is given by m i,e μ = m

(iv) The variance of Poisson distribution is given by $\sigma^2 = m$

(v) Like binomial distribution, Poisson distribution could be also unimodal or bimodal depending upon the value of the parameter m.
We have μ_0 = The largest integer contained in m if m is a non-integer
= m and m−1 if m is an integer

(vi) **Poisson approximation to Binomial distribution**
If n, the number of independent trials of a binomial distribution, tends to infinity and p, the probability of a success, tends to zero, so that m = np remains finite, then a binomial distribution with parameters n and p can be approximated by a Poisson distribution with parameter m (= np).
In other words when n is rather large and p is rather small so that m = np is moderate then β(n, p) ≅ P (m)

(vii) **Additive property of Poisson distribution**
If X and y are two independent variables following Poisson distribution with parameters m_1 and m_2 respectively, then Z = X + Y also follows Poisson distribution with parameter (m_1 + m_2).
i.e. if X ~ P (m_1)
and Y ~ P (m_2)
and X and Y are independent, then
Z = X + Y ~ P (m_1 + m_2)

Application of Poisson distribution

Poisson distribution is applied when the total number of events is pretty large but the probability of occurrence is very small. Thus we can apply Poisson distribution, rather profitably, for the following cases:

a) The distribution of the no. of printing mistakes per page of a large book.
b) The distribution of the no. of road accidents on a busy road per minute.
c) The distribution of the no. of radio-active elements per minute in a fusion process.
d) The distribution of the no. of demands per minute for health centre and so on.

Normal or Gaussian distribution

The two distributions discussed so far, namely binomial and Poisson, are applicable when the random variable is discrete. In case of a continuous random variable like height or weight, it is impossible to distribute the total probability among different mass points because between any two unequal values, there remains an infinite number of values. Thus a continuous random variable is defined in term of its probability density function f (x), provided, of course, such a function really exists, f (x) satisfies the following condition:

$$f(x) \geq 0 \text{ for } x(-\infty,\infty) \text{ and } = \int_{-\infty}^{+\infty} f(x) = 1$$

The most important and universally accepted continuous probability distribution is known as normal distribution. Though many mathematicians like De-Moivre, Laplace etc. contributed towards the development of normal distribution, Karl Gauss was instrumental for deriving normal distribution and as such normal distribution is also referred to as Gaussian Distribution.

A continuous random variable x is defined to follow normal distribution with parameters μ and σ^2, to be denoted by

$$X \sim N(\mu, \sigma^2)$$

If the probability density function of the random variable x is given by

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}}.e^{-(\bar{x}-\mu)^2/2\sigma^2} \quad \text{for } -\infty<x<\infty$$

where μ and σ are constants, and > 0

To be continued in the next capsule

"Don't judge each day by the harvest you reap but by the seeds that you plant."
- Robert Louis Stevenson

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Commenced on 25th October 2021

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Timings

Session 1	Session 2
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Akola Branch of WICASA of ICAI organises Student Meet with Honorable President of ICAI

▲ CA. Nihar N Jambusaria, President, ICAI with the CA Students in a group photograph of Akola Branch along with CA. Manish Gadia, Chairman, WIRC of ICAI and CA. Keyur Dedhia, Chairman, Akola Branch and other Managing Committee Members of Branch. (21-09-2021)

▼ A Group Photograph of CA. Nihar N Jambusaria, President, ICAI with the CA Students of Akola Branch along with CA. Keyur Dedhia, Chairman, Akola Branch and other Managing Committee Members of Akola Branch. (21-09-2021)

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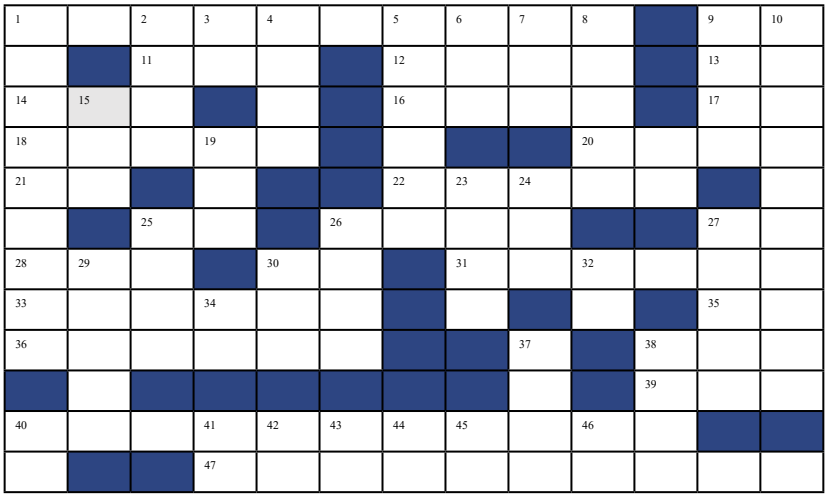

ACROSS

1. Agreements between competitors operating at the same level in the economic process.
9. An American multinational company best known for Power, Renewable Energy, Aviation and Healthcare industries.
11. An abstract model of a computer
12. Abbre: Indiana Worker's Compensation Institute
13. _____stands for "ante meridiem
14. _____a worldwide leading supplier of mechanical fastening systems, assemblies, precision moulded parts and logistics solutions
16. _____technologies is a custom software development company.
17. _____is the symbol of titanium
18. _____a famous food item
20. _____may be used in military operations which means tactical fighter training group.
21. _____a major river in Russia.
22. RoC can extend holding of AGM for _____ months.
25. An American medical drama television series
26. _____is designed to introduce the junior Officer Cadet to the high pace and heavy workload of military life
27. _____was formed by a group of motoring enthusiasts in London
28. An office under the Indian Ministry of Corporate Affairs that deals with administration of the Companies Act, 2013
30. An American non-profit organization and international network devoted to educational access and expanding the range of creative works available for others to build upon legally and to share
31. _____in accounting, is an income distributed to the owner in a profitable market production process.
33. A company founded by Jeff Bezos.
35. _____is very important in analysing trends, helping you forecast the future and solving any problems you identify
36. A ___ is an agreement that unites two existing companies into one new company
38. _____refers to a senior executive responsible for managing the financial actions of a company.
39. A nine-digit number issued to U.S. citizens, permanent residents under Social Security Act.
40. _____illustrates a theoretical relationship between rates of taxation and the resulting levels of the government's tax revenue
47. _____is payment of part of the revenues or profits from a sale or deal that is paid to the person who arranged or facilitated the deal.

DOWNWARD

1. An approximate representation of the distribution of numerical data
2. Capital asset pricing method calculates cost of equity based on _____.
3. _____ curve derives from the property that it represents that desired investment equals desired saving
4. A Spanish apparel retailer
5. The time period for completion of fast track CIRP is ----------days from the insolvency commencement date
6. Any mistake apparent from the record, may be rectified from NCLT within period of ____years from the date of the order
7. _____ is tissue that connects the thighbone to the shinbone, at the knee.
8. _____was a Tamil militant organization that was based in north-eastern Sri Lanka.
9. A legal agreement between many countries, whose overall purpose was to promote international trade
10. The act of leaving a resident country or place of residence with the intent to settle elsewhere
15. Something you say that is not true
19. A franchise cricket team representing the city of Kolkata in the Indian Premier League
23. To want something to happen or be true
24. _____is a blood test that looks for antibodies to syphilis.
25. _____is the only research organization dedicated to understanding IT's role in colleges and universities
26 An ___ account is a type of term deposit that NRIs can hold in India in a foreign currency.
27. Abbre: Analytic intrinsic mode functions

29 A Swiss luxury watch manufacturer
30. _____is a process for improving quality by documenting and addressing issues.
32. _____is a command on various operating systems for displaying data in various human-readable output formats
34. _____Staffing Solutions Pvt. Ltd is a fastest growing manpower solutions company
37. A premier institute with the objective of capacity building in remote sensing and Geo-informatics
38. _____is linked to networks of human rights activists, academic professionals, civil society organizations
40. A South Korean multinational electronics company.
41. Fee representing the cost of credit, or the cost of borrowing
42. _____is the world's only peer-to-peer network exclusively for entrepreneurs
43. _____is a leading supplier of technology and resources to the education sector
44. is the selling price per unit minus the variable cost per unit.
45. is the series of screens, pages, and visual elements like buttons and icons that enable a person to interact with a product or service.
46. is often an abbreviation for versus.

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