CFE SDM Model Solutions
Spring 2019

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 measures or corporate value and their uses in corporate decision making.

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 models such as Porter's five forces.
- 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.

(2a) Assess various measures that firm can use to assess value and recommend appropriate measures to evaluate corporate value.

(2b) Assess how performance metrics and incentives could impact key business decisions and create value for shareholders:
- Explain how managerial accounting can impact strategic decisions.
- Explain and recommend methods a firm may use to allocate its costs and how these methods impact the perceived performance of a firm or its component lines of business.

Sources:
Chapter 5 Responsibility Accounting & Transfer Pricing

Chapter 7 Cost Allocation Theory (taxation systems)

Commentary on Question:
This question tests candidates' understanding of a company's organization into different responsibility centers and how to properly incentivize managers of each. Concepts related to how different departments within an organization are impacted by managerial accounting decisions, such as transfer pricing and cost allocation, and its impact on the firm as whole are also tested.

1. **Continued**

Candidates generally did well on the first parts of the question. In the latter parts, it was necessary to apply syllabus concepts to the case study in order to receive full marks. This is where some candidates struggled.

Solution:
(a)   Identify whether or not each cost allocation basis (I to III) is an insulating or non-insulating cost allocation basis. Justify your answer.

Commentary on Question:
Most candidates did well on this part. Some candidates confused insulating vs non-insulating. Generally, a cost allocation basis is considered insulating if in the short term, it will not vary with performance. This distinction is important because in the long run, every cost allocation basis is non-insulating.

An insulating cost allocation results in cost allocations that do not depend on the operating performance of other divisions.
1. # of Employees: insulating – cost allocations will not vary depending on how well the other division does
2. # of Plants: insulating – cost allocations will not vary depending on how well the other division does
3. Revenues: non-insulating – cost allocations will vary depending on performance of the other division

(b)   Explain why BJT may choose to use an insulating cost allocation basis.

Commentary on Question:
To get full marks, candidates needed to relate their answer directly back to BJT.

An insulating cost allocation does not allow one division to distort the performance of another division.
- BJT-Canada and BJT-USA operate in different countries and are managed separately, so it makes sense to tie expenses to activities and decisions within the control of each division.
- BJT may be focused on getting accurate profitability of each division, since BJT-USA has been performing better than BJT-Canada.

(c)   Calculate the allocated expense for the new system to BJT-USA. Show your work.

Commentary on Question:
The majority of candidates did well and were able to identify the allocation % under each basis and arrive at the correct allocated expense. Partial marks were given as long as the allocation % was correctly calculated.

1. **Continued**

Cost Allocation Basis	# of Employees	# of Plants	Revenues
BJT-USA	75k	2	$170M
Total – BJT-USA and Canada	75k + 25k = 100k	2 + 1 = 3	$170M + $34M = $204M
% allocated to BJT-USA	75k / 100k = 75% of Costs	2 / 3 = 66.67% of Costs	$170M / $204M = 83.33%
Allocated Expense	75% * $8M = $6M	66.67% * $8M = $5.33M	83.33% * $8M = $6.67M

(d)   BJT has decided to implement the allocation basis that maximizes expense allocation to BJT-USA.

Critique this decision.

Commentary on Question:
This question tests the candidate's ability to tie expense allocation to other concepts in the syllabus. In order to receive full marks, candidates were required to present at least 3 different aspects of the expense allocation decision (positive and/or negative) and explain the ramifications of each.

Candidates were not penalized if they assumed a different expense allocation basis other than revenue (the allocation basis that maximized expenses to BJT-USA from Part (c)), as long as they critiqued the assumed decision.

From Part (c), the expense allocation basis that maximizes expense allocation to BJT-USA is revenues.
- What are the implications of using revenues as the cost allocation basis? This is a non-insulating cost allocation basis. It may distort the performance of each division and make it harder to assess how each is doing
- A non-insulating cost allocation basis could encourage increased collaboration between BJT-USA and BJT-Canada
- What are the tax implications of this decision? BJT should have taken into consideration the local tax rates for BJT-USA and BJT-Canada. Maximizing expenses to BJT-USA could be favorable for BJT as a whole if taxes are lower for BJT-USA
- Where is this invoice system actually being used? BJT-USA has had strong sales and is likely the key user of the invoice system. Allocating based on revenues could make sense

1.   Continued

(e)   Explain why each of BJT-USA, CCC Tire Stores and Beaudry supports their particular approach.

Commentary on Question:
Candidates received credit for answers besides the ones listed below, as long as the reason they provided for each stakeholder was plausible. Some candidates mistook Beaudry as CEO of BJT-USA only, without realizing that Beaudry is responsible for CCC Tire Stores as well since CCC Tire Stores is owned by BJT.

BJT-USA: may prefer the variable-cost approach since it closely relates to the actual cost of producing additional tires for sale to CCC. BJT-USA would want the cost determined based on the actual level of production.

CCC Tires: prefers market-cost approach since CCC could buy tires from external companies at the market price. Could also be wary of subjectivity and manipulation of transfer cost calculation by BJT-USA if variable-cost approach is used. Market-cost approach is most objective.

Beaudry: full-cost approach avoids disputes. Simple to implement.

(f)   Recommend one potential way to reorganize BJT to eliminate the transfer pricing problem. Justify your answer.

Commentary on Question:
To receive full marks, candidates needed to propose a way of reorganizing BJT, then justify how the new structure would eliminate the transfer pricing problem, either completely or by changing incentives.

Proposal: Reorganize BJT-USA and CCC Tire Stores so that BJT-USA is responsible for manufacturing only and CCC Tire Stores is responsible for sales only. Manufacturing could then be set up as a cost center with a focus on output only, with BJT-USA managers judged on efficiency. CCC Tires could then be left as a profit center. This eliminates the conflict in incentives if both remain as profit centers.

2. **Learning Objectives:**
3. The candidate will understand the ERM processes that consider all types of risks and their use in setting a risk return strategy in any industry.

Learning Outcomes:
(3a) Identify and assess second-order risk factors:
- Explain the various types of risks that can arise from specific business activities but are not directly specific to the business itself.
- Critique the applicability and relevance of measurement and management techniques for these second-order risks.

(3b) Explain ERM principles and frameworks:
- Describe the components of a risk appetite statement. Design and develop a risk appetite statement and risk-return strategy.
- Evaluate a company's ERM processes in its ability to adapt to emerging issues and identify strategic opportunities based on risk-return trade-off.
- Evaluate the sustainability of a given business enterprise based on its risk tolerances and appetite.
- Apply risk mitigation strategies in ERM decisions.

Sources:
ORSA practice note ORSA Quantifying Risk Exposure for Own Risk and solvency Assessment Reports pg. 7-20

http://www.milliman.com/uploadedFiles/insight/2017/2016-embedded-value-europe.pdf 22

Commentary on Question:
The intent of the question was for candidates to demonstrate understanding of ORSA and European Embedded Value (EEV). In general, the principles of ORSA were not reflected in the answers of many candidates nor was the definition of EEV understood.

Solution:
(a) List four primary risks that Darwin should include on the Risk Register underlying the ORSA.

Commentary on Question:
The idea here was to capture primary risks. Most candidates got part marks, but some delved into subparts too quickly (e.g., discussion of equity risk, default risk rather than market risk).

1. Market risks such as inflation, interest rate risk, equity risk, F/X credit quality, default and volatility
2. Biometric or demographic risks such as lapse, mortality and longevity and trend

2. **Continued**

3. Regulatory risk
4. Expense risk

(b)   Describe the considerations specific to Darwin that must be included when
       determining the frequency of the review of the Risk Register. Justify your
       answer.

Commentary on Question:
*Candidates could respond with either annually or quarterly as long as proper
justification was provided. Monthly is too unwieldy, less frequent than annual is
poor risk management. Full points required the candidate to link answers to
Darwin.*

Frequency of review would typically be annual, but individual risks might attract
higher frequency (e.g., quarterly for VA). Emerging risks such as cyber suggest
higher frequency due to their evolving nature. Quality of industry and company
data may also influence the debate

Key ideas to consider would be

i.   The time the risk first emerges to the time it can cause damage (fast vs slow).
ii.   The materiality for the company.
iii. The availability of monitoring tools.

(c)   Describe the changes that Darwin should make to its ORSA as a result of the new
       product with respect to:

(i)   Market risk;

(ii)   Frequency of review.

Commentary on Question:
*Multiple answers were possible here, but required mastery of the material to
construct a valid response. Full marks were given to candidates that provided
any defensible replies built upon the syllabus materials.*

The universal life product will introduce new market risks which can influence
the risk profile quite quickly (fast). Of particular concern would be the minimum
rate of return guarantees in the fixed rate account and the cap/floor in the indexed
account. Use of derivatives creates operational risks. Potential for illiquid
investments such as private placements and mortgages increases liquidity risk.

2. **Continued**

As Darwin is already in the market, we are focused on incremental volume; however, if volumes increase rapidly as the CEO suggests, the risks might become more material. Universal life is a well understood segment and therefore the monitoring tools are relatively speaking quite available.

Recommendation would be for more frequent than annual review: quarterly.

(d) Explain how two secondary risks have changed due to the introduction of the Indexed Universal Life product.

Commentary on Question:
Most candidates did reasonably well on this part as long as their answers did not overlap with part a: primary risks cannot also be secondary risks.

Availability of Data (especially in the initial stage): It may be helpful to use industry or reinsurance data or a judgmental approach Liquidity Risk. Some of the investments will be new to the Darwin. The company should consider reverse stress testing to identify pressure points on the balance sheet. The use of derivatives may trigger liquidity needs when posting collateral.

Operational/Reputational: There are many of vulnerabilities (e.g., cyber risk, communication with policyholders, operational risks such as hedging or documentation).

Legal Risk: Inherent in a complicated product like UL.

(e) Describe how to discount very long-dated cashflows using the European Embedded Value rules.

Commentary on Question:
Many candidates appeared to have not read this particular study note.

Under EEV, the actuary needs to identify the last liquid point of the yield curve and an ultimate forward rate. Points in between the last liquid point on the yield curve and the ultimate rate are interpolated. There are a range of potential techniques to interpolate between the LLP and UFR.

3. **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 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 models such as Porter's five forces.
- 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.

(4a) 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.

(4c) Evaluate business situations and describe how quantitative and statistical methods can improved decision making.

Sources:
Ch. 7 of Data, Models, and Decisions: The fundamental of Management Science

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a)
　　(i) Describe two benefits to Frenz of increasing its coffee supply from Vietombia.

　　(ii) Describe two potential risks associated with increasing supply from Vietombia.

　　(iii) Explain how the partnership with Vietombia impacts Frenz' Bargaining Power of Suppliers.

3. **Continued**

Overall, Part a was answered well by candidates. In order to receive full marks, candidates needed to describe benefits and risks specific to Frenz's objectives/strategy. Candidates that stated that supplier power will decrease for other sources were also awarded marks.

    (i)   Two benefits associated with Frenz are:
        1. Reducing coffee price volatility for Frenz.
        2. Enable Frenz to be a product differentiator by offering a product their customers enjoy.

    (ii)   Two risk factors are
        1. Increasing concentration risk of coffee supply in Vietombia.
        2. Slower adaptation of market trends if customer taste changes.

    (iii)   Frenz entering into a long term partnership with Vietombia will increase the supplier power of Vietombia over Frenz. Frenz will be subjected to a primary source of coffee bean producer. However, this relationship can be beneficial to both parties as Vietombia is guaranteed long terms sales while Frenz can ensure steady supply of high quality coffee.

(b)

    (i)   Critique the proposed decision model.

    (ii)   Explain three ways to improve the decision model to address concerns identified in part (i).

    (iii)   State the objective function and constraint function(s) based on your answer to part (ii).

In order to receive full marks on this part, candidates were required to offer both positive and negative aspects of the model, as it relates to Frenz's strategy and objectives. The improvements were then required to tie back to the critique. Many candidates just stated the changes to the decision in part (i) and (ii) and did not give reasoning (i.e., improvements were not explained).

3. Continued

   (i) The proposed decision model is only working on reducing price. It does not fit the overall objective of Frenz as Frenz wants to be known as a product differentiator with a product that their customers enjoy. The primary goal of Frenz should not be minimizing the cost of beans. Frenz needs to prioritize maximizing customer taste index while balancing out price volatility and political risk. Price should be considered in any business decision, however the decision model is lacking the main consideration of CTI.

(ii)

   1. Add additional constraint for CTI
   2. Add additional constraint for political risk
   3. Add additional constraint for volatility
   4. Add non negativity constraints

(iii) Minimize 600A + 1200B + 750C +850B

   Constraints: CTI: (3A + 8B + 6C + 8D) / (A+B+C+D)$\geq$ 5
   Supply : A + B + C + D = 25000
   Non-Negativity: A, B, C, D $\geq$ 0

   Volatility*: $25 \left(\frac{A}{25000}\right)^2 + 5 \left(\frac{B}{25000}\right)^2 + 15 \left(\frac{C}{25000}\right)^2 + 20 \left(\frac{D}{25000}\right)^2 \leq 15$

    $25+5B+15C+20D \leq 15$

    *Formula above is shown using Volatility as Variance. Marks were also awarded if candidates treated volatility as standard deviation.

(c)

   (i) Describe how each strategy (I and II) changes your decision model in part (b)(iii).

   (ii) Recommend a strategy based on your answer to part (i). Justify your answer.

Commentary on Question:
Either I or II were both accepted as a recommended strategy. Candidates were required to offer sufficient justification to support their decision.

3. **Continued**

(i)   Vertical Integration: Vertical integration in this instance would be for Frenz to take over the coffee bean growing operations from their suppliers. Frenz would own the farms and supply itself with the beans grown on those farms. Frenz will be protected from unreasonable price changes and benefit from control of bean quality. However, Frenz would also be subjected to startup cost due to the acquisition, and have a reliance on the Vietombia economy that would be costly to replace if Vietombia beans fall out of favor and/or the political climate deteriorates. Frenz will have direct control of supply and price from Vietombia . Price volatility will be reduced and Frenz can be expected to cut down on supply from other countries after their Vietombia operation is up and running.

Non-equity strategic alliance: This is where Frenz enters into a contractual agreement with a coffee chain in Vietombia. The goal of the alliance would be for both Frenz and the local partner to share resources and create a competitive advantage. Frenz can outsource their roasting operation in the region to the local supplier. They can expect decreased prices of beans from Vietombia along with decreased price volatility through the alliance. However, the decrease come at the cost of higher bargaining power of suppliers. Frenz can use this new partnership to expand in the region as part of their corporate objective. The expanded partnership with Vietombia can be expected to reduce both price and price volatility for Frenz, with the expectation of higher volume of beans from Vietombia.

(ii)   [Example only] It is recommended that Frenz to pursue a non-equity strategic alliance. The risks related to vertical integration are too great to ignore along with the high initial startup cost and potentially limiting future agility. Frenz can achieve their strategic goals by engaging a local company in Vietombia. The can enable Frenz to achieve their corporate objectives to expand into the Asian market with a steady supply of coffee beans that their customer love. This strategy will lower both price and price volatility of Frenz's coffee supply.

4.   **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 the ERM processes that consider all types of risks and their use in setting a risk return strategy in any industry.

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 including innovation and market disruption.

(3a)   Identify and assess second-order risk factors:
   - Explain the various types of risks that can arise from specific business activities but are not directly specific to the business itself.
   - Critique the applicability and relevance of measurement and management techniques for these second-order risks.

Sources:
When and When Not to Vertically Integrate pg. 1-10

Supply Chain Risk Management pg. 185-201

Chapters 2 and 3 of Liquidity Risk – Measurement and Management, Matz and Neu

Commentary on Question:
Generally candidates did well relating answers to Frenz. Candidates who were not able to do so performed poorly overall on the question. Lists below do not necessarily comprise exhaustive lists of acceptable answers to receive full marks.

Solution:
(a)   Describe two risks to which Frenz's exposure would increase as a result of setting up operations in Vietombia.

   Commentary on Question:
   While candidates were able to list risks that would have increased exposure, many candidates were not able to describe these risks for Frenz in particular.

   1 – Foreign exchange risk: As per the case study, the low cost of the Vietombia deal is very likely due to the currency being pegged. Vietombia's pegged currency has risk of unpegging and being severely volatile, increasing costs and future uncertainty. Frenz already faces significant foreign exchange risk, which is amplified by setting up operations in Vietombia.

4. Continued

2 – Political risk: The corrupt government and weak laws only started getting better two years ago. There is still a high amount of uncertainly in the political landscape. There is a risk of the a regime change, who would not honour old deals. Frenz is already being affected by weather, political, and economic conditions.

(b)   Describe five ways in which Olivier's testing of liquidity could be improved.

Commentary on Question:
Candidates did quite well on this part of the question. Most candidates were able to determine where Olivier's testing was suboptimal but many were not able to effectively suggest ways to improve.

1) Probabilistic testing would be more beneficial than using deterministic scenarios (this would provide insights into impacts not considered and would give an indication of the likelihood of various impacts). Alternatively, stress testing can also be better than current scenarios, as they enable the modeler to gauge scenarios significant to Frenz.
2) Scenario selection (credit downgrade) - Not a good idea to use changes in Frenz' rating to define scenario; rating changes are lagging indicators of trouble and almost always follow the market. It would be better to identify precursors for ratings downgrades instead.
3) Just looking at capital is not sufficient; when testing liquidity risk, the quality of capital is important, as is a company's ability to meet liquidity demands (being able to sell off assets fast enough when needed), In addition, testing at various points in time will ensure capital levels remain consistent.
4) Only using historical data relies heavily on the assumption that future events can be predicted from history. This is not shown to be true in practice. This is known as the Black Swam problem.
5) It would be good to include general market disruptions. Olivier should also include company specific crises, national macroeconomic disruption, run-on-the-bank, industry-wide disruption, loss of large investor, etc.

(c)   Critique Olivier's overall conclusion of the Vietombia initiative.

Commentary on Question:
Candidates mostly only provided negative critiques opposed to mentioning both positive and negative points.

Olivier is correct that this initiative could help meet the company objective of expanding the store base and growing in developed countries. Having an already established business should make it easier to set up stores, however the purchasing power and local coffee appetite is not high.

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4. **Continued**

That being said, it cannot be concluded that the company's risk profile is reduced, as he ignores non-liquidity risks that will affect capital. While existing risks may be diversified through the work in Vietombia, added risks from this deal are much higher.

(d)   Identify two biases that exhibited in this statement. Justify your answer.

Commentary on Question:
Many candidates were able to get full marks for this question.

Ostrich Effect - Richard refuses to look at the data contradicting his opinion.
Zero-risk bias - Richard prefers to not add any nominal risk even though diversifying risk can reduce the overall risk profile of the business.

(e)   Design a risk response plan for Frenz to manage liquidity risk.

Commentary on Question:
A number of candidates did not relate the risk response plan to Frenz and lost marks as a result. Below is a sample of a range of possible correct answers.

Identification of Known Risks
This is a description about the nature of risks (refer to the ERM framework), the risk causes, the likelihood of risk occurrence as defined by the probability distribution and discrete-event simulation, and the estimated cost of each risk. Liquidity risk is affected by the large costs setting up operations in Vietombia. As free capital decreases so does Frenz's ability to withstand fluctuations in earnings. The likelihood of liquidity issues developing in this scenario is high.
Identification of Risk Owners
This is a section identifying what disciplines and who from those disciplines, including existing roles and responsibilities, will assume leadership as risk owners Frenz's Chief Risk officer should own this risk because of overlapping duties and experience.
Articulation of Risk Responses
This is a description of what everyone will do in the event of a risk event, and what tactics to deploy. This might also include cost/benefit relationships.
When total liquid assets drops below set threshold, there is a rating decrease, or potential default risk rises above a threshold, Frenz will pre-emptively sell less-liquid assets to decrease liquidity risk.
Articulation of the Measure of Successful Risk Mitigation
This includes the key performance indicators that reveal how well an organization is succeeding in mitigating a risk.
At all times, total liquid assets and cash should be monitored. Liquid assets must be greater than X and greater than Y for shocked scenarios.

5.   **Learning Objectives:**
4.   The candidate will understand how to apply decision making models to general managerial decisions within specified business constraints.

Learning Outcomes:
(4a)   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.

(4b)   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.

Sources:
The Fundamentals of Management Science - Ch. 7

The Fundamentals of Management Science - Ch. 9

Commentary on Question:
The goal of this question was to test candidates' ability to apply linear optimization models to a business problem, identify the optimal solution, and adapt the model to changing business requirements.

Candidates generally were able to appropriately identify the key decision variables, recognize that the nature of the problem is discrete, and visually graph the constraints. Additionally, candidates generally were able to adapt the objective function to accommodate new requirements.

However, some candidates missed identifying several key constraints for the primary objective functions, and few candidates successfully identified the binding constraints.

Solution:
(a)
(i)   Identify the decision variables.

(ii)   State the objective function.

Commentary on Question:
Candidates should be able to identify that this is a Net Income maximization problem, and that the variables are for # of flights, not # of passengers.
The $10,000 market research investment is a sunk cost and is to be excluded from the objective function.

5. **Continued**

T = # of morning flights to Toronto   Flights are 50 passengers per flight
N = # of morning flights to New York

$(50*150 - 1500) * T + (50*125 - 1000) *N$

Maximize: $6000T + 5250N$

(b)   State the required constraint functions.

Commentary on Question:
Candidates generally structured this part of the question correctly, by ensuring variables were on the left-hand side and identifying the non-negativity and integer constraints. However many candidates missed identifying key constraints, such as NY Demand, or did not appropriately setup the "Flights to NY at least as many as Toronto" constraint

Flights to Toronto Demand:	T	$\leq$	7
Flights to NY Demand:	N	$\leq$	3
Available Planes:	$T + N$	$\leq$	5
Required Plane utilization:	$T + N$	$\geq$	4
Flights to NY at least as many as Toronto:	$N - T$	$\geq$	0
Non-negativity requirement:	T, N	$\geq$	0
Integer requirement	T, N are integers		

(c)   Sketch the feasible region with binding constraints clearly labelled.

Commentary on Question:
There were many points available when setting up the graph. Candidates did not score full points if the feasible region was not clearly identified as only the 3 points (1,2), (2,2), & (2,3) given the axes below. Very few candidates successfully identified the binding constraints.

Binding constraints are highlighted in green, and were the constraints:

Available Planes
&
Flights to NY Demand

5.   Continued

# of Flights to Toronto
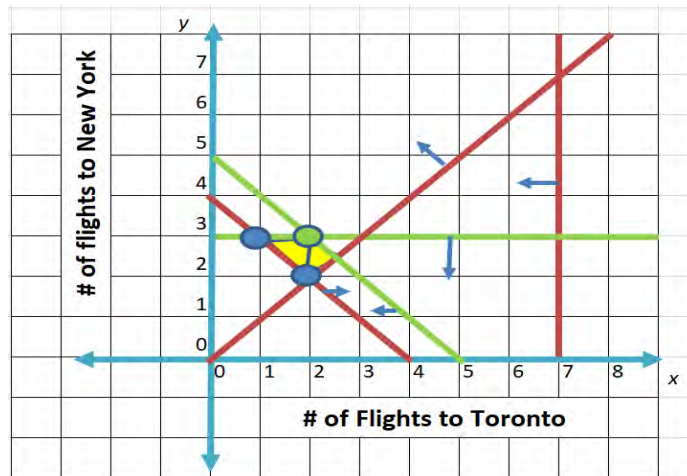
(d)   Calculate the optimal solution. Show your work.

Commentary on Question:
To get full credit on this question candidates would be required to demonstrate that their optimal solution yields the greatest value. This was done by either evaluating the 3 feasible points from the graph above, or through the isoquant method. The $10,000 market research investment is a sunk cost and is to be excluded from the objective function.

$6000 * 1 + 5250 * 3 = \$21,750$
$6000 * 2 + 5250 * 2 = \$22,500$
$6000 * 2 + 5250 * 3 = \textbf{\$27,750}$

The optimal # of flights is 5, with 2 going to Toronto and 3 going to New York
This results in net income of this offering of $6000 * 2 + 5250 * 3 = \textbf{\$27,750}$

(e)   Revise the model from part (a) to account for each variable I-III. Justify your answer.

Commentary on Question:
Candidates generally answered this question well, by appropriately updating the objective function from part (a) to incorporate the Foreign exchange variable, fuel price variable, and hub costs, as well as the interactions between them. The $10,000 market research investment is a sunk cost and is to be excluded from the objective function. Since WXY is an American company, the model should output values in USD.

5. Continued

T = # of morning flights to Toronto

N = # of morning flights to New York

Maximize: (50 * 150-500)*T*(CAD to USD exchange rate) - (1500+200*Fuel_Price)*T+ (50 * 125)*N -(1000+450+100*Fuel_Price)*N

= 7000T*(CAD to USD exchange rate) - (1500+200*Fuel_Price)T+6250N - (1450+100*Fuel_Price)N

6. **Learning Objectives:**

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

Learning Outcomes:

(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:

Minto Chapter 8: Questioning the problem solving process pg. 2-7

Organizational Behavior Chapter 10 pg. 314-315

Commentary on Question:

Candidates were to determine and describe the decision making style of each character from the referenced case study material. Candidates were required to apply the steps of Sequential Analysis to a particular scenario.

Solution:

(a) Identify Jeff and Kitty's individual decision making styles with respect to gathering information and evaluating alternatives. Justify your answer.

Commentary on Question:

Most candidates performed well on part (a)

Jeff – Gathering Information – Intuition Style
- Jeff exhibits a vision for the future, describes the big picture - each store is a profit center, increased merchandise sales is the future

Jeff – Evaluating Alternatives – Feeling Style
- Guided by emotions and personal subjective judgement
- Statements like "Feels wrong to him" that a CD attracts more overhead than coffee support this

Kitty – Gathering Information – Sensing Style
- Kitty believes in experience, following rules, step-by-step explanations and fact checking - detail oriented and enjoy gathering information
- Mentions rules on how stores are set up and displayed
- Must go through the appropriate channels (rule following) to change expense allocation

6. **Continued**

Kitty – Evaluating Alternatives – Thinking Style
- Makes impersonal, rational judgements based on logical objective analysis
- Wants to weigh pros and cons to changing
- Requires studying data to change the current allocation system

(b) Describe the five steps of Sequential Analysis.

Commentary on Question:
Many candidates answered with the 6 step decision making process (in error) rather than the steps described by Sequential Analysis. Partial credit was awarded for these answers. Additionally, many candidates only provided a list and did not describe the steps, so received only partial credit.

1. What is the problem?
• The problem is you don't like the result. To what precisely do you object? How will you know when the problem is solved?

2. Where does it lie?
• What is the situation within which the problem occurs? What are the set of activities that cause the problem?

3. Why does it exist?
• Gathering of information to determine the underlying root cause. This may require deeper probing of multiple processes that make a up larger, more complicated structures.

4. What could we do about it?
• Determine courses of action that could remedy the problem.

5. What should we do about it?
• Visualize the new situation with the change implemented
• Risk analysis – mistake in assumptions, not achieve your objective, inspire retaliation

(c) Apply Sequential Analysis to the problem Jeff has identified.

6. Continued

Commentary on Question:
*Candidates that answered part (b) correctly generally performed well on part (c).
Two common errors were:*
- *Not making a clear recommended course of action in Step 5. Many candidates listed actions that could be done, rather than deciding on a specific action that should be done.*
- *Not discussing the risks of implementing the candidate's recommendation.*

Candidates that answered with the 6 step decision making process in part (b) were given partial credit if they correctly applied it to the problem identified.

1. What is the problem?
- How can we allocate overhead most effectively such that each coffee shop receives a fair amount regardless of their mix of sales?

2. Where does it lie?
- The method of allocating overhead that Frenz is using. Overhead is allocated based on an item's standard price, causing supplemental item sales like CDs and greeting cards to attract relatively more overhead.

3. Why does it exist?
- This has been a historical practice.

4. What could we do about it?
- Take actual corporate overhead and allocate it as $X per store; or,
- Allocate Corporate overhead to each store based on smoothed budget amounts

5. What should we do about it?
- Frenz should allocate overhead based on smoothed budget amounts to allow each store to operate as a profit center. Changing the method introduces new risks such as:
  o Stores that mainly sell coffee will not benefit from the change.
  o Managers will need to shift focus away from coffee sales to products with higher profit margins.

7. **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 understand how to apply decision making models to general managerial decisions within specified business constraints.

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 including innovation and market disruption.

(4a) 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.

(4b) 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.

(4c) Evaluate business situations and describe how quantitative and statistical methods can improved decision making.

Sources:
Strategic Management: Competitiveness and Globalization, Concepts
- Ch. 3, Internal Organization: Resources, Capabilities, Core Competencies and Competitive Advantages
- Ch. 9, Cooperative Strategy

Data, Models, and Decisions: The fundamental of Management Science
- Ch 5 –Simulation Modeling

Commentary on Question:
Commentary listed underneath question component.

Solution:
(a) List four criteria of a sustainable competitive advantage.

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7. Continued

Commentary on Question:
Non-obsolescence is identified in some material as a criteria of a sustainable competitive advantage. Full points were awarded for any combination of 4 of the 5 items below.

- Valuable
- Rare
- Costly to imitate
- Non-substitutable
- Non-obsolescence

(b) Identify one core competency for Blue Jay Tire Corporation (BJT). Justify your answer.

Commentary on Question:
Candidates were required to provide an example of a core competency from the case study and justify using case study evidence to receive full points. Note, candidates who identified BJT's brand/quality assurance as a core competency did not receive full points as the tire scandal has tarnished the BJT brand.

BJT's manufacturing process, which is adaptable and scalable gives the company competitive advantage over its competitors. When BJA purchased BJT, it was able to adapt its manufacturing process to manufacture a broader range of tires, expanding into commercial vehicle tires from the specialty tires the founding company used to make. The manufacturing process is also scalable. BJT expanded its Canadian operations into the U.S., opening two plants and was able to meet ambitious sales targets, gain market share and dominate the earnings of the BJA group.

(c) Explain how vertical complementary alliances help a company improve its performance in individual product markets.

Commentary on Question:
To obtain full points for this question, the candidate's answer had to mention the sharing of resources from different stages of the value chain.

Vertical complementary alliances help companies share resources from different stages of the value chain in complementary ways to create competitive advantage. Often, the vertical alliances are formed to adapt to environmental changes.

7. **Continued**

(d)

(i)   Design a model to project BJT's earnings from commercial plane tires.

(ii)   Calculate projected earnings over the next 10 months using the random numbers provided. Show your work.

Commentary on Question:
Points for this part varied and few received full points. Candidates who set up the variables and equation to solve correctly, incorporating unused tires in inventory to fill demand and showed all of their work leading up to the calculation of earning overs 10 months obtained full points.

(i)   P = price of commercial plane tire ($/tire)
        D = sales of commercial plane tires (tires) to other airlines.
        E = random variable representing commercial plane tire earnings of BJT ($)
        I = random variable representing inventory of plane tires (tires)
        E = P*min(250+I,D) - 500K + 3000*500 = P*min(250+I,D) – 350K

(ii)   Simulate Demand based on CDF of provided discrete distribution

Random Number Interval	Tire Demand
0-0.1	0
0.1-0.3	100
0.3-0.6	200
0.6-1	400

Random Number	Tire Demand
0.35	200
0.75	400
0.85	400
0.15	100
0.25	100
0.05	0
0.45	200
0.55	200
0.95	400
0.65	400

7. **Continued**

Simulate price for commercial plane tires. For each random number x, compute value of y whose cumulative distribution function value is equal to x. That is, given x, solve the following equation to obtain y:

$E(y) = Pr(Y<=y) = x$

y is the simulated price

Y ~ Normal (mean = 4000, std dev = 1000)

i.e. if Z is -0.5:

$P = 4000 + 1000*(-0.5) = 3500$

Z Std Normal rv	Price
0.00	4,000
-0.50	3,500
0.50	4,500
-1.00	3,000
-0.50	3,500
1.50	5,500
1.00	5,000
-2.00	2,000
0.50	4,500
0.00	4,000

Calculate closing inventory from unsold tires, which factors into available for sale tires for next period and compute earnings based on equation $E = P*\min(250+I,D) - 350K$:

Inventory	Available for Sale	Amount Sold	Earnings ($)
-	250	(200)	450,000
50	300	(300)	700,000
-	250	(250)	775,000
-	250	(100)	(50,000)
150	400	(100)	-
300	550	-	(350,000)
550	800	(200)	650,000
600	850	(200)	50,000
650	900	(400)	1,450,000
500	750	(400)	1,250,000

(e) Recommend two metrics BJT could use to evaluate earnings risk from the commercial plane tire product line. Justify your answer.

7. Continued

Commentary on Question:
This part was answered very poorly and most candidates received very little to no points. Providing general risk metrics like VaR and CTE and listing advantages to using them in general is not appropriate and resulted in no points awarded. The chosen metric should also measure earnings risk and the best candidates calculated the metric based on the results in the previous section. Candidates are not expected to calculate a particular metric based on the simulation. Note that sample mean is not an appropriate risk metric as it does not provide a measurement of variability.

Risk metric 1: Sample standard deviation = $593k. This tells us that there is significant variability in monthly results, particularly if compared to an expected earnings metric such as sample mean ($547k).

Risk metric 2: Prob (earnings <= 0) = 3/10 = 30% by counting the number of simulations that resulted in losses. This metric gives the probability of making zero profit or a loss. It is a good metric to understand the propensity of loss-making months and can be used to inform a risk appetite around earnings volatility. The simulation results show that BJT can expect to make a profit 70% of the time.

(f) Describe two additional considerations as to whether or not BJA and BJT should enter into a vertical alliance. Justify your answer.

Commentary on Question:
Answers to this part was also very poor. Candidates had to connect back to the case study in order to obtain points. Listing general considerations to vertical integration resulted in no points.

Consideration 1: BJA and BJT have similar business strategies but the recent BJT safety issue can hurt BJA's business. BJT's business strategy is differentiation. It distinguishes itself from competitors by offering high quality tires that is also safe and representative of the brand name. BJA is a very customer-centric company that wants to be the safest airline and one of their goals is to expand the business-travel customer base. In terms of business strategy and goals, the two companies are aligned and this supports vertical integration. However, BJT has recently had a scandal about the safety of its tires that caused an accident and death. Although the safety issue has been resolved, customers may be wary and this could be seen negatively by customers contemplating travel with BJA. This would go against vertical integration for BJA. Lastly, by taking over control of the production facility, BJA can enforce quality standards in line with its business goals of being a safety-first, customer centric airline. This also supports vertical integration.

7. **Continued**

Consideration 2: Secure fixed price and supply of tires for BJA, which could be translated into cheaper flights for the customer and BJT generates additional income on the plane tire sales. This supports vertical integration. This improves BJA's margins on a standalone basis because they are securing tires below market price; however BJT is forgoing some tire sales at market price by guaranteeing a certain supply to BJA at fixed rates. They will need to think about appropriate transfer pricing and accounting of the arrangement, given the arrangement should have no net impact on the consolidated results (as the cost savings to BJA is exactly offset by revenue erosion to BJT). Potentially, BJT could be considered an investment center to BJA and the stability around tire production and price could help BJA create efficiencies in their operations. The value of this should be evaluated and BJT performance metrics for the plane tire segment should reflect these potential benefits.

8.

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 measures or corporate value and their uses in corporate decision making.

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 models such as Porter's five forces.
    *   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.

(2a) Assess various measures that firm can use to assess value and recommend appropriate measures to evaluate corporate value.

(2b) Assess how performance metrics and incentives could impact key business decisions and create value for shareholders:
    *   Explain how managerial accounting can impact strategic decisions.
    *   Explain and recommend methods a firm may use to allocate its costs and how these methods impact the perceived performance of a firm or its component lines of business.

Sources:
Milliman Research Report: 2016 Embedded Value Results: Europe pg. 17-23

CFO Forum – MCEV Basis for Conclusions pg. 8

Strategic Management: Competitiveness and Globalization – Chapter 2 pg. 45-55

Commentary on Question:
Many candidates understood the components of MCEV and how the external environment can potentially influence its calculations. Candidates who understood the shortcomings of MCEV and how it can be used to evaluate performance and make decisions generally did better.

Solution:
(a) Describe how Darwin's market-consistent embedded value (MCEV) calculation is or could be affected by each of the four segments (I to IV).

8. Continued

Commentary on Question:
Candidates generally only received part credit for generic answers of how MCEV could be effected by the external environment. Those candidates who were able to relate to Darwin through case facts and provide examples received full credit.

Demographic - Mortality and lapse assumptions specific to Darwin Life's inforce and new business portfolio (the domestic US market) are used to calculate the insurance risk requirement of required capital. The larger the variability of these assumptions, the greater the required capital, which leads to a decrease in MCEV. These assumptions are also used to calculate the PVFP component of the VIF.

Economic - Volatility of the interest rates and market forces increase required capital. Continuously decreasing interest rates may threaten Darwin Life's solvency and management may choose to strengthen capital for economic risks. Darwin has a VA hedging program which may reduce required capital by supporting the asset and interest rate risk requirement of the required capital. Low interest rates in 2015 will direct impact the discounting component of the MCEV.

Political/Legal – Changes in regulation that lead to an increase/decrease in required capital would lead to a decrease/increase in MCEV. There may be new regulations that restrict Darwin's ability to do business, or force Darwin to rethink its current products which may affect PVFP. Any legal disputes or lawsuits may lead management to change assumptions that reduce PVFP.

Technological - The CEO is thinking about selling products directly over the Internet. He wants to be the disruptor in that space. The CEO may want to project MCEV (increase in PVFP) in the future to evaluate whether or not this idea is worth the investment. Technological advancements may increase MCEV through efficiencies, thereby reducing expenses and increasing PVFP.

(b)

(i)   Describe two shortcomings of MCEV as a measure of corporate value to investors.

(ii)   Critique the board's proposal to use the change in MCEV as the sole key performance indicator for incentive compensation.

(iii)   Recommend changes to the compensation structure based on your answer in part (ii). Justify your answer.

8.   Continued

Commentary on Question:
Many candidates performed well on parts (i), but were unable to achieve many points for parts (ii) and (iii). Many candidates repeated the answer given for part (i) in (ii), neglecting concepts such as controllability, and the suitability of using a sole metric as a performance indicator.

Part (iii) was answered poorly by the majority of candidates. Many answers did not attempt to address the shortcomings answered in part (ii). Furthermore, many answers did not include MCEV at all. Nearly none of the candidates introduced a personal component to the incentive compensation and focused entirely on financial or scorecard metrics.

(i)   Full credit to any two of the below:
- MCEV only accounts for inforce business and does not account for future or potential business.
- MCEV does not account for intrinsic value such as customer lists, technology etc. compared to market capitalization.
- MCEV is not a widely understood metric, and is not immediately comparable to non-insurance companies.

(ii)
- Since MCEV does not capture the value of new business, the impact of the pricing and sales team are not reflected and are not compensated.
- It does not factor in the personal contribution of the employee. Employees will feel that the incentive compensation is beyond their control. The compensation needs to incentivize contribution from each employee.
- Model volatility due to change in assumptions could change YoY change in MCEV.
- Using YoY change in MCEV as the sole metric does not properly incentivize positive contribution from each employee, nor does it align itself well with Darwin's aggressive organic growth strategy.

(iii)   The total incentive compensation should be broken up into two components: corporate and personal. Senior executives should have compensation skewed towards corporate performance as they have more controllability over financial results than non-managerial staff. The corporate component should be composed of both MCEV and VNB to account for performance on both the inforce and new business portfolio. Incentive compensation for non-managers should skew towards personal performance. This component should be based on yearly performance appraisals.

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

5. The candidate will understand the role that organizational behavior and communication play in organizational decision making and efficacy, as well as learn how to 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 models such as Porter's five forces.
- 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 including innovation and market disruption.

(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.

(5b) Evaluate the impact of human behavior factors on the effectiveness of decision making processes within organizations:
- Explain the role of cognitive biases on making suboptimal individual decisions.
- Evaluate the role of organizational behavior on organizational decision-making processes and efficacy.

(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.

9. Continued

Sources:
Organizational Behavior Ch10

Mento Communication Book Ch3: Pyramid Principle

Leaders as Decision Architects

Strategic Management Ch2

When and When Not to Vertically Integrate

Case Study

Commentary on Question:
Overall, candidates did well in this question. Many candidates did not answer part b from Jeff's perspective, though, which was awarded only partial credit.

Solution:
(a)   Evaluate the Vietombia proposal with respect to each of the features of vertical market failure (I – IV).

   Commentary on Question:
   Most candidates were able to evaluate at least 3 of the 4 VMF characteristics correctly and identify that the Vietombia coffee bean market exhibited many VMF characteristics.

- Criteria 1 - A small number of buyers and sellers: Vietombia is a concentrated seller of the Vietombia Finca Palmilera. The general coffee bean industry has many buyers and sellers, but there are only a few sellers that sell high-quality coffee beans, which is what Frenz is trying to buy.
- Criteria 2 - High asset specificity, durability, and intensity: Vietombia Finca Palmilera has high specificity since the majority of it is grown in Vietombia. Criteria 3 - Frequency transactions: Transactions are frequent
- Criteria 4 - Uncertainty, bounded rationality, and opportunism: Frenz can exploit market power by having exclusive access to the Vietombia Finca Palmilera. There could be uncertainty induced by the political instability in Vietombia.

9. Continued

(b)

    (i)   Apply the six-step process to compare the projects from Jeff's perspective.

    (ii)   Recommend which project would best align with Jeff's perspective.

Commentary on Question:
Candidates had mixes responses to this question.
Some candidates confused "perceptual influence" and "judgemental influence".
Very few were able to apply Jeff's intuition and feeling style into how he would make this decision. Few marks were given for candidates that applied the decision making process on a generic basis.

Define the problem:
- Due to capital constraints, Frenz must choose between investing in the digital strategy, or in an agreement to secure coffee beans from Vietombia.

Identify Criteria:
- Does the option align with Frenz' focused differentiation strategy?
- Does the option produce synergy with Frenz' other products/services?
- Does the option fit in with the current industry trend (can use Section 4.3 market trend as reference)?

Gather and Evaluate Information:
- Perceptual influences (sensing vs intuition): Jeff would focus on abstraction and describing the "big picture" (intuition).
- Jeff would rely less on detailed quantification studies (e.g. cash flow projection) and more on "big picture" evidence such as market trend reports (e.g. section 4.3).
- For example, millennials are now more concerns about where their coffee comes from, whether the workers and the communities are treated well. Frenz will have to implement worker programs since they do not currently exist, this might cost more than originally expected.
- Frenz's digital strategy is the first among its competitors. Frenz is known as a product innovator.

List and Evaluate Alternatives:
- Judgmental influences (thinking vs feeling): Jeff would use subjective values with emotional and personal factors (feeling).
- Jeff may be inclined to evaluate the options based on his non-coffee marketing background.

9. Continued

Select Best Alternative:
- Jeff would use feeling (using subjective values with emotional and personal factors).
- Jeff would be inclined to choose the digital strategy option since he comes from a non-coffee marketing background. This personal experience may prompt him to stick to a familiar option compared to Vietombia coffee production.

Implement and Follow Up:
- Evaluate the success of the chosen project based on the criteria listed in step 2.

Based on the above analysis (especially steps 3, 4, and 5), Jeff will choose the Digital Strategy project.

(c)   Construct a three-level pyramid structure with the top-down approach using the information from part (b) that Jeff can use as an aide to write a memo communicating his decision.
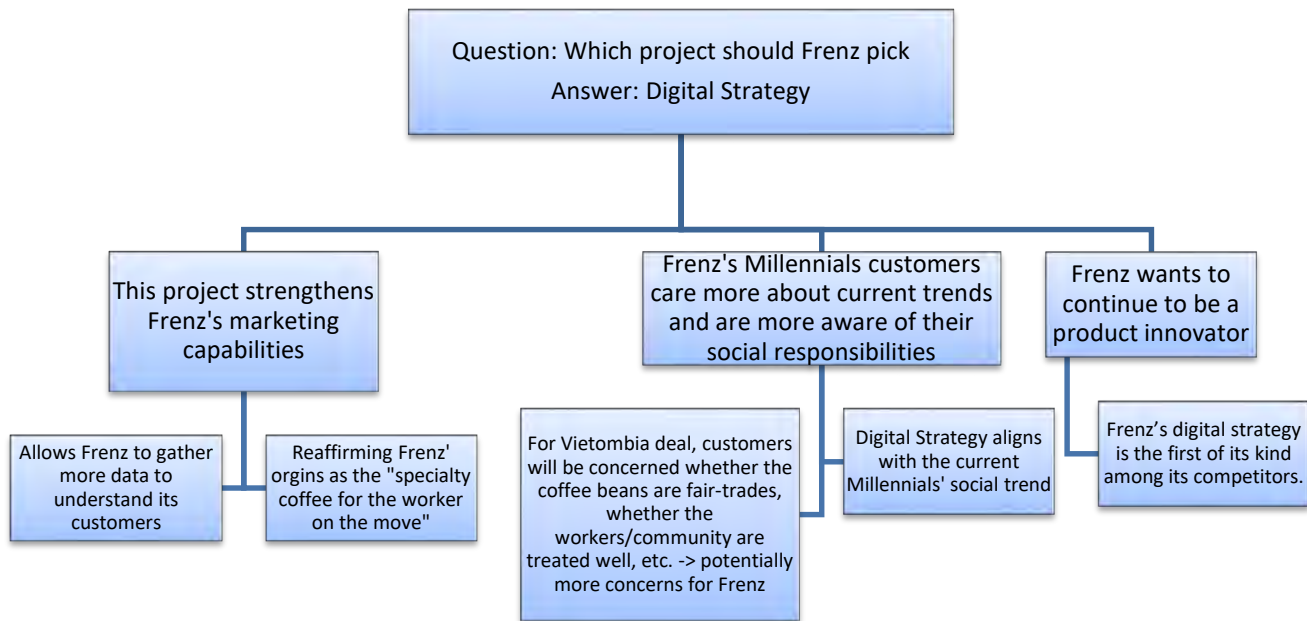
Commentary on Question:
Candidates did poorly on this part. Many candidates were able to draw out a rough pyramid structure, but struggled with listing the topic items like the situation and complications.
Some candidates simply copied over the analysis from part b) into boxes, which was not the objective. This part focused on how to communicate the analysis.

The key is to organize the answers from part b) into the pyramid format. Below is an example:

Situation: Capital restrain
Complication: Can only choose one project
Question: Which project to choose
Next Question: Why

(d)   Explain one lever from each of the following modes of decision making that can help you achieve the goal.

   (i)   System 1

   (ii)   System 2

   (iii)   Bypass both systems

Commentary on Question:
This section was done well. Full marks were only awarded for examples that were not overly impractical. Some candidates misread the question and gave examples of how to improve the app's popularity in general, rather than focusing on the loyalty program.

9.   Continued

Many answers could be acceptable as long as the lever was clearly defined and the example was plausible, the following are some examples:

System 1:
Simplify the process: people are more likely to sign up if the process is simple (i.e. no unnecessary steps). We can make the sign up process to be as simple as making a click/swipe.
Harness biases: people feel twice as bad about incurring a loss and they feel good about receiving a gain. To nudge customers to sign up, whenever a customer completes an in-app payment, a message can pop up remind them that "you could have earned 100 points towards a great reward!" to prompt them on what they have lost.

System 2:
Use planning prompts: remind customers who did not sign up, or who were the in the process of signing up and stopped.
Reminder: similar to above

Bypass both systems:
Set the default: Enroll the customer in loyalty program automatically