UNIVERSITY OF WESTMINSTER

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

5MNST006C.2 MANAGEMENT DECISION MAKING FOR BUSINESS

Assessment 2

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Q1. Decision-making in the business simulation game

A) Company Details

- Provide the name of your company in the business simulation - **Strides**
- State your chosen generic competitive strategy - **Combination of all three**
- State your chosen market segment(s) – **Men, Women and kids**
- Name your distributor(s) – **LTC, Zwolawski & Zwolawski**
- Record your company figures for rounds 1 and 6 -

Round 1			
Decisions and results	**Market segment - Men ***	**Market segment Women ***	**Company**
Volume	70,969	74,148	n/a
Selling price	£50	£50	n/a
Revenue	£3,548,450	£3,707,400	£7,255,850
Purchasing cost	£43	£46	n/a
Distribution cost	£6	£6	n/a
Variable cost per unit	£49	£52	
Contribution margin per unit	£1	(£2)	n/a
Total variable costs	£3,508,707	£3,834,935	£7,343,642
Total contribution margin	£39,743	(£127,535)	(£87,792)
Marketing and Sales	n/a	n/a	£1,570,216
General administration cost	n/a	n/a	£844,645
Other fixed costs (optional)	n/a	n/a	-
Fixed costs - total	n/a	n/a	£2,414,861
Profit **			(£2,502,653)

Round 6				
Decisions and results	**Market segment - Men ***	**Market segment Women ***	**Market segment - Kids ***	**Company**
Volume	84,480	87,979	67,071	n/a
Selling price	£51	£53	£50	n/a
Revenue	£4,308,480	£4,662,887	£3,353,550	£12,324,917
Purchasing cost	£37	£39	£39	n/a
Distribution cost	£6	£6	£4	n/a
Variable cost per unit	£43	£45	£43	
Contribution margin per unit	£8	£8	£7	n/a
Total variable costs	£3,597,158	£3,947,618	£2,875,334	£10,420,110
Total contribution margin	£711,322	£715,269	£478,216	£1,904,807
Marketing and Sales	n/a	n/a	n/a	£380,216
General administration cost	n/a	n/a	n/a	£2,564,945
Other fixed costs (optional)	n/a	n/a	n/a	-
Fixed costs - total	n/a	n/a	n/a	£2,945,161
Profit **				(£1,040,353)

B) Decision Evaluation

	Demand	Sales	Purchasing	Inventory	Decline sales	Decline sales when, Demand > Inventory cap.	Decline sales when, Demand < Inventory cap.
Men	154,448	70,969	68,552	4,715	83,479	19,313	64,166
Women	183,260	74,148	74,442	5,107	109,112	35,510	73,602
Total	337,708	145,117	142,994	9,822	192,591	54,823	137,768

While our company was playing the simulation game, we encountered a major problem in our inventory management. Our declined sales volume increased to 192,591 units due to the severe gap between our demand and actual sales. As we investigated the situation, we found that there were two main issues that led to this situation. One was that we were running out of stock due to severe delivery delays as our supplier takes 2 weeks to supply. The other was that our warehouse's limited inventory capacity was unable to meet the high demand. Therefore, the core problem was how to recover declining sales and improve our market share.

To solve this problem, we considered hiring a fast delivery supplier who would re-stock immediately or expand our warehouse capacity. If we hire a fast delivery supplier, we will lose £2.5 contribution margin, as the delivery cost of the fast delivery supplier is £8.5. If we expand our storage capacity, it will take a year to complete and require a high initial investment. We also considered the possibility of doing both at the same time. To determine which decision to make, we applied three decision rules, Maximax, Maximin, and Minimax regret.

Expected contribution per unit when delivery time 2 weeks	£5
Expected contribution per unit when delivery time 0 weeks	£2.50

Option	Short term		Long term	
Fast deliver with 0 weeks	2.50*(145,117+137,768)	707,212.50	2.50*(145,117+137,768)	707,212.50
Expanding Warehouse	5*(145,117) - 400,000	325,585	5*337,708	1,688,540
Combination	2.50*(145,117+137,768)-400,000	307,212.50	5*337,708	1,688,540

	Option	Short term	Long term	Max Payoff
Maximax Rule	Fast deliver with 0 weeks	707,212.50	707,212.50	707,212.50
	Expanding Warehouse	325,585	1,668,540	1,668,540
	Combination	307,212.50	1,668,540	1,668,540

According to the Maximax rule, the option with the highest profit is the best option. Here, expanding the warehouse and combining fast delivery and warehouse expansion at the same time would be the options to choose using the Maximax rule.

	Option	Short term	Long term	Min Payoff
Maximin Rule	Fast deliver with 0 weeks	707,212.50	707,212.50	707,212.50
	Expanding Warehouse	325,585	1,668,540	325,585
	Combination	307,212.50	1,668,540	307,212.50

According to the Maximin rule, the option with the highest worst outcome is the best option. Here, hiring a fast delivery would be the ideal option to choose.

	Option	Short term	Long term	
Minmax Regret Rule	Fast deliver with 0 weeks	707,212.50	707,212.50	
	Expanding Warehouse	325,585	1,668,540	
	Combination	307,212.50	1,668,540	
	Option	Short term	Long term	Highest Regret
	Fast deliver with 0 weeks	0	961,327.50	961,327.50
	Expanding Warehouse	381,628	0	381,628
	Combination	400,000	0	400,000

Minimax regret approach seeks to minimize the loss of opportunities. Here, expanding the warehouse is the best option to choose, because failing to invest will lose an expected result of £1,668,540 in the long-term.

Since two approaches propose warehouse expansion, we will move forward with it as it is expected to bring long-term benefits to the company. Furthermore, by expanding the warehouse, we can increase our storage capacity to meet growing customer demand, reduce lost sales during peak periods and improve overall inventory management. Moreover, providing a buffer against supply chain delays will create a stable operating environment, ensuring continuation of order fulfillment even when there are disruptions in delivery. While it may not be able to withstand short-term losses, this forward-looking strategy aligns with the company's growth objectives, will meet future demands effectively.

C) Reflection

While playing simulation, our team experienced both pros and cons of group and individual decision-making. One of the pros of group decision-making was brainstorming. This helped us to make better decisions than when we are doing individually. Another advantage is the ability to distribute the workload. If we do a task individually, it will take longer. But in a team, we can distribute the workload and complete it faster. A disadvantage of group decision-making is that conflicting opinions require time-consuming discussions. As a group, it is prone to conflicts. In those cases, we used a voting-based approach to make faster and better decisions, although not as fast as individually. Connectivity issues are also a disadvantage of group decision-making. Since we all have busy schedules, it was very difficult to have a physical meeting, so we used online platforms. When it came to team decision-making strategies, we used data-driven approaches to make decisions. By using tools like CVP analysis, payback period calculations and other financial metrics we were able to make better decisions. Being a good team member means actively listening to others, supporting teammates when needed and taking responsibility for individual tasks to ensure the success of the entire team.

Q2. Dealing with uncertainty and managing risk

A)

Maximax Rule

	Payoffs in £000			Max Payoff
Option	High growth	Medium growth	Low growth	
Campaign A	150	25	-100	150
Campaign B	45	45	0	45
Campaign C	-10	10	50	50

Decision : Campaign A

Maximin Rule

	Payoffs in £000			Min Payoff
Option	High growth	Medium growth	Low growth	
Campaign A	150	25	-100	-100
Campaign B	45	45	0	0
Campaign C	-10	10	50	-10

Decision : Campaign B

Minimax Regret Rule

	Payoffs in £000		
States of nature	High growth	Medium growth	Low growth
Campaign A	150	25	-100
Campaign B	45	45	0
Campaign C	-10	10	50

	Payoffs in £000			Highest Regret
Option	High growth	Medium growth	Low growth	
Campaign A	150 - 150 = 0	45 - 25 = 20	50 - (-100) = 150	150
Campaign B	150 - 45 = 105	45 - 45 = 0	50 - 0 = 50	105
Campaign C	150 - (-10) = 160	45 - 10 = 35	50 - 50 = 0	160

Decision : Campaign B

Expected Monetary Value (EMV)

	Payoffs in £000			EMV
Option	High growth (0.2)	Medium growth (0.2)	Low growth (0.6)	
Campaign A	150	25	-100	-25
Campaign B	45	45	0	18
Campaign C	-10	10	50	30

EMV (A) =	(150*0.2) + (25*0.2) + (-100*0.6) =	-25
EMV (B) =	(45*0.2) + (45*0.2) + (0*0.6) =	18
EMV (C) =	(-10*0.2) + (10*0.2) + (50*0.6) =	30

Decision : Campaign C

A decision making problem can be identify in question, as there is a situation where four people must select from three marketing campaigns to end the uncertainty about the values of the outcomes. This can be challenging to address, with uncertainty, risk and conflicting objectives. To solve this problem under uncertainty, we can use three criteria called the Maximax rule, the Maximin rule and the Minimax regret rule. Under conditions of risk where probabilities are given, the Expected monetary value (EMV) approach can be used.

Using these criteria, the maximin rule recommended for optimistic decision makers recommends campaign A, because it provides the highest return. The maximin rule for risk-averse individuals recommends campaign B, because it provides the best outcome in the worst case. The Minimax Regret rule, which selects the lowest maximum opportunity loss recommends Campaign B. When probabilities are taken into consideration, EMV approach recommends campaign C as it is the option with the highest expected value.

B)

When considering the decision-making preferences of four individuals, each of them has a different type of rule approach based on their attitude towards risk. As Anton is optimistic and likes taking risks, the Maximax rule applies to him. Because it is a rule for risk takers, it provides the decision with the best results. In this question, this rule recommends campaign A. By contrast, James and Samira are risk averse. It is recommended for them to Maximin rule, as it provides the decision with best worst result. This rule recommends campaign B. Since Khalid considers himself a rational decision-maker, the Minimax regret rule applies to him. Because this rule provides the decision with the lowest maximum opportunity loss. This rule recommends campaign B.

I prefer the risk-averse approach, as it offers more stable and consistent growth. When playing the simulation, our company faced a severe sales decline. We had two options. Either switch to a faster delivery supplier or expand the warehouse. A fast supplier can replenish inventory quickly but carries high delivery costs and the risk of potential stock-out if demand exceeds supply. Expanding the warehouse will require higher capital investment but can manage higher demand more reliably. Given my risk-averse approach, I have chosen to expand the warehouse because it provides a more stable and controlled environment to address the decline sales and has low risks compared to relying on fast delivery suppliers.

C)

Best EMV =	30		
EV with perfect information =	(0.2*150 + 0.2*45 + 0.6*50) =		69
Value of perfect information =	69 - 30 =	39	
Net profit/loss =	Value of perfect information - information cost		
=	39 - 50		
=	-11		

It is understandable to think that Samira would agree with getting information as he is a risk averting individual. However, I believe that Khalid's opposition is the correct approach. This is because the value of the perfect information is £39,000. This means that if they accept a £50,000 offer to obtain the information, they will lose £11,000.

Q3. Investment appraisal

A) Payback period

Payoff Table

Machine A				
Period	Cash Outflow	Cash Inflow	Net Cashflow	Unrecoverd Investment
0	5,000		-5,000	-5,000
1		1,350	1,350	-3,650
2		1,400	1,400	-2,250
3		1,850	1,850	-400
4		2,000	2,000	1,600
5		2,100	2,100	
Total	5,000	8,700	3,700	

Payback Period =	3 + (400/2000) =	3.2 years

Machine B				
Period	Cash Outflow	Cash Inflow	Net Cashflow	Unrecoverd Investment
0	6,400		-6,400	-6,400
1		1,800	1,800	-4,600
2		5,000	5,000	400
3		400	400	
4		400	400	
5		400	400	
Total	6,400	8,000	1,600	

Payback Period =	1 + (4600/5000) =	1.92 years
Decision :	Machine B	

The payback period calculates how long it will take to pay back the original investment. This is easy to use and helps maintain liquidity. In the given question, the payback period of machine A is 3.2 years, but machine B is the best investment option, as it has the shortest payback period of 1.92 years. Furthermore, considering that the company's policy is to only accept projects with a 2-year payback, they should choose machine A. But it should be noted that it limits its effectiveness in long term decision making as it does not consider cash flows outside the payback period and time value of money.

B) NPV

Machine A			
Period	Net Cashflow	Discount factor (5%)	PV
0	-5,000	1	-5000.00
1	1,350	0.952	1285.20
2	1,400	0.907	1269.80
3	1,850	0.864	1598.40
4	2,000	0.823	1646.00
5	2,100	0.784	1646.40
		NPV	2445.80

Machine B			
Period	Net Cashflow	Discount factor (5%)	PV
0	-6,400	1	-6400.00
1	1,800	0.952	1713.60
2	5,000	0.907	4535.00
3	400	0.864	345.60
4	400	0.823	329.20
5	400	0.784	313.60
		NPV	837.00

Decision :	Machine A

The Net present value (NPV) is the sum of the initial investment and the discounted future cash flows generated by the project. This is calculate using the present value of expected future cashflows, discounted at the company's discount rate and then subtracting the initial investment. That means, it looks into the potential future value generated by the investment. In the given question Machine A has a NPV value of £2445.80 and Machine B has a NPV value of £837. Since Machine A has the highest NPV value, company should consider choosing this desion as it is expected to generate most to the company.

C) IRR

Machine A					
Period	Net Cashflow	DF - 5%	PV - DF for 5%	DF - 20%	PV - DF for 20%
0	-5,000	1	-5,000.00	1	-5000.00
1	1,350	0.952	1,285.20	0.833	1124.55
2	1,400	0.907	1,269.80	0.694	971.60
3	1,850	0.864	1,598.40	0.579	1071.15
4	2,000	0.823	1,646.00	0.482	964.00
5	2,100	0.784	1,646.40	0.402	844.20
NPV			2,445.80		-24.50

IRR = $(N_1 r_2 - N_2 r_1) / (N_1 - N_2)$

= (2,445.80 * 0.2 - (-24.50) * 0.05) / (2,445.80 - (-24.50))

= 0.20

Machine B					
Period	Net Cashflow	DF - 5%	PV - DF for 5%	DF - 20%	PV - DF for 20%
0	-6,400	1	-6,400.00	1	-6400.00
1	1,800	0.952	1,713.60	0.833	1499.40
2	5,000	0.907	4,535.00	0.694	3470.00
3	400	0.864	345.60	0.579	231.60
4	400	0.823	329.20	0.482	192.80
5	400	0.784	313.60	0.402	160.80
NPV			837.00		-845.40

IRR = $(N_1 r_2 - N_2 r_1) / (N_1 - N_2)$

= (837.00 * 0.2 - (-845.40) * 0.05) / (837.00 - (-845.40))

= 0.12

Decision : Machine A

The internal rate of return (IRR) is the discount rate that results when the net present value (NPV) of a project is zero. This means that if the company's interest rate is less than the IRR, the investment is considered profitable. On the other hand, if the company's interest rate is greater than the IRR, the project should not be undertaken. In the given question Machine A has a IRR of 20% and Machine B has a IRR of 12%. This suggests that considering IRR, choosing machine A will bring greater returns to the company as it reflects a more profitable investment and better long-term value.

D) Revised Machine Appraisal

Payoff Table for Machine A

Period	Cash Outflow	Cash Inflow	Net Cashflow	Unrecoverd Investment
0	5,000		-5,000	-5,000
1			0	-5,000
2			0	-5,000
3		1,500	1,500	-3,500
4	570	2,500	1,930	-1,570
5		1,200	1,200	-370
6		1,000	1,000	630
Total	5,570	6,200	630	

Payback Period =	5 + (370/1000) =	5.37 years
Decision :	Machine B	

Period	Net Cashflow	Discount factor (5%)	PV
0	-5,000	1	-5000.00
1	0	0.952	0.00
2	0	0.907	0.00
3	1,500	0.864	1296.00
4	1,930	0.823	1588.39
5	1,200	0.784	940.80
6	1,000	0.746	746.00
		NPV	-428.81

Decision :	Machine B

Now seeing the revised information about Machine A, its expected life expectancy has increased to 6 years. However, it's payback period has increased to 5.37 years and shows a loss of £428.81 in NPV. Looking at these figures, Machine B should be the best investment option, as it has a payback period of less than 2 years and an NPV of £827.

Q4. Decision trees

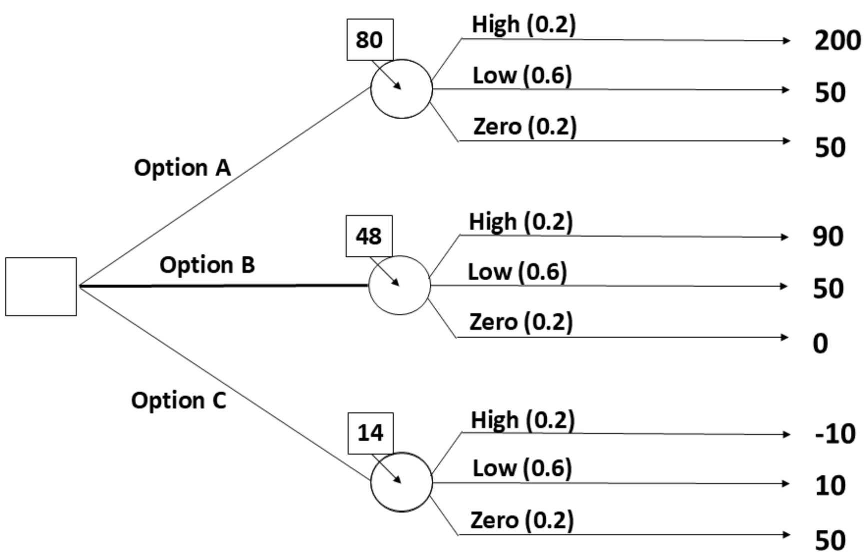
A) EMV

	Economic growth		
Decision	High (0.2)	Low (0.6)	Zero (0.2)
Option A	200	50	50
Option B	90	50	0
Option C	-10	10	50

EMV;	
Option A =	(200*0.2) + (50*0.6) + (50*0.2)
=	80
Option B =	(90*0.2) + (50*0.6) + (0*0.2)
=	48
Option C =	(-10*0.2) + (10*0.6) + (50*0.2)
=	14
Decision :	Option A

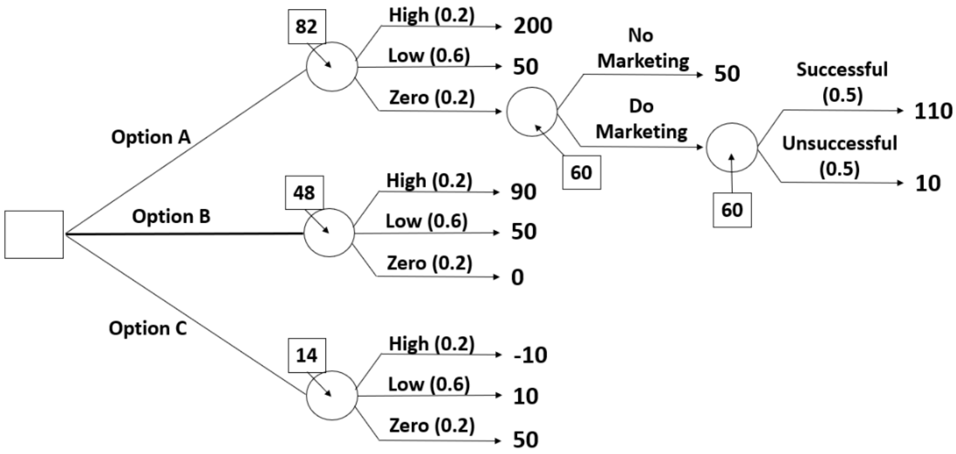
Expected Monetary Value (EMV) is calculated by multiplying each outcome by their expected probability. In this calculation, the highest EMV value is considered the best option. EMV helps the company identify the best option, as EMV considers the expected outcome and their associated probabilities. In this question, the EMV value of option A is £80,000, the EMV value of option B is £48,000, and the EMV value of option C is £14,000. Since option A has the highest value of the three options, it should be chosen as the best option that will generate the most profit for the company.

B) Decision tree



The above decision tree shows the expected outcome of each option with their associated probabilities. This explains Option A has the highest EMV value.

C) Revised decision tree



After including the figures for the proposed marketing campaign, the expected monetary value (EMV) increases to £60,000 if the campaign is implemented in a zero economic growth. Otherwise, the company will only receive £50,000. Since the marketing campaign yields a higher EMV, it is a better course of action under zero economic growth for Option A. Among the three options Option A still offers the highest EMV value. Therefore, the company should proceed with the marketing campaign with Option A, as it provides the most financially advantageous outcome.

Q5. Sustainability issues in the sneaker sector

A) The sneaker sector

The global sneaker market was valued at £56 billion in 2020 and is expected to grow to £95 billion by 2025. Sneakers make up the largest share in the global market by producing 24 billion pairs of shoes annually. In 2016, the sneaker industry contributed 1.4% to global greenhouse gas emissions, raising concerns over environmental sustainability.

There are 65 different parts to an average sneaker. There are still only four or five main components that make up the basic structure, such as the insole, midsole, outsole and upper. To investigate the carbon footprint of the sneaker industry, MIT researchers conducted a comprehensive life cycle assessment (LCA). According to that assessment they found that a pair of running shoes generates about 30 pounds (13.6 kilograms) of carbon dioxide (CO_2). To further comprehension they divided the life cycle of sneakers into five main stages: material processing, manufacturing, logistics, use or end of life. Here manufacturing alone accounted for 64% of total emissions, equating to approximately 9.5 kg of CO_2. Material processing adds 4 kg, while logistics and use or end of life stages contribute only 0.2 kg and 0.3 kg respectively. The upper part of the sneaker is the most carbon intensive as it produces 41% of the emission. The midsoles emit 30%, outsole emits 13% and insoles emit 10%. The other minor parts like packaging and laces only emit 6%. (McLoughlin, 1970)

A sneaker design requires 360 assembly steps. These steps include sewing, cutting, injection molding and foaming etc. These steps are highly relied on energy thus countries like China perform these tasks using coal as a source. Materials such as synthetic polymers contribute to emissions, but to a lesser extent. To reduce carbon emissions in the sneaker industry, it is essential to prioritize manufacturing efficiency and energy sources. Recycling unused material left over from production could be a better solution to this carbon emission problem. Furthermore, streamlining the design by reducing the number of parts, combining components or printing decorative elements instead of sewing or attaching them can significantly reduce energy consumption. Moreover, energy consumption can be significantly reduced by optimizing the energy sources used in the manufacturing process. For example, switching from coal to renewable energy can achieve significant carbon savings. (Chu, 2013)

To reduce carbon emissions, we can also use sustainable materials for production. Eco-friendly alternatives like recycled materials, organic cotton, hemp, bamboo and cork can replace high carbon emission materials like leather and synthetics. This selection will significantly lower the carbon footprint by reducing the energy-intensive processes associated with resource extraction. Also, we can reduce manufacturing waste with precise cutting techniques. Carbon emissions can be reduced by using energy optimally. This can be achieved by using energy-saving machinery, energy management systems and lean manufacturing methods to reduce waste and emissions. Finally, by designing durable sneakers ensure sneakers last longer and reduce the need for frequent replacements as less production is the best way to reduce carbon emissions. (Motawi, 2023)

These strategies will be helpful in reducing the carbon footprint of the sneaker industry.

B) Sneaker companies

Currently, sneaker companies are increasingly adopting eco-friendly strategies to reduce their carbon footprint. According to a study by MIT, a pair of sneakers emits 14 kilograms of CO_2 throughout its life cycle. In response to that brands like Nike, Adidas and Brooks are integrating sustainability into their product designs and manufacturing processes. For example, Adidas partners with Parley for the Oceans to produce sneakers like the Ultra Boost Parley, which uses up to 11 ocean recycled plastic bottles per shoe. This innovation significantly reduces emissions during the material processing stage. The recycled polyester used in these shoes requires 84% less energy than virgin polyester, further reduce CO_2 contribution of the upper from 1.6kg to 0.26kg. This is a 9.6% reduction in carbon emissions. Nike's focus on sustainability includes ambitious goals such as halving the environmental impact of each of their products with the aim of doubling their business. Initiatives like Nike Flyknit and Flyleather incorporate recycled materials, thereby reducing reliance on raw materials. Additionally, Nike's Colordry technology eliminates water use in fabric dyeing, conserving resources and reducing emissions. Brooks contributes by offering shoes with biodegradable midsoles, such as Adrenaline, which reduces carbon emissions by up to 2.5%.(McLoughlin, 1970)

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