CFE SDM Model Solutions
Spring 2022

1. **Learning Objectives:**

1. The candidate will understand and apply strategic management concepts and frameworks to corporate financial and ERM business problems.

2. The candidate will understand how sustainable growth and value can be created through strategic budgeting. The candidate will also understand measures of an organization's value and their uses in decision making.

5. The candidate will understand the role that organizational behavior and communication play in organizational decision making and efficacy, as well as learn how ineffective communication is a risk to organizations.

Learning Outcomes:

(1a) Evaluate and apply strategic management concepts, recognizing factors that affect development and implementation of strategies:
- Analyze the firm's external environment and the internal organization.
- Describe and apply strategic management models, including Porter's five forces and value chain analysis.
- Define types of business-level strategies and recommend an appropriate business-level strategy for a given situation.
- Explain the impact of competitive dynamics on strategic management.

(1b) Evaluate commonly used business growth strategies and their application under different economic risk and business environments:
- Critique and evaluate internal/organic and external/inorganic growth strategies.
- Assess and recommend growth strategies under different business situations and market opportunities, utilizing the applicable strategic management models.

(2a) Explain how strategic budgeting can create value and sustainable growth

(2b) Assess how effective strategic budgeting is in tracking progress of an organization's initiatives

(2d) Evaluate and recommend appropriate value measures for an organization

1. Continued

(5a) Apply best practice techniques to structure and communicate ideas logically and persuasively:
  - Explain differences between good and poor communication techniques and their implications
  - Apply techniques to structure ideas logically
  - Develop clear fact-based messages that can be communicated persuasively

Sources:
219-21, Handbook of Budgeting – Ch. 30 ZBB

What Everyone gets wrong about Change Management

Commentary on Question:
Overall, candidates had difficulty applying budgeting and change management concepts to the case study.

Solution:
(a) Big Ben senior management is considering next year's funding goals for the four strategic initiatives: digital banking, cryptocurrency, the insurance opportunity with Darwin, and solar energy financing. Management faces both conflicting demands and limited resources. They decide to focus on making incremental changes from the previous year's expenditure level to set next year's budget.

List the shortfalls under this budgeting approach.

Commentary on Question:
Most candidates were able to list at least one or two shortfalls of incremental budgeting. To receive full marks, candidates needed to list and explain at least four shortfalls.

The incremental approach to budgeting has several shortfalls, including the following:
  - It is hard to adapt to changing environments – incremental budgeting does not establish priorities; hence companies have a tough time adjusting to changing situations
  - Alternatives are not considered for accomplishing the desired objectives. There may be other methos not in the current budget that could achieve the same outcome at less cost
  - The funding requests often exceed the budgeted amounts, which causes managers to recycle the existing process
  - Incremental budgeting does not recognize the tradeoffs between the long-term goals and the operating needs

1.   Continued

- Key problems and decision areas in funding one initiative versus the others are not highlighted

(b)   Identify all applicable Quest categories for each of the four strategic initiatives. Justify your answers.

Commentary on Question:
Candidates often did not demonstrate a complete analysis to justify which quest types were applicable for each opportunity, resulting in candidates not receiving full marks.

A – Global Presence
B – Customer Focus
C – Nimbleness
D – Innovation
E – Sustainability

1.   Digital Banking
B: By creating digital solutions, Big Ben provides customers with an excellent customer interface design, online chat systems and resolve customer problems quickly.
C: Big Ben saw that Neobank are growing in popularity and decided to be agile and avoid having to deal with legacy systems.
D: Big Ben wants to expand its digital banking presence by potentially collaborating with or acquiring or create a Neobank, which is digital, cloud-based solution and uses artificial intelligence. These new offerings exploit new opportunity, which is innovative.

2.   Cryptocurrency
B: Supports the customer quest since it would allow customers to access new products (savings account and ETF) that would give them more options for how they want to bank with Big Ben.
D: The initiative would increase Big Ben's customer offerings by giving customers access to new innovative cryptocurrency products. These products are not currently used by Big Ben's competitors and would be an innovative step to evolve their banking offerings.

3.   Insurance opportunity with Darwin
A: Since it is travel insurance and is offered digitally, it will reach Big Ben's globally mobile customers.
B: By providing travel insurance to its customers, customers will feel that they are cared for in all aspects. The idea is borne from the need of the customer.

1. Continued

          D: Big Ben is planning to use its mobile app to provide travel insurance, which is building internal synergies.

    4.   Solar financing

          B: The solar project gives customers a new option for how to power their home. This product will allow Big Ben to further develop their relationship with their customers.

          D: Would be a differentiated product offering. If Big Ben is the first to offer this program, then it should be considered an innovation.

          E: The main quest for the solar project is sustainability. This project will incentivize more homeowners to get solar powered energy for their home which will help the environment and help Big Ben's brand as it relates to being a sustainable company.

(c)   Big Ben management feels that digital banking and cryptocurrency are the two best options. They wish to use the Zero-Based Budgeting approach (ZBB) to help answer the question "If we can only implement either Digital *or* Crypto, which should we choose?"

There are Five Key Elements of Zero-Based Budgeting.

Apply each element of ZBB within the context of the two alternatives.

Commentary on Question:
Candidates did poorly on this question. Only a few candidates were able to correctly identify the 5 elements of ZBB and apply them to the case study. Candidates showed lack of understanding of ZBB and the case study materials.

The 5 elements of ZBB are:
- Identify the objectives
- Evaluation of the alternative ways of performing an activity
- Evaluation of alternative funding levels
- Evaluation of workload and performance measures
- Establish priorities

Identify the objectives
The overall objective of the ZBB budgeting for Big Ben is to allocate the resources to the identified initiatives as much as possible given the limited resources and conflicting demands.
The objective for Digital Banking is to compete with FinTechs, to maintain Big Ben's market power realizing threats from NeoBanks, and to expand its digital presence and reach more 'unbanked' customers and digital-oriented markets.
The objective of Crypto is new product development and to expand to the crypto market.

1.   Continued

Evaluation of the alternatives
For Digital Banking, there are multiple ways to achieve this initiative. Big Ben can:
- Build an in-house digital banking division to compete with NeoBanks
- Partner with NeoBanks that lack banking license
- Acquire an existing NeoBank

For Crypto, Big Ben can:
- Build in-house capacity for offering crypto products
- Have alliance with existing crypto ETF managers to leverage their experiences in launching crypto ETF products
- Acquire a crypto security provider and distribution channel

Evaluation of alternative funding levels
Both Digital and Crypto are new initiatives that did not exist before. Big Ben must evaluate their cost-benefit relationships to identify the appropriate funding levels. Big Ben can leverage existing initiatives that have a similar nature to these 2 and assess if they should: 1) not funding, 2) fund at reduced, current, or increased level, 3) fund one or both.

Evaluation of workload and performance measures
Once the funding level is determined, Big Ben needs to determine the resources needed to support the initiatives. Big Ben should also determine the appropriate performance measures to evaluate the efficiency and effectiveness of the initiatives.
For example, for both Digital and Crypto, Big Ben will likely need to invest in relevant technology and acquire experienced IT personnel to support in-house building.

Establish priorities
Given the limited resources and conflicting demands, Big Ben needs to prioritize the initiatives based on their strategic importance to Big Ben's success. Big Ben should also set up a short term, interim, long-term plan for budgeting.

(d)   Explain what is wrong with management's use of ZBB.

   Commentary on Question:
   Candidates generally did not understand the principle of ZBB and therefore had difficulty answering this question.

   ZBB is not designed to look at two options in a vacuum. Management needs to evaluate current activities and alternatives at the same time as new programs are identified and considered.

1. Continued

(e) Management wants to maximize Big Ben's 5-year income from their investment. If the initiative is unsuccessful, it will merely break even over five years. Ignore effects of time value of money.

Item	Initiative	Initial investment ($M)	Annual Income ($M)	# of internal departments impacted	Overall Probability of success
1	Digital banking	9	2	8	60%
2	Crypto	13	2.5	5	30%

    (i)   Develop a metric that best compares the initiatives. Justify your answer.

    (ii)   Calculate the metric for each initiative.

    (iii)   Rank the initiatives by order of preference.

    (iv)   Interpret the results of the ranking.

Commentary on Question:
Candidates generally performed well in this question. Common mistakes for the metric calculation include: 1) using the number of internal department in the calculation, and 2) multiplying the probability of success with the initial investment.

    (i)   Metric should include 5-year income, weight by probability of success (as that is a relevant factor) and compare this to the initial investment.
We can add up the 5 years of income, weighted by prob of success, and then subtract off the initial investment, to get the dollar contribution of each initiative.

    (ii)   Digital banking = (2 x 5)(0.6) - 9 = -3
Crypto = (2.5 x 5)(0.3) - 13 = -9.25

    (iii)   1.Digital banking
2.Crypto

    (iv)   Both projects have a negative metric, which means that the projects are expected to contribute losses to the organization. However, if we had to choose one project from the two choices based only on the metric above, we should choose digital banking as it contributes a smaller loss.

1. Continued

(f) Explain two important reasons for defining a minimum level of funding for the digital banking initiative.

Commentary on Question:
Candidates generally performed poorly on this question.

Defining a minimum level of funding requires managers to make an in-depth evaluation of their operations, and forces them to consider alternatives. Without this exercise, managers may avoid a full analysis and simply recommend to continue past practices.

Managers needs the option of elimination and reduction if funds are to be allocated with conflicting demands. If only one level of effort was analyzed, management would be forced to make a yes-or-no decision on the funding request. This in turn result in either funding at the requested level, eliminating the program, making arbitrary reductions, or recycling the budget process in the event funding requests exceed funding availability.

(g) Critique Mr. Patel's statement.

Commentary on Question:
Most candidates agreed that the minimum level of effort is the hardest to determine. However, candidates had trouble explaining the flaws of Mr. Patel's statement. In order to receive full marks for this question, both the correct and incorrect potions of Mr. Patel's statement need to be addressed.

Mr. Patel is correct that minimum level of effort is the most difficult to identify.

Mr. Patel is incorrect to assume 75% is the correct minimum level. The minimum level must be identified by each manager in charge of the related operations. This minimum level must be below the current level of effort and identify the critical level of effort below which the operation would be discontinued because it loses its viability of effectiveness.

2. **Learning Objectives:**
1. The candidate will understand and apply strategic management concepts and frameworks to corporate financial and ERM business problems.

2. The candidate will understand how sustainable growth and value can be created through strategic budgeting. The candidate will also understand measures of an organization's value and their uses in decision making.

Learning Outcomes:
(1b) Evaluate commonly used business growth strategies and their application under different economic risk and business environments:
*   Critique and evaluate internal/organic and external/inorganic growth strategies.
*   Assess and recommend growth strategies under different business situations and market opportunities, utilizing the applicable strategic management models.

(2a) Explain how strategic budgeting can create value and sustainable growth

(2b) Assess how effective strategic budgeting is in tracking progress of an organization's initiatives

(2c) Demonstrate how an organization's strategic goals can be effectively incorporated into the financial budgeting decision making process

(2e) Assess the impact of performance measures and incentives on key business decisions and stakeholder value

Sources:
Handbook Budgeting Chapter 15, 17 and 29

SDM-192-22: Cultural Change that Sticks

Organizational Behaviour, Chapter 10

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Define Corporate Performance Management.

Commentary on Question:
This definition should be recalled directly from the syllabus. Definitions that matched the meaning from the text were given full credit. Credit was not given for generically describing performance management without providing a definition.

2.   Continued

CPM is defined as "*an umbrella term that describes the methodologies, metrics, processes and systems used to monitor and manage the business performance of an enterprise*"

(b)   Critique SEA's proposed expansion plan with respect to CPM.

Commentary on Question:
Candidates that did well provided both pros and cons that are specifically linked to CPM. Many candidates only pointed out holes in the SEA plan, without addressing where the plan was consistent with well-designed CPM. No credit was given for criticism of the SEA plan not linked to CPM.

- Pros:
    - Each tactic/goal has a measure
    - Each tactic is aligned to the strategy
- Cons:
    - No responsible party is defined for the strategy/goals
    - "By flight" should be included in Dimension
    - CPM should not be done in a silo; the SEA plan does not address how this will be integrated into company operations
    - This plan does not address the target culture of the company

(c)   Critique SEA's proposed expansion plan based on the Five Principles to Help Cultural Changes Stick.

Commentary on Question:
Candidates that did well provided each of the Five Principles to Help Cultural Changes Stick and then indicated whether or not the SEA plan addressed each principle. Credit was given for listing principles consistent with the text without matching the principles word for word. No credit was given for answers not justified by the case study or inconsistent with the Five Principles from the text.

1. Match Strategy and Culture
   The SEA plan aligns goals with the company strategy of safety/strong maintenance. It fails to address the strategy to be cost competitive directly.
2. Focus on a few critical shifts in behavior
   It is not obvious how SEA plans to monitor the shifts in behavior needed to align company culture. They have not set metrics to measure new behaviors.
3. Honor the strengths of your existing culture
   The plan points to safety, but could more directly point to the culture within the maintenance department that achieve their superior safety metrics.
4. Integrate formal and informal interventions

2. Continued

> The current CPM is silent on informal interventions, but does define formal interventions in the form of incentives for company performance and safety.

5. Measure and monitor cultural evolution
Business performance is both measured and monitored, milestones/timelines are defined for this performance measures. Critical behaviors necessary to achieve this performance are not defined. It is not specified how the company plans to monitor their employees beliefs and feelings.

(d) Recommend two changes to SEA's proposed expansion plan based on your assessment in (c). Justify your answer.

Commentary on Question:
Candidates that did well on this question identified 2 of the 5 principles from part C where they did not believe the current SEA plan addressed cultural change appropriately and provided a reasonable solution to do so.

SEA should:
- Add informal interventions to measure satisfaction via staff and management interviews that can be measured against formal metrics for sales.
- Add customer satisfaction surveys to ensure the behaviors and experience are consistent for the expanstion.

(e)

(i) Critique the problem definition to be solved by the proposed incentive plans. Justify your answer.

(ii) Compare and contrast the proposed incentive plans.

(iii) Recommend one of the proposed incentive plans. Justify your answer.

Commentary on Question:
Candidates that did well on this question needed to recognize that the proposed solutions did not solve the problem of improving safety directly. They also needed to recognize that cash provides a shorter-term incentive than options. Several candidates interpreted the wording of the cash option to mean that the cash paid increased significantly each year. This was determined to be a reasonable interpretation of the question and justification for recommending the cash option as a better incentive.

(i) By the data, management has defined the problem to be "Increase tenure of a maintenance staff can increase the safety of the plans". However, this logic might not be fully correct since safety records can be affected by other measures (e.g., safety records of new staff, equipment evaluation). By doing so, management has ignored other important metrics.

2.   **Continued**

    (ii)   Cash incentive:
- Pro: Provides ongoing annual benefits and is attractive in the short-term.
- Con: Some employees will leave the company after receiving the bonus.

    Stock grants:
- Pro: Long-term bonus to help keep employees stay at SEA.
- Con: Potential dilution of SEA shares. And no immediate benefit for employees who work here every year.

    (iii)   I recommend the Stock Options incentive:
This option provides the best incentive for employees to stay a longer time (until they leave) instead of having discrete time points where employees will consider leaving each year.

(f)   The consultant is asked for their input on the incentive plan. They note that SEA will likely need to rapidly increase its workforce over the next few years; they feel this growing workforce will really value up-front cash from SEA. The consultant recommends option I.

    (i)   Identify the decision style used by the consultant to gather and evaluate information. Justify your answer.

    (ii)   Identify the decision style used by the consultant to select the best alternative. Justify your answer.

Commentary on Question:
Part f was generally well answered. To obtain full credit, the candidate needed to indicate whether the consultant was using intuition vs. sensing as well as thinking vs. feeling and justify using keys from the question text.

    (i)   The consultant is using the intuition style. The focus on is on the bigger picture of needing to grow while retaining.

    (ii)   The consultant is using the feeling style – they 'feel' the workforce will value cash, but do not provide concrete facts to indicate they've used any data to reach that conclusion.

3. **Learning Objectives:**
1. The candidate will understand and apply strategic management concepts and frameworks to corporate financial and ERM business problems.

3. The candidate will understand how to apply decision making models to general managerial decisions within specified business constraints.

Learning Outcomes:
(1a) Evaluate and apply strategic management concepts, recognizing factors that affect development and implementation of strategies:
- Analyze the firm's external environment and the internal organization.
- Describe and apply strategic management models, including Porter's five forces and value chain analysis.
- Define types of business-level strategies and recommend an appropriate business-level strategy for a given situation.
- Explain the impact of competitive dynamics on strategic management.

(3a) Apply fundamental techniques and frameworks of management science to make informed business decisions:
- Apply linear optimization models to managerial decisions.
- Develop decision trees, scenario tests, and simulation models.

(3b) Apply statistical and quantification methods to analyze managerial decisions with uncertain conditions:
- Apply probability distributions to business situations with random variables.
- Construct optimization models utilizing probability theories.

(3c) Evaluate business situations and describe how quantitative and statistical methods can improved decision making.

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Big Ben is considering providing financing under the solar energy subsidy program described in section 5.4 of the case study. Stakeholders of the program may be in 1 of 3 categories:

    I. Capital market stakeholders
    II. Product market stakeholders
    III. Organizational stakeholders

List the stakeholders that are in each category (I through III). Justify your answers.

3. **Continued**

Commentary on Question:
Many candidates received partial points on Part a. Only a few candidates were able to identify all three groups accurately and received full points.

I.   Capital market stakeholders
The company, Big Ben or RPPC: Shareholders and debtholders of the company essentially provide the capital necessary to invest in the project. They also share the embedded risk in the project.

II.   Product market stakeholder
Homeowners: They are customers of Big Ben, as they will be borrowing from the bank to pay for their solar panels.
Solar Panel Providers: They are the customers of Big Ben and will depend on Big Ben for processing financing when selling solar panels to customers.
Electric Utilities: In this case, the utilities are stakeholders since homeowners can only pay back the loan if utility companies purchase electricity from them.

III.   Organizational Stakeholders
Big Ben employees and management will have a stake in the success of the solar energy program.

(b)   Calculate the expected annual loan repayment. Show your work.

Commentary on Question:
Most candidates were able to set up the expected value of EEP and RP correctly but only few candidates identified U as a Bernoulli Distribution. Partial points were awarded for the setup of the different components of the expected payments.

Expected Repayment = Expected [EEP] x Expected [RP] x Expected [U]
= 75 x 0.55 x (3 x 0.8 + 1 x 0.2)
= 107.25

(c)   Calculate the standard deviation of the annual loan repayment. Show your work.

Commentary on Question:
Candidates did poorly on Part C as most had a hard time correctly calculating the standard deviation for loan repayments. Most of the candidates incorrectly calculated Variance of EEP, RP and U independently. Partial points were awarded for each component of the calculation below.

Variance [Repayment] = Expected [Payment^2] – Expected [Payment]^2
= Expected [EEP^2 x 9 x RP^2 x U^2] – 99^2
= 6125 x 9 x (Variance [RP] + Expected [RP]^2) x (Variance [U] + Expected [U]^2) – 99^2

3. **Continued**

= 6125 x 0.3425 x (9 x 0.8 + 1 x 0.2) – 107.25^2
= 4021.25

Standard Deviation [Repayment] = SQRT(Variance [Repayment)]
= 63.4133

(d)   Explain why a simulation model is a useful tool to evaluate this investment.

Commentary on Question:
Points were awarded for answers that were relevant to the question and case study. Most candidates were able to receive at least partial points however full points were only awarded for candidates that were able to justify their response.

There is a lot of non-linearity in the return profile, driven by the convolution of multiple random variables that result in variability in a given payment for a given year. Moreover, the overall transaction IRR is a non-linear calculation on a sequence of 20 such random outputs, resulting in a highly non-linear result overall. The use of simulation allows the modeler to delineate complex outputs such as this transaction IRR calculations into tractable variables to model.

(e)

    (i)   Calculate the simulated payment amount for each year in the above scenario.

    (ii)   Calculate the Internal Rate of Return (IRR) to Big Ben with respect to the investment under this scenario.

Commentary on Question:
Most candidates were able to set up the first two distributions (EEP and RP) correctly but had a difficult time setting up the third distribution (U). Some candidates also struggled in identifying the loan amount of $1,000 to be used in the IRR calculation. Partial points were awarded if the Payment was calculated incorrectly but the IRR calculation was set up correctly.

An example of how to map each randomly generated number to a variable in each distribution:
0.18 in EEP = 50
-0.75 in RP = 0.55 - 0.75*0.2 = 0.4
0.60 in U = 1
Expected [Repayment] = 50 x 0.4 x 3 x 1 = 60

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3. **Continued**

Year	EEP	RP	U	Payment
0				-1,000
1	100	0.546	1	54.6
2	75	0.31	1	23.25
3	75	0.436	3	98.1
4	75	0.468	3	105.3
5	50	0.722	3	108.3
6	25	0.578	3	43.35
7	50	0.914	1	45.7
8	50	0.568	3	85.2
9	75	0.35	3	78.75
10	75	0.602	3	135.45
11	75	0.698	3	157.05
12	75	0.598	1	44.85
13	75	0.25	3	56.25
14	75	0.772	3	173.7
15	75	0.608	3	136.8
16	75	0.674	3	151.65
17	125	0.768	3	288
18	100	0.658	1	65.8
19	75	0.428	1	32.1
20	75	0.838	3	188.55

IRR = 6.81%

(f)   Recommend two risk measures Big Ben should consider when evaluating this investment. Justify your recommendation.

Commentary on Question:
Candidates did well on this part of the question. Most candidates were able to provide acceptable risk measures, but only received full points if they provided explanation on how it would apply to Big Ben.

Value at Risk / TVaR – articulates the potential returns at a specified extreme tail scenario, useful for downside risk management of Big Ben.
Probability of negative return – allows Big Ben to analyze how principal protected the investment is.

(g)   Explain how the simulation output can be used to help Big Ben decide whether or not invest.

3. Continued

Commentary on Question:
Most candidates received partial points for reasonable answers. However, full points were only awarded for good supporting justification to their answers.

Simulation output provides decision maker with comprehensive range of possible outcomes, so that probabilities may be assigned to various scenarios, to inform risk-adjusted decision making rather than single deterministic analysis. It provides insight into tail risk so that appropriate risk management responses can be developed. When part of a larger simulation engine, can easily add positions to exiting portfolio / build in relevant hedging effects, etc. so that portfolio accumulations, diversifications, hedge effectiveness can all be better understood for optimal decision making.

(h) Assume no relevant factors have been omitted from the model.

    (i) Identify two shortcomings of the simulation model used by Big Ben.

    (ii) Recommend two enhancements to the model that address your findings in part (i). Justify your recommendation.

Commentary on Question:
Most candidates were able to identify the shortcomings of the simulation model. Full points were awarded only when justifications were provided.

• The payment is not floored at zero which is unrealistic – there is no scenario where the bank would have to put additional funds toward the project as presently defined.
• The variables do not vary/correlate over time which is may not be realistic as underlying drivers (e.g., weather, energy markets, utilities willingness to participate, etc.) may have cyclical or autocorrelated features.
• The variables are assumed to be independent which may not be realistic as it is likely that the retail price would influence the utilities' willingness to participate, for example.
• The Bank does not reflect any potential salvage value of the solar panel after the 20-year period, which may be a factor.

3. Continued

(i) Assume the model **does not** capture all relevant factors:

    (i)   Identify two additional factors Big Ben should consider in its analysis. Justify your answer.

    (ii)   Describe how each additional factor identified in part (i) could affect Big Bank's investment decision. Justify your answer.

Commentary on Question:
Most candidates were able to identify additional factors and did well on this question.

• Should consider within an ERM / portfolio context; what is an appropriate rate of return / downside risk for this type of investment given the underlying risk drivers relative to other Bank investments?

• The deal model is based on $1000 of solar panel financing but is not necessarily scalable to a larger portfolio. In reality, the underlying risk factors are highly correlated / systemic across all such loans (e.g., energy prices) so the law of large numbers doesn't necessarily apply here. The model does not provide any insight on how to diversify the book of loans.

• Potential synergies with other products (e.g., can solar panel financing be embedded in the bank's mortgage process).

(j)

    (i)   Identify which direction of organizational communication is being used to communicate the simulation results. Justify your answer.

    (ii)   Describe the two barriers to effective communication present in the dialogue. Justify your answer.

    (iii)   Evaluate the choice of communication media that Big Ben's senior management has asked you to use to provide the results.

Commentary on Question:
For i, some candidates confused this for a downward communication. In order to receive full points, candidate most identify this as a form of upward communication along with justification.

For ii, candidates received points for listing the barriers along with reasonable justification.

3. **Continued**

For iii, some candidates failed to identify the choice of communication as a formal numerical text category and that it's the least rich form of communication. Full points were awarded for correction identification and suggested alternative communication with reasonings.

(i)   Upward communication: as it flows from the analyst to you to senior management.

(ii) Status differences – management is ignoring your concerns about the shortcomings of the model.

Time pressures – You are required to send the results by end of day today. You may not have time to thoroughly explain the results and shortfalls of the model.

(iii) The IRR distribution is just a graph which falls under the formal numerical text category. This is the least rich form of communication media and has the least potential for immediate feedback, the use of multiple cues, the use of natural language, and has no personal focus. Without additional background information and explanation, and potential for feedback, this may lead to an inappropriate understanding of the results. This is not an appropriate choice of communication media for this large of a decision. It would be better to schedule a formal in-person meeting and use the written document to supplement my verbal explanation since face to face meetings allow for more feedback and are more rich interactions. An in person meeting will allow for more clarity of information and will have a more personal touch since it has a higher degree of richness.

4. **Learning Objectives:**

1. The candidate will understand and apply strategic management concepts and frameworks to corporate financial and ERM business problems.

4. The candidate will be able to analyze and model dynamic systems and evaluate the risks and sustainability of these complex systems.

5. The candidate will understand the role that organizational behavior and communication play in organizational decision making and efficacy, as well as learn how ineffective communication is a risk to organizations.

Learning Outcomes:

(1a) Evaluate and apply strategic management concepts, recognizing factors that affect development and implementation of strategies:
- Analyze the firm's external environment and the internal organization.
- Describe and apply strategic management models, including Porter's five forces and value chain analysis.
- Define types of business-level strategies and recommend an appropriate business-level strategy for a given situation.
- Explain the impact of competitive dynamics on strategic management.

(1b) Evaluate commonly used business growth strategies and their application under different economic risk and business environments:
- Critique and evaluate internal/organic and external/inorganic growth strategies.
- Assess and recommend growth strategies under different business situations and market opportunities, utilizing the applicable strategic management models.

(4a) Identify and model the dynamic processes within a complex system:
- Develop and apply causal loop diagrams that model the feedback structure of complex systems
- Apply stocks and flows to dynamic modeling
- Apply dynamic modeling to business decisions

(4b) Explain the underlying factors that drive the sustainability and stability of a dynamic system:
- Evaluate the structure and behavior of dynamic systems
- Identify the factors that contribute to risk and instability in dynamic systems

(4c) Evaluate complex systems and describe how actuarial principles can mitigate risks and improve sustainability.

4. Continued

(5a) Apply best practice techniques to structure and communicate ideas logically and persuasively:
- Explain differences between good and poor communication techniques and their implications
- Apply techniques to structure ideas logically
- Develop clear fact-based messages that can be communicated persuasively

(5c) Evaluate the importance of communication to the decision-making processes:
- Explain why communication is strategically important to organizations
- Describe how information is communicated within organizations
- Describe organizational and individual barriers to effective communication
- Identify the risks of ineffective communication
- Explain how to overcome communication barriers and minimize risks of ineffective communication

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) Describe how the value chains for BJT and its rubber supplier are connected. Justify your answer.

Commentary on Question:
Candidates often provided surface level information. Simply stating that the supplier provides rubber to BJT was not rewarded points

There is a vertical linkage between BJT's inbound/supply-chain and their rubber supplier's distribution. This linkage reduces operational costs for the two organizations.

(b) Explain oscillation and amplification in the context of stock management.

Commentary on Question:
Most candidates were able to define oscillation but were unable to define amplification.

Oscillation: production and inventories achronically overshoot and undershoot the appropriate levels.

Amplification: the amplitude business cycle fluctuations in materials production is significantly greater than that in the consumer good production.

4. Continued

(c)

    (i)   Define steady state error.

    (ii)   Explain how to incorporate steady state error into stock management.

    (iii)   Calculate BJT's current steady state error.

Commentary on Question:
(i)   Most candidates were able to correctly define steady state error.
(ii)   Some candidates were generally unable to apply the definition to a stock management setting.
(iii)   Most candidates were unable to recall the formula and perform the calculation.

    (i)   Steady state error is a consistent difference between desired and actual stock.

    (ii)   Candidates need to demonstrate understanding that steady state error is not so much an "error" but an ongoing throughput/loss of inventory to things like sales. Good stock management must consider this when planning for inventories.

    (iii)   Steady state error = 1 million / 24 months = 41.67 thousand per month.

(d)   Calculate the expected monthly inventory of BJT's customers for stock for 25 months, starting at month 0. Show your work.

Commentary on Question:
Candidates were unable to perform the full calculation. Part marks were awarded for correctly calculating components of the projection.

Model solution in Excel.

(e)   Sketch a causal loop diagram to illustrate the relationship between the inventory of BJT's customers, their acquisition rate, and adjustment for stock.

Commentary on Question:
Some candidates were unable to identify the key relationships and demonstrate the correct flow of the balancing loop.

The key relationships that were needed was those between desired stock, AS, and AR. The diagram should demonstrate a balancing loop that naturally reverts to a steady state after and increase to the desired stock.

4. **Continued**
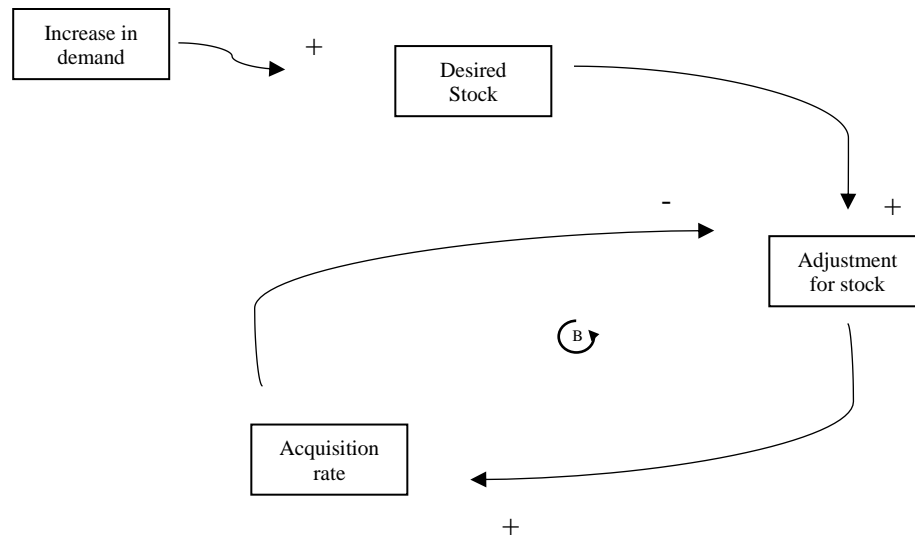
(f)

    (i)   Calculate the amplification ratio.

    (ii)   Interpret the amplification ratio calculated in part (i) with respect to BJT's Risk Profile in Section 3.3 of the Case Study. Justify your answer.

    (iii)   Calculate the increase in rubber suppliers' production assuming that BJT's orders comprise about 5% of rubber suppliers' overall business and the amplification ratio is 5.

Commentary on Question:
(i)   Most candidates were unable to perform the calculation.
(ii)   Many candidates were able to describe how the amplification ratio affects the supply chain.
(iii)   Many candidates were unable to understand the question and perform the calculation.

    (i)   Amplification Ratio = [(141.67 / 41.67) -1] / [(1200/1000) -1] = 12. It is defined as maximum change in output divided by maximum change in input.

    (ii)   Amplification ratio means that demand fluctuation for BJT may be a lot higher than the demand change for their client. Demand change for the rubber supplier will be even higher than the demand change for BJT because there will be another amplification ratio between BJT and their supplier.

               Only answer that can be justified by amplification ratio is Commodity Risk.

4. Continued

      (iii) $5 * 5\% = 25\%$

(g)

      (i)   Explain how the model results change if there is a random chance of failure instead, equal to 50% per year and tires last at most 4 years.

      (ii)   Explain how an aging chain can be incorporated into the model.

      (iii)   Describe the impact of an aging chain on the Desired Acquisition rate when the demand for tires increases. Justify your answer.

      (iv)   Describe the impact of an aging chain on the Desired Acquisition rate 10 years after the demand for tires increases. Justify your answer.

Commentary on Question:
(i)   Candidates were unable to understand that randomness does not impact the expected results from the model.
(ii)   Most candidates correctly described the impact of incorporating an aging chain into the model.
(iii)   Many candidates understood the impact on the Expected Loss.
(iv)   Most candidates understood that the chain would stabilize within 10 years.

      (i)   No change, loss rate is still 1/24 per month.

      (ii)   Aging chain can be used to categorize tires in several buckets (new, medium, old), and recognize that old tires need to be discarded as they cannot be used.

      (iii)   When all the tires are new, no tires need to be discarded because they are too old, so EL is lower when a large proportion of new tires is added to the inventory.

      (iv)   After 10 years, we will have a more uniform distribution of tire ages, converging on average rate of 1/24, corresponding to a 2-year lifetime

(h)   Contrast the amplification ratio for airplanes and tires.

Commentary on Question:
Many candidates addressed the difference in Expected Loss but failed to identify the difference in the Stock Adjustment Time.

4. **Continued**

The Amplification ratio is an inverse function of Stock Adjustment Time and Expected Loss. Airplane production time is much longer than cars. Therefore expected loss is significantly lower relative to the acquisition rate. However, the stock acquisition time will also be significantly higher. The two effects are in opposite directions, so the overall impact on the amplification ratio is uncertain.

(i)

    (i)   Explain how the change in demand for tires changes the Five Forces model where BJT is a supplier. Justify your answer.

    (ii)   Describe two specific actions that BJT may take to meet mitigate the challenges created by the change in demand for tires. Justify your answer.

Commentary on Question:
(i)   Candidates correctly recalled the Five Forces. The concepts were applied to the case well, in general. Synthetic tires were often overlooked when analyzing substitution.
(ii)   Candidates failed to identify actions that were realistic and impactful in the short term.

(i)

The essence of the question is to interpret a 20% increase in demand for tires using the Five Forces model using the syllabus material and the case study. Candidates must apply this to BJT's case study.

- Candidates must recognize that 20% increase is a change in the external environment.

- Bargaining power of buyers (distributors)
    - o Buyers may switch to new, low-cost entrants (see below)
    - o There is no mention of product differentiation in the industry: makes switching easier.
    - o This counteracts, to some extent, the decrease in the bargaining power of buyers due to the increase in demand for tires
- Bargaining power of suppliers (BJT and others)
    - o Market is dominated by several major established companies, but there are some SMALL new entrants
    - o This means the large players will have some ability to lower quality and/or increase prices, mitigated by the ability for the new entrants to meet growing demand
- Threat of new entrants (smaller, cheaper companies as per case)
    - o Increased demand, particularly for these new vehicles, will create an opportunity for these smaller companies.

4. Continued

- Threat of substitute products (other than rubber tires)
  - Synthetic rubber is now being used and, apart from BJT, the industry sees rubber supply as a risk. The amplification ratio will increase that risk, which creates more opportunities for synthetic rubber tires.

- Rivalry among competitors: there is insufficient information in the case study to comment on this. No marks for this particular force.

(ii)

Actions described must account for short time frame (2 months) and impact on rubber supply (i.e., amplification on amplification). Therefore, M&A, establishing long term partnerships, and expansion of capacity are unreasonable answers.

Examples of acceptable answers:
- Lowering the quality of tires (within regulator standards) temporarily to increase production speed to meet spike in demand
- Increase the adjustment time to reduce the amplification on rubber suppliers and reduce commodity risk. Candidates may use model to demonstrate that current supply of tires will be able to absorb this delay

Partial marks were given for:
- Increase in prices: plausible but will not really help meet the increase in demand, which is due to a change in the external environment
- Using synthetic rubber instead of regular rubber: this makes a lot of assumptions beyond the scope of the exam material

(j) BJT wants to thank the customers who stay with them while stock levels adjust. They plan to make a $1 donation at the end of the 24 months for every tire purchased by each distributor during the 24 month period that inventory levels are adjusting.

Recall the three pillars of thanking customers:

I. Type and amount
II. Timing and frequency
III. Sustainability

4. **Continued**

    (i)   Describe the three pillars (I through III).

    (ii)   Critique the proposed approach with respect to the three pillars.

    (iii)   Sketch a memo that informs customers of the customer appreciation program using a three-level pyramid structure. Label the vertical relationship between the point and subpoints.

Commentary on Question:
(i)   Most candidates were able to describe the three pillars.
(ii)   Most candidates were able to adequately critique the proposed approach.
(iii)   Candidates were failed to create an appropriate structure.

(i)

Type/amount: The type of reward (e.g., money vs. verbal acknowledgment) that the customer responds best to and its amount (e.g., size of gift, amount of money, improvement in line wait)

Timing: The optimal timing or frequency of incentives needed to keep customers loyal, while not exhausting resources; also, whether timing should be tied to behavior (fixed–ratio) or tied to certain times in the calendar year, such as every quarter or month (fixed–interval)

Sustainability: The likelihood that the chosen acknowledgment method (type, amount, and frequency) will be sustainable over time

(ii)

Type/amount: Using the model, total donations will be close to $1.18 million, this is 0.33% of total gross sales; about 3% of income before taxes. Recall that this is spread over 2 years. This is likely to be perceived as very small.

Timing: Better than not thanking them at all, but should be done more frequently than at the end of the 24-months. Should be closer to the time of the desired behaviour.

Sustainability: Relatively low cost and frequency is very conservative: very sustainable.

4. **Continued**

(iii)

We want to thank our existing

why

Want to reward customer loyalty

There may be a long adjustment period

how

$1 donation to charity per tire purchased

The total will be paid out at the end of 24 months