# CFD SDM Model Solutions
# Spring 2025

## 1. Learning Objectives:

1. The candidate will understand and apply strategic management concepts and frameworks to develop an organization's financial and ERM Solutions.

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.

**Sources:**

SDM-194-22: The Hard Side of Change Management

Data, Models and Decisions: The Fundamentals of Management Science

Ch. 1: Integration in the Art of Decision Modeling

## 1. Continued

**Commentary on Question:**
*Question 1 assessed candidates' ability to apply decision trees to evaluate strategic business initiatives. While many candidates demonstrated a solid understanding of the basics, fewer were able to provide targeted critiques or propose context-specific enhancements. Performance varied across parts, as noted in the sub-question commentary.*

**Solution:**
(a)

(i) Describe the difference between a decision node and an event node.

(ii) Identify the decision nodes and the event nodes in the decision tree modeled in the Excel spreadsheet.

**Commentary on Question**:
*Performance on part (i) was mixed. Some candidates provided clear definitions, while others gave general responses that were not tied to the decision tree context and therefore received only partial credit. For part (ii), most candidates successfully identified the decision and event nodes in the provided model.*

(i) A decision node represents a decision - controllable factors and is represented by a square node, while an event node represents an uncertain event - uncontrollable factors and is represented by a circular node.
(ii) Style of entry and admin capabilities are the decision nodes. Regulatory approval is an event node.

(b) Critique the components of the Expected Monetary Value (EMV) calculation.

**Commentary on Question**:
*Candidate performance was mixed for this part as well. While a good number demonstrated the ability to critically assess the EMV calculation, others gave generic descriptions of decision trees or offered unsupported personal opinions. Full credit required a focused critique of the specific EMV components used in Darwin's Excel model.*

Below is a sample answer, other answers were accepted if sufficiently justified and specific to the EMV calculation shown for Darwin.

- Overly simplified scenarios.
- Timelines are not taken into account. Only one period is used.
- EMV doesn't take $ value of capital investment into account.
- EMVs are compared based on % ROI not $ return.

## 1. Continued

(c)

(i) Identify two shortcomings of this decision tree model with respect to Darwin's situation. Justify your answer.

(ii) Recommend two enhancements to the tree that address the shortcomings identified in (i). Justify your recommendation.

**Commentary on Question**:
*Candidates generally performed well on this part. Full credit was awarded to those who identified shortcomings relevant to Darwin's specific situation and proposed clear enhancements tied directly to the structure of the decision tree. Partial marks were deducted when responses were too general or when proposed enhancements lacked sufficient detail.*

Several sample answers are shown below. Candidates only needed to identify **two** shortcomings/enhancements to receive full credit. Other answers were accepted if reasonable and sufficiently justified.

(i)

- Timelines have not been described
- No sensitivity analysis has been done for the outcomes
- Doesn't take into account substantive risk embedded in each node
- Assumes mutually exclusive and collectively exhaustive outcomes, may not be realistic
- Each final node has a financial value, may be difficult to predict as decision tree gets more layers

(ii)

- Bringing products to market quickly, Darwin often has not had time to fully build systems and handle the back-end administration prior to product launch, may need to include timelines in each node and make it a factor in decision making process.
- Align risk preferences, appetite, and tolerances with the entry strategy in light of other major lines of businesses:
    - Build best and worst case scenarios in each node
    - Build interdependencies between node

## 2. Learning Objectives:

1. The candidate will understand and apply strategic management concepts and frameworks to develop an organization's financial and ERM Solutions.

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:**

(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.

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

(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 of Budgeting – Ch. 30 Zero-Based Budgeting

Handbook of Budgeting – Ch. 6 Strategic Planning and Budgeting Process

Handbook of Budgeting – Ch. 2 Balanced Scorecard-based Budgeting & Performance Management

What Everyone gets wrong about Change Management

**Commentary on Question:**

*Question 2 assessed candidates' understanding of zero-based budgeting, initiative prioritization, and the alignment of financial decisions with strategic goals. Candidates generally performed well on technical aspects and recommendations but often lost marks for vague justifications or failing to tie responses directly to the case study. Stronger responses clearly linked budgeting decisions and performance measures to Darwin's strategic objectives.*

## 2. Continued

**Solution:**

(a) Assess the accuracy of each of the statements I and II listed above.

**Commentary on Question**:
*Candidates generally performed well on this question. To receive full marks, part (a) required correctly identifying the accuracy of each statement and providing a clear rationale supported by examples or relevant concepts. Partial marks were awarded if the rationale lacked sufficient justification.*

(i) This is true. ZBB forces corporate prioritization and identifies problem areas. It is good at translating long term objectives into action plans that are funded via ZBB. It is good at providing alternatives to fund several initiatives and at what levels, allowing for trade-offs. It is also clear how budgets can be adjusted when changes happen such as when macro-environment changes or when there are internal changes to direction.

(ii) This is false. A decision package needs to consider elimination of the operation, reduced level of funding up to the minimum level to function, current level of functioning (maintenance level), and increased levels of funding. A decision package is a unit of budget with information that management can use to prioritize some or all of the underlying action plans and decide on its funding level.

(b) Consider Darwin's company profile from Section 6.2 of the Case Study and the strategy map provided in the Excel spreadsheet.

(i) Recommend whether or not Darwin should invest in each of the initiatives I to III. Justify your answer.

(ii) Recommend two measures for the balanced score card for one of the initiatives in I to III. Justify your answer.

**Commentary on Question**:

*(i) Candidates generally performed moderately well. To receive full marks, candidates needed to provide a clear recommendation to either invest or eliminate each initiative (1 point each), along with a well-supported rationale referencing the company's strategy, case study context, or relevant examples (up to 3 points per rationale).*

*(ii) Performance on this part was mixed. Full credit required identifying two distinct balanced scorecard measures (1 point each) that clearly aligned with the company's strategy map. Up to 3 points were awarded per measure based on how well the candidate justified its relevance in tracking strategic objectives. While a sample solution was provided, other well-reasoned responses were also accepted.*

## 2. Continued

(i)

- Digital Distribution – It does not fit within Darwin's core strategy's internal objectives of customer service excellence, product build capability or inforce management . Going upward on the strategy map, which shows the key drivers that affect successive perspectives moving upward, this initiative also does not serve intermediate customers at all, and can come in conflict with them. It could be a way to reach more of Darwin's end customers but risks big conflicts with the rest of the current core strategy. Recommendation: eliminate
- Innovation Program – With the cost reductions used to reduce prices and increase Darwin's sales and improve retention, this supports I6 Competitive Products, Internal perspective Product Build Capability and Inforce Management • Going upward the strategy map, this then supports Darwin's intermediate customers with (a) competitive products, which then increases sales and generates growth, and with (b) a strong insurer backing promises of these products. However, care should be taken that cost reductions do not affect customer service excellence, especially on I3. Recommendation: investment
- Product Innovation – This does not fit in Darwin's capability of being a fast follower with competitive product, which is at the bottom row Internal perspective Product Build Capability. Darwin could create a new Product Innovation Team but that in itself does not build capability to build the product, especially as Darwin already has lack of expertise on cutting edge product areas.Pointing upward the strategy map, this then does not support C1 Fast follower delivery of market established product solutions for the intermediate customers' clients. Darwin's producers may also not have the capability to push innovative products in the marketplace or sell its value to their clients, Darwin's end customers. The risk of product failure is high.

  Recommendation: **eliminate**

(ii)

For the innovation program to cut costs,

- one objective it supports is to increase competitiveness of products (I6). A measure to track success would be cost reduction that ties to an increase in margin that allows for a big enough product enhancement that can increase sales.
- one objective it supports it to increase retention which in turn increases profitability (I7). A measure to track success would be a % increase in retention that ties to a cost reduction.
- One objective is to continue to achieve customer excellence, especially on direct and quick access to service and assistance (I3). A measure to track would be a net promoter score or other customer and/or distribution feedback score to ensure that Darwin retains a high level of customer satisfaction.

## 2. Continued

(c) The following are the five prototypical quests:

- Global Presence
- Customer Focus
- Innovation
- Nimbleness
- Sustainability

(i) Explain which one or more of the five prototypical quests are associated with each of the initiatives I to III.

(ii) Recommend what actions Darwin can take to avoid the three transformation traps when considering initiatives I to III. Justify your recommendation.

**Commentary on Question**:

***(i)*** *Candidates generally performed reasonably well. Full marks required correctly mapping each initiative to one or more of the five prototypical quests (1 point each), along with justifications based on case study details (1 point per justification), for a total of up to 12 points. General or vague responses not tied to the case study did not receive credit. Most candidates successfully identified relevant quests and provided reasonable justifications across all three initiatives.*

***(ii)*** *Most candidates earned partial credit by correctly identifying the three transformation traps. To receive full marks, candidates needed to go further by linking their responses to Darwin's specific context, such as referencing its strategy or CEO Gabriela's role, and by offering appropriate recommendations to avoid each trap.*

(i) **Digital Distribution** – Combination of Customer Focus, Nimbleness, and Innovation.

**Customer Focus** – will allow for a sales process that could appeal to a large section of the population, especially amongst millennials who have been found to be particularly disengaged in traditional channels. Will also offer a distinct experience to customers compared to its rivals like the ability to compare prices and features against competitors.

**Nimbleness** – the more direct method accelerates and simplifies the process, allows for more direct and frequent customer connection, makes cross-selling/target marketing easier, and faster reaction to market changes/customer trends.

**Innovation** – the app would offer a distinct/unique experience compared to its rivals, utilizing innovative ideas like price and feature comparisons.

## 2. Continued

**Innovation Program** –
**Innovation**. This program is exploring ideas/fresh sources to expand Darwin's opportunities for cost-savings.
**Nimbleness** would likely also be a part of this initiative, accelerating or simplifying processes to reduce Darwin's costs. Such cost-savings improvements would lead to competitive advantages for Darwin as they would be able to gain a higher profit due to lower costs or be able to reinvest the cost-savings in other initiatives, marketing, and/or other areas to gain Darwin more business.

**Product Innovation** –
**Innovation**. Being first to market with innovative products to gain a competitive advantage, the team is tasked with researching market trends and developing new product ideas.
**Nimbleness** and **customer focus** might also be relevant, especially if the new products aim to meet emerging customer needs quickly.

(ii) **Neglecting the quest** – Darwin needs to identify a mobilizing theme and link its effort to the company's objectives and strategy. I recommend Darwin review these initiatives against the strategy map it has defined here and its objectives of customer service excellence, product build capability, and inforce management to determine which align best with the company strategy and ensure any efforts invested in the chosen initiative(s) continue to align with Darwin's objectives.

**Being seduced by the wrong quest** – this can occur when the team is led astray by a forceful CEO or when a copy tries to copy the strategic moves of competitors. The CEO, Gabriela, has received warnings from her direct reports that Darwin doesn't have the technical expertise to develop a seamless direct marketing sales process, and they are also worried that conflict could ruin the digital initiative if losses on the agency side outweighed gains from online distribution. Additionally, though Darwin uses a fast follower strategy for products, Gabriela has created a new production innovation team. Deep deliberation needs to occur weighing the pros/cons and feedback received, resulting in a shared conviction across the board and top team and ensuring the chosen initiatives address the central issues, instead of just accepting the CEO's vision.

## 2. Continued

**Focusing on multiple quests** – some corporations overreach, taking on too many quests at once or overestimating their leadership capabilities in a given area. This is currently a potential concern of the CEO – "was Darwin doing too much? Every time you turned around the Wall Street Journal's front page seemed to cover yet another high-risk meltdown. No industry, especially the financial sector, was immune. Darwin had aggressive plans. Did management have a handle on the risks they were taking?" Darwin should evaluate its many initiatives and prioritize/focus its efforts on one or two that align best with its strategy instead of trying to do all at once. The company should also assess its leadership capabilities to ensure they are equipped to handle the prioritized initiatives.

Darwin's CEO has now prioritized the initiative on Acquisition and New Markets, described in Section 6.3 of the Case Study. The total funding for select areas in Darwin has been set to $100 million in the next year, with the budgeting worksheet provided in the Excel spreadsheet. The budget has been designed following a zero-based budgeting process.

(d)

(i) Identify the decision packages IT must have submitted to Darwin's management that were then used to come up with the budget items shown.

(ii) Explain three decisions made by Darwin's management in developing its budget ranking given its strategy map.

**Commentary on Question**:

***(i)*** *Candidates generally struggled with this part. Many identified only the most obvious IT-related packages, such as infrastructure improvements, and overlooked others. To receive full credit, candidates needed to identify all decision packages allocated to the IT team and correctly state the budget ranking, including a clear explanation of which packages would be approved based on the $100 million budget cap.*

***(ii)*** *Candidates generally performed adequately. Full marks were awarded to those who clearly linked each budget decision to Darwin's strategic priorities, demonstrating how the ranking aligned with the company's overall goals.*

(i) IT's decision packages are submitted in order of ranking. Based on Darwin's budget of 100 million, the company should invest in packages 1-5 with the minimum "strengthening IT infrastructure" package

(1) Minimum package = regulatory required
(2) Same level of capability as current run of business

## 2. Continued

(3) Increase in capability in meeting customer service excellence via higher linkage to distribution partners
(4) New corporate growth initiative support packages which would be part of cross functional packages (PRT, Fintech, Acquisition)
(5) Strengthen IT infrastructure
Minimum package – product infrastructure which is key to Darwin's product build capability
Enhanced package – infrastructure environment
(6) Inforce Capabilities

Minimum package – inforce management to increase profit margins
Alternative package – inforce service capabilities enhancements to support customers and limit surprises
Alternative package – other inforce management enhancements that can strengthen portfolio (e.g. predictive analytics capabilities)

(ii) (1) Keeping current level of capabilities and service is key to Darwin's success
(2) Darwin prioritizes customer service excellence to its distribution partners high with the API build coming third in the ranking
(3) Increasing competitiveness of products (I6) and keeping company profitability and ratings (I7) by increasing yield is also high in Darwin's priority to protect its core business
(4) The growth initiatives are getting funded, high above what might be seen as more maintenance or sustainability projects.

## 3. Learning Objectives:

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.

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

**Learning Outcomes:**

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

(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.

**Sources:**

Business Dynamics Steman: Chapter 12 Coflows and Aging Chains

**Commentary on Question:**

*Question 3 assessed candidates' understanding of the aging chain model and its application to workforce planning decisions. While candidates generally performed well on parts requiring direct recall, many struggled with questions that required deeper comprehension and application of the concepts to the case scenario. On average, candidates earned just over half of the available points.*

**Solution:**

(a) Identify the inflows and outflows for the BJA pilot labor force using the aging chain model.

**Commentary on Question**:

*Most candidates performed well on this question, with many receiving full marks. To earn full credit, responses needed to clearly describe both the inflows and outflows, as well as reference both trainee and qualified pilot states.*

## 3. Continued

Trainee:
Inflows: hiring a trainee
Outflow: drop out or promotion to Qualified pilot
Qualified pilot
Inflows: trainee being promoted or hiring Qualified pilot
Outflow: quitting

(b) Calculate the equilibrium trainee fraction for BJA. Show your work.

**Commentary on Question**:
*Overall performance on this question was poor, with few candidates earning more than half of the available points. While most correctly identified the quit rate for qualified pilots as 1/15, many struggled to apply the correct formula to calculate the equilibrium trainee fraction.*

In equilibrium the inflow = outflows.

Experienced quit rate = 1 / 15 = 0.067 per year = R

It takes two years for a trainee to graduate to experienced pilot.

Trainee fraction = number of trainees/total employees
= 2R / (2R + 1)
= (2/15) / (1 + 2/15) = 0.118

(c) Calculate the equilibrium productivity. Show your work.

**Commentary on Question**:
*Overall performance on this question was also poor. While many candidates identified some of the key inputs from the question stem, most struggled to apply the correct formula and compute the final answer. Full credit required both the correct formula and a correct final result.*

Trainees are 25% as productive as fully qualified pilots. From (b), we know that the experience quit is 1/15, and it takes trainees two years to graduate from trainee to fully qualified pilot.

Equilibrium average productivity as a fraction of productivity of experienced employees = (1 + 0.25 * (1/15) * 2) / (1 + (1/15) * 2) = 0.91

## 3. Continued

(d)

(i) Describe qualitatively how the increase in the number of pilots impacts metrics I to III within the first three years. Justify your answer.

(ii) Analyze metrics I to III in the three-year growth period versus those after three years.

(iii) Describe the effect on metrics I to III if BJA hires experienced pilots in addition to hiring trainees.

**Commentary on Question**:
*Candidates generally performed well on part (i), with most correctly identifying the impacts on the three metrics and providing sound reasoning. Part (ii) was also handled reasonably well, although some candidates had difficulty distinguishing between short-term and long-term effects. In part (iii), most responses earned partial or full marks, with many correctly noting that hiring experienced pilots would improve productivity.*
*Full credit required candidates to assess each metric individually and provide rationale grounded in the case context. General or unsupported answers did not receive credit.*

**Part (i)**
Metric I: If we assume that BJA only hires trainees, then if BJA wants to increase the number of pilots they will inevitably have to hire more trainees and the hiring rate of trainees will increase.

Metric II: Trainee fraction will increase as all new hires will be trainees and this is how BJA will achieve its increase in number of pilots.

Metric III: productivity will decrease as trainees are less productive than qualified pilots and the percentage of trainees will have increased. It takes 2 years for trainees to become qualified pilots, so in year 3, the productivity rate may increase from the prior 2 years due to trainees becoming qualified pilots.

**Part (ii)**

Metric I: The hiring rate of trainees will increase during the three-year growth period. After the growth is accomplished, it will revert to a new equilibrium where the hiring rate will offset the quit rate.

Metric II: The trainee fraction will increase during the first two years of the growth period. After that point trainees will start graduating to experience pilots and eventually a new equilibrium trainee fraction is reached.

## 3. Continued

Metric III: Productivity will initially decline as trainees are brought in during the three-year growth period, but then steadily increase after two years as trainees become qualified pilots.

**Part (iii)**
Metric I: Hiring rate of trainees will be decreased because some of the hiring will be allocated to experienced hires.

Metric II: The impact to the trainee fraction is unknown, the hiring of trainees will increase trainee fraction while the hiring of qualified pilot will decrease trainee fraction. Based on this, BJA has flexibility on how the trainee fraction is impacted.

Metric III: The productivity will increase in the beginning because qualified pilots are more productive than trainees, however the productivity will reach the same equilibrium in the long term.

(e) Critique the use of the first-order formulation of the transition rate in the model described in (a).

**Commentary on Question**:
*Candidates generally did not perform well on this question. Most responses focused on general knowledge rather than addressing how the assumption applied specifically to BJA's workforce. Full credit required referencing the assumption of perfect mixing inherent in first-order formulations and drawing a consistent conclusion based on that context..*

The first order formulation is that output (productivity) is equal to equilibrium divided by average delay time. This is direct and clear formula describing the transition rate. However, it assumes the order of outflow is with equal probability, which means the order of output is irrelevant to order of input (perfect mixing). This may not be realistic in training. Usually, people starting training early will also finish training early, which conflicts with the perfect mixing feature.

(f) Recommend an improvement to the model described in (a) that will allow using the first-order outflow. Justify your recommendation.

**Commentary on Question**:
*Candidates also struggled with this question. Full credit required proposing an improvement that directly addressed the limitations of the mixing assumption. Partial marks were awarded to candidates who suggested a cohort-based approach but did not clearly justify it in relation to the mixing assumption.*

## 3. Continued

Both Trainee state and Experienced Pilot state could be split into cohorts. For instance, we could add different levels of experience to trainees (based on the number of months in training). Increasing the number of cohorts and adding states will come to the point where perfect mixing assumption actually holds.

(g) Describe three potential impacts of an aging population on fixed cost for the BJA pilot workforce using the improved model in (f). Justify your answer.

**Commentary on Question**:
*Candidates generally performed well on this question, with most earning at least partial credit. Full marks were awarded to responses that identified relevant items from the reading and clearly justified how each item impacted fixed costs. Some candidates misinterpreted the question, assuming it referred only to the aging of BJA's current workforce rather than the broader population. Partial credit was still awarded when reasonable factors and supporting rationale were provided.*

An aging population means BJA is less likely to be able to hire enough trainees to replace the experienced pilots who are quitting. They will have to find ways to decrease the quit rate of experienced pilots or increase the hire hate of trainees/experienced pilots. This is also an issue other competitors would be facing which drives up competition for labor.

There are three potential ways that an aging population would increase fixed costs for BJA:

- Increased recruitment budget/better benefits early on in career to get more trainees
- Greater salary increases at older ages to incentivize experienced pilots to stay rather than retiring
- A greater proportion of the workforce could be experienced pilots which is correlated with higher years of experience and higher salaries

## 4. Learning Objectives:

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

**Learning Outcomes:**

(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.

(3c) Evaluate business situations and describe quantitative and statistical methods.

**Sources:**

The Fundamentals of Management Science - Ch. 7 Linear Optimization

The Fundamentals of Management Science - Ch. 9 Discrete Optimization

The Fundamentals of Management Science - Ch. 10 Integration in Art of Decision Modelling

**Commentary on Question:**

*Question 4 assessed candidates' ability to apply linear optimization techniques and interpret model limitations within a business context. Most candidates performed well on the technical components when clear work and units were shown, but some struggled with model-based critiques. Stronger responses tied their reasoning directly to the model framework rather than offering general business suggestions.*

**Solution:**

(a)

(i) State the objective function.

(ii) State the constraint functions.

**Commentary on Question**:

*Most candidates performed well on this question. However, many omitted the units of measurement for the variables, and some did not recall whether the objective function should be maximized or minimized.*

*There was a wide range of approaches to the production and availability constraints, with some responses lacking simplification or consistency in units (e.g., trays vs. individual units). Additionally, many candidates overlooked the need to specify integer constraints.*

## 4. Continued

M = Muffins
C = Cinnamon buns

Maximize revenue: 2.5 * M + 4.5 * C

Non-negativity:
M >= 0
C >= 0
M and C are positive integers (to avoid partial food)

Production Capacity:
12 * M + 20* C <= 600, -> M <= 50, C<=30
Adequate Availability
10 * M + 10 * C >= 400

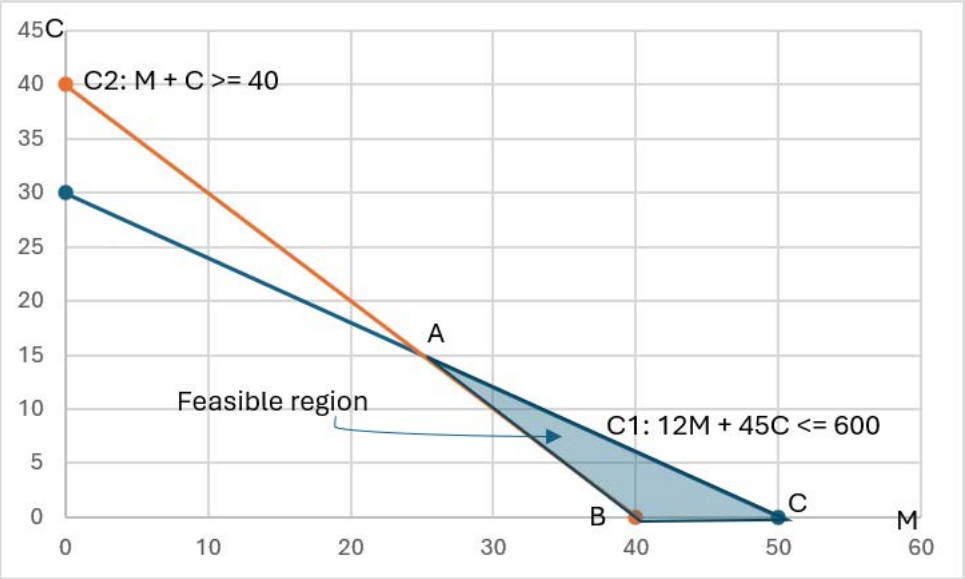
(b) For the optimization problem defined in part (a):

(i) Sketch the feasible region, with binding constraints clearly labeled.

(ii) Calculate the optimal solution. Show your work.

**Commentary on Question**:
*Candidates who answered part (a) well generally carried that success into part (b), which was overall well handled. However, many did not clearly label the constraints or identify the feasible region on their graph.*
*While many candidates correctly identified the optimal solution, only a subset evaluated all three key points (intersection and boundary) necessary for full credit. Full marks were awarded only when sufficient supporting work was shown.*

## 4. Continued




The optimal solution to a linear optimization problem will lie at a corner point of the feasible region.

At point B, Z = 25(40) + 45(0) = 1000
At point C, Z = 25(50) + 45(0) = 1250
The two constraints intersect at point A, (25, 15). Here, Z = 25*25+45*15 = 1300

Therefore, the optimal solution to maximize revenue while also meeting both constraints corresponds to the production of 25 trays of muffins and 15 trays of cinnamon rolls.

To solve for the intersection:
12M + 20C = 600
12(40-C) + 20C = 600
C = 15
M = 40-C
M = 25
These are also integers and greater than 0, which satisfies constraint 3.

(c) State the constraint function to reflect the new information.

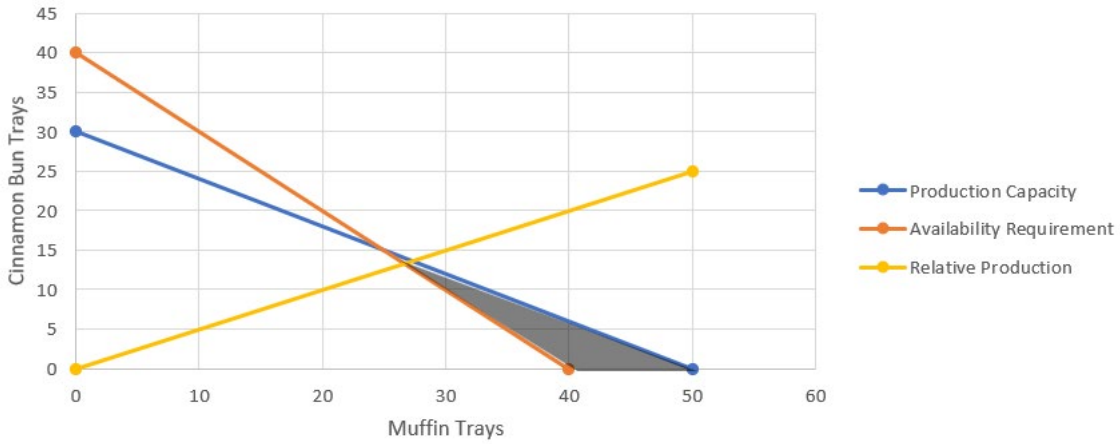
**Commentary on Question**:
*Candidates generally performed well where over 90% of candidates received full marks on this part when the correct constraint was provided.*

In addition to C1, C2, and C3, a new constraint function would be:
C4: M – 2C >= 0

## 4. Continued

(d) Calculate the optimal solution for the optimization problem defined in part (c). Show your work.

**Commentary on Question**:
*Many candidates found part (d) challenging. Marks were not awarded if a revised graph incorporating the additional constraint from part (c) was missing, if the requirement for an integer solution was not acknowledged, or if the calculation supporting the optimal solution was not shown.*
*Some candidates correctly noted that an integer solution was required but did not identify the pair of points that would yield the most optimal feasible outcome.*




The revenue the boundary points are:
Z = 25(40) + 45(0) = $1000
Z = 25(50) + 45(0) = $1250

Considering the new constraint:

M + C = 40 -> 3C = 40 -> C = 40/3 = 13.333 (but needs to be an integer)
So, new C = 13

12M = 600 – 20(13) -> M = 340/12 = 28.33 (but needs to be integer)
So, new M = 28

So, the optimal solution is P = $25*28 + $45*13= $1285

Where P = profit, M= Muffin tray of 10 units, C = Cinnamon bun Tray of 10 units

## 4. Continued

(e)

(i) Identify two implicit assumptions or limitations of the current model framework.

(ii) Describe how Frenz can address these implicit assumptions or limitations in its decision-making process. Justify your answer.

**Commentary on Question**:
*Many candidates successfully identified two limitations of the current model and explained why each was a limitation. However, some responses were overly general and did not relate specifically to the model framework presented in the case study. Full marks were awarded only when two distinct, model-related limitations were clearly provided.*
*In part (ii), candidates often struggled to propose solutions that could be integrated into the model framework or its underlying assumptions. Instead, many suggestions focused on operational changes to the physical stores, which were outside the scope of the model.*

The linear optimization model implicitly assumes that all available baked goods will be sold on a daily basis. This assumption hinges on Frenz understanding their customer preferences, which is not guaranteed. If the actual daily sales are materially lower than what is implicitly assumed by the model, then the model optimization can end up being completely off. This is an inherent limitation of a linear optimization model, as it makes assumptions about the real world which may not hold (such as being able to sell all units produced).

Another limitation of the linear optimization model is that it does not consider the relationship between the production of these new products, and other products already offered. This includes both the opportunity cost of producing these goods instead of other potential goods, as well as the shift in customer demand as a consequence of the introduction of these new products. For instance, even if all the new products are sold daily, what will that do to the sales of the existing lineup?

Franz can address the first limitation by continuing to do surveys to better understand their customer base, and reacting to the information received by said surveys. For example, if Frenz were to just proceed with the model from part (b), they would not be adjusting to the new information introduced by the initial survey result. In that case, Frenz is risking the original assumptions no longer holding, which could result in unsold units, and a lower daily revenue amount than anticipated. Conversely, if Frenz were to proceed with the model from part (d), they may be more accurate in that they will capture the additional survey result information which better reflects consumer preferences/demand.

## 4. Continued

Frenz should continue to do survey exercises of this nature to ensure the ongoing adequacy of their model. However, note that even in this case they are still bound by the limitations of linear optimization, and so the base assumptions can still breakdown from other factors from the real world which are not captured within the model.

Frenz can address the second limitation by introducing existing products into the linear optimization model, and thereby account for the potential reduction in sales of existing products due to the introduction of new products. Franz will need to study sales outcomes to understand this dynamic better. Another thing that would help in this regard would be to come up with a way to model the unsold units as well outright (where unsold unit provide no sales revenue/profit). However, this may require a different model altogether, and may even require more qualitative considerations.

## 5. Learning Objectives:

1. The candidate will understand and apply strategic management concepts and frameworks to develop an organization's financial and ERM Solutions.

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.

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

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

(2f) Assess an organization's ability to create value and recommend actions to improve value creation.

**Sources:**

Valuation: Measuring and Managing the Value of Companies: Ch 18 Using Multiples

Valuation: Measuring and Managing the Value of Companies: Ch 32 Divestitures

Damodaran on Valuation: Chapter 14 Value of Liquidity

**Commentary on Question:**

*Question 5 assessed candidates' understanding of financial performance metrics and their application in evaluating strategic business decisions. Most candidates demonstrated familiarity with ratio calculations, but fewer provided complete explanations of how corporate actions impact valuation metrics. Stronger responses clearly linked ratio movements to underlying business changes and offered reasoned recommendations based on the case study context.*

## 5. Continued

**Solution:**

(a)

(i) Evaluate qualitatively the impact of each of the actions I to III on RPPC's P/E ratio.

(ii) Evaluate qualitatively the impact of each of the actions I to III on RPPC's EV/NOPAT ratio.

**Commentary on Question**:
This part tested candidates' understanding of the P/E and EV/NOPAT ratios. Full credit required demonstrating how each of the proposed actions would affect the numerator and denominator of both ratios, and clearly explaining the resulting impact. Most candidates received partial credit, often by addressing only one of the two ratios or not fully evaluating all three actions.

(i) Evaluate qualitatively the impact of each of the actions I to III on RPPC's P/E ratio.

I) Transferring pension liabilities to a third party could change net income. If earnings per share increase, then assuming the stock price does not change, the P/E ratio will decrease. When making the decision to transfer the pension liability, RPPC should also consider the cost of the transfer compared to the pension liabilities, and also the risk mitigation that the transaction provides.

II) Bringing down excess cash through stock buybacks will lower net investment income due to loss of return on a lower value of excess cash. If the stock price increases due to fewer outstanding shares, the P/E ratio will increase. If the stock price decreases, P/E will increase as long as the stock price decrease is less than earnings per share decrease.

III) Investing in a new growth initiative in one of its consolidated financial subsidiaries should increase EPS, which would decrease the P/E ratio, unless stock price increases to the same degree or more as a result of the initiative

(ii)

I) Transferring pension liabilities to a third party has no impact on EV/NOPAT as pension liabilities are a non-operating item and not included in enterprise value or operating cash flows.

II) Bringing down excess cash through stock buybacks does not impact operating cash flows (the denominator of the ratio.) However, cash is added to the DCF used to arrive at EV, so reducing cash will decrease EV and result in a lower EV/NOPAT ratio

III) Investing in a new growth initiative in one of its consolidated financial subsidiaries should increase the value of the subsidiary and the EV.
EBITA and NOPAT might be lower because of the investment. This would lead to a higher EV/NOPAT ratio.

## 5. Continued

(b)

(i) Calculate Frenz' P/E ratio. Show your work.

(ii) Calculate Frenz' EV/EBITA ratio. Show your work.

(iii) Evaluate the Board's recommendation based on your answer to (i) and (ii).

**Commentary on Question**:
*Most candidates performed well on parts (i) and (ii), with many correctly calculating the ratios. A common error was using an incorrect EBITA value from the case study. Part (iii) proved more challenging, as many responses lacked sufficient reasoning to support or oppose the Board's recommendation. While most candidates noted the relative positions of the ratios compared to industry benchmarks, full credit required interpreting those results in a strategic context.*

Part (i) and (ii) can be found in the model Excel spreadsheet.

(iii) Frenz has a P/E ratio of 15.1 which is lower than the industry average. This implies that they are valued lower than industry counterparts in the US and Europe.However, EV/EBITA ratio for Frenz is substantially higher than the industry average. This indicates that Frenz is outperforming its peers from a fundamental perspective.This could be indicative of Frenz better performance but could be misleading.The Board should look at EV/NOPAT to bring in the differing tax jurisdictions where Frenz operates. Market value reflects differences in tax rates. Board should evaluate Frenz performance from that perspective. Still, I support the Board's idea to divest. Divestiture of profitable, growing business can increase the value of Frenz and RPPC. Frenz could innovate and grow faster. RPPC would get more focused on the core businesses. Frenz is underperforming compared to its peers but has potential to grow. RPPC may not be able to generate much value from this sale, but it is likely that a different company would be judged to be a better owner of the business and could come in and help Frenz operate more efficiently and fix that valuation/stock price.

(c) Explain the potential impact on RPPC's stock price.

**Commentary on Question**:
Most candidates correctly recognized that the stock price would likely increase in response to the buy trade. However, few considered the potential effects of illiquidity or other market dynamics in their explanation.

## 5. Continued

It could increase RPPC's stock price, which indicates the value of illiquidity. Stock price will likely stay up given greater focus on RPPC's core businesses. Also, RPPC could be seen as having expertise in divesting and acquiring businesses. A new owner for Frenz could recognize the growth potential and improve the valuation. The company could become more optimally managed.

## 6. Learning Objectives:

1. The candidate will understand and apply strategic management concepts and frameworks to develop an organization's financial and ERM Solutions.

**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.

**Sources:**

Understanding Michael Porter: The Essential Guide to Competition and Strategy

- Chapter 4 – Creating Value: The Core
- Chapter 5 – Trade-offs: The Linchpin
- Chapter 6 – Fit: The Amplifier
- Chapter 7 – Continuity: The Enabler

**Commentary on Question:**

*Question 6 assessed candidates' ability to apply Porter's five tests of a good strategy to evaluate strategic positioning and sources of competitive advantage. Most candidates demonstrated a solid understanding of the framework and used the case study appropriately. Full credit required clear, detailed analysis tied to SIT's specific strategy rather than general descriptions.*

**Solution:**

(a) The five tests of a good strategy, according to Porter, are as follows.

I. A Distinctive Value Proposition

II. A Tailored Value Chain

III. Trade-offs Different from Rivals

## 6. Continued

IV. Fit Across the Value Chain

V. Continuity Over Time

Analyze SIT's strategy under each of the five tests I to V.

**Commentary on Question**:
*Most candidates used the case study effectively to analyze several of Porter's five tests. However, full credit was often missed due to insufficient detail, a lack of clear assessment of whether SIT met each test, or weak analysis of continuity over time. The model solution includes more detail than was required for full marks and illustrates a range of acceptable approaches.*

1. Unique Value Proposition - **SIT passes this test.**
   - SIT offers a unique value proposition by simplifying insurance purchase process, targeting healthier and tech-savvy customers.
   - SIT meets the needs of the middle market with limited issue ages and risk classes on term insurance.
   - For auto insurance, SIT uses pay-by-the-mile telematics to target customers working remotely or in a hybrid model, or likely to be a safer risk. Using RIC's data analytics allows SIT to offer discounts to customers and use AI chatbot to tailor purchase recommendations.

2. Tailored Value Chain – **SIT passes this test.**
   - SIT offers a tailored value chain, particularly in its digital-first approach to insurance.
   - It has a robust technology stack and integrates well with their partners to issue and service their products.
   - SIT's value chain is well constructed, having control of the application, underwriting, issuance, and administration of its products.

3. Trade-offs – **SIT passes this test.** *(see alternate answer below)*
   - SIT has made several trade-offs including its focus on the middle-market term life insurance with limited issue ages and risk classes.
   - SIT's partnership with RIC to offer auto insurance focuses on tech-savvy users of their app and made the trade-off to market to safer customers working remotely or in a hybrid model, rather than all drivers in a given region.
   - **Alternate answer: SIT may struggle with this test** as it expands its strategy by increasing the face amount to $10m to reach a broader demographic. This could dilute its focus on digital simplicity and can create conflicts with its core competencies.

## 6. Continued

4. Fit Across the Value Chain – **SIT passes this test.** *(see alternate answer below)*
   - SIT's digital focus and use of the AI chatbot and telematics data show a strong fit across activities.
   - SIT's partnership with preferred vendors allows them to execute on their strategy with instant quotes, lower costs, and a highly differentiated product.
   - **Alternate answer:** However, on the life insurance side, the integration of health data and AI for accelerated underwriting is missing at least 5% of fraud cases and could be better aligned.

5. Continuity Over Time – **SIT passes this test.**
   - SIT has grown significantly since its founding in 2018, using strategic partnerships to expand their products from term insurance to add auto insurance and set up its digital insurance company (New Co).
   - SIT has continued to advance its digital platform for applications and issuance processes to make it easy for customers to make the purchase decision.
   - SIT has maintained its continuity by controlling the application, underwriting, issuance, and administration of the products, even as it continues to expand into new areas.

(b) Explain how three tests from (a) give SIT an advantage over a rival copying its strategy.

**Commentary on Question**:
*Candidates generally performed well in explaining how the selected tests provided SIT with a competitive advantage. Similar to part (a), responses that lacked depth or specific justification did not receive full marks. While the sample solution includes three specific tests, other combinations were accepted if well supported.*

**Tailored value chain is the first line of defense against imitation.**
- SIT's value chain is built on a strong technology stack, including digital-first solutions, AI-powered chatbots, and telematics for tracking driver behavior, all of which are highly specialized.
- Developing these capabilities would require significant capital investment, technical expertise, and time from a rival, creating a barrier to entry.
- SIT's control over the application, underwriting, issuance, and claims processes allows it to reduce inefficiencies and deliver a seamless customer experience, which is difficult for competitors to replicate without similar end-to-end integration.

## 6. Continued

- The scalability and robustness of SIT's technology platform enable it to respond quickly to market demands and improve margins, further enhancing its competitive edge against imitators.

**Trade-offs different from rivals is the second line of defense**.

- SIT deliberately focuses on niche markets like the middle-market consumer for term life insurance and remote or hybrid workers for pay-by-the-mile auto insurance, ensuring its offerings are highly targeted.
- By maintaining a narrow product range (e.g., term life insurance instead of more complex policies), SIT achieves cost and operational efficiencies that allow it to compete effectively while avoiding overextension.
- An InsurTech startup that attempts to serve a broader range of customers would likely face higher costs and reduced efficiency, making it challenging to match SIT's profitability and performance.
- SIT's trade-offs in areas like product complexity and operational focus reinforce its strategic position, as rivals must either copy SIT and forego their broader offerings or risk falling short in efficiency and specialization.

**Fit across activities sustains competitive advantage against new entrants.**

- SIT's competitive advantage lies in the seamless integration of its activities, creating a system where each component reinforces the others. For instance, its data-driven customer acquisition process uses accelerated underwriting and telematics to attract a healthier, safer demographic.
- AI-powered chatbots provide tailored purchase recommendations, guide customer interactions, and enhance service efficiency, reducing reliance on live agents and improving customer satisfaction.
- Telematics technology enables SIT to track driver behavior and offer personalized renewal quotes and discounts, creating a value proposition that is both dynamic and customer focused.
- By linking its claims process, vendor network, and telematics data, SIT ensures real-time responses and cost efficiencies, making it harder for competitors to replicate without duplicating all elements of this interconnected system.