Software Project Management
INF3708
Assessment 3

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Assignment briefing

- This is Assessment 3.
- Do not cheat! If you do, I will know, I will catch you out – a zero mark will be rewarded. Do not copy any part of the assignment from other students. Your assignment should be your work and should be unique. This is part of your learning process in this module. It should be your learning that is reflected in the assignment report you submit.
- If you want to submit this assignment on time, start immediately.
- Before you start with the assignment, read it through. So, read the Case, Question 1, Question 2, Question 3 and Question 4.
- Submit your solution(s) by uploading a PDF file to the INF3708-24-Y site on the myUNISA website.
- The case, all names, characters, and incidents portrayed in this assessment are fictitious. No identification with actual persons (living or deceased), places, buildings, and products are intended or should be inferred.

Case

After Sarita Chatterjee graduated with a BSc in Information Systems from the University of South Africa, she was appointed as a Business Analyst at Culinary Bargain. Culinary Bargain sells coupons for use at popular South African restaurants and earns a 25% commission on each sale. For example, if Culinary Bargain sells a R200.00 meal coupon discounted by 20%, they earn R40.00 from the R160.00 sale. Recently, Sarita has been tasked with ideating a corporate social responsibility (CSR) project to contribute to the company's goal of societal improvement. Sarita conceptualized two projects, Project T and Project O, to support hunger relief. In the project charter, Sarita cites Stats SA's (2023) report on the increasing number of households experiencing hunger. The report mentions South Africa's high unemployment rate and energy crisis as factors that increase the cost of living. According to the report:

> *almost 17,9 million households in SA in 2021, almost 80 percent (14,2 million) reported that they had adequate access to food, while 15 percent (2,6 million) and 6 percent (1,1 million) stated that they have inadequate and severe inadequate access to food, respectively. (stats sa, 2023, para. 4)*

In the project charter, Sarita suggests extending Culinary Bargain's website and app to incorporate the marketing and selling of meal coupons. Clients, when shopping for discounted coupons, will be presented with the option to contribute an additional amount (2.5% of the meal price) that is credited to hunger relief coupons. Hunger relief coupons are to be used by a beneficiary[1] experiencing hardship. Sarita suggests the design of a platform to be used by the beneficiary, which is integrated into the main payment system. The beneficiary platform will include, among other features, an interface that shows the coupon's progress towards being exchanged for a meal. See Figure 1 below.

[1] To become eligible as a beneficiary, applicants need to submit a police clearance certificate, present information to prove income, expenses, and assets, and then undergo an interview.

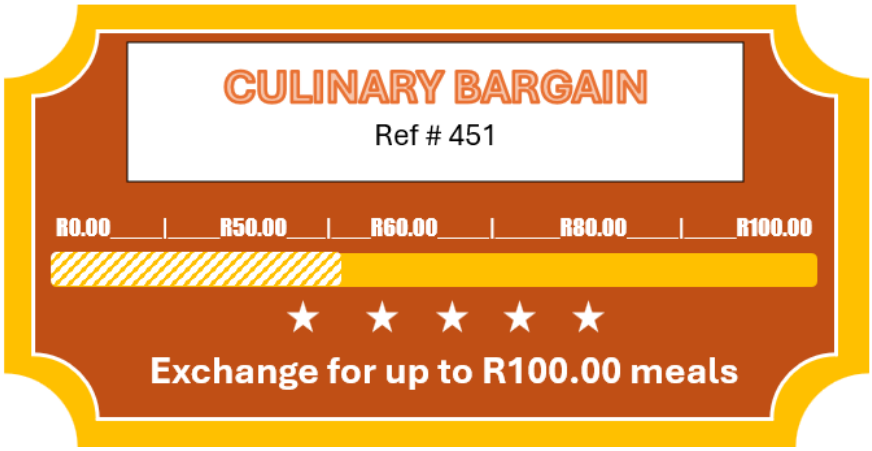

Figure 1. A sample design of a coupon showing progress of benefactor contributions.

When the beneficiary decides to exchange a coupon, they have the option to either collect the meal themselves or have it delivered by a delivery service. If they opt to have the meal delivered, they can track the delivery status of the meal in real-time via an interactive map. Project T and Project O differ in that Project T aims to partner with Uber's delivery service to handle the delivery of meals, thus integrating with the existing Uber platform. On the other hand, Project O pursues the idea of optimizing and converting Google Maps with geolocation services, global positioning systems, route optimization, and estimated time of arrival technology for a personalized tracking order service[2].

Culinary Bargain hired Telescopic to design the beneficiary platform. Telescopic is an experienced software vendor specializing in designing and building software applications to meet specific needs and solve problems. They continuously innovate to improve their product design and stay abreast of the latest technological advancements. After you graduated with a BCom Honours in Business Informatics from the University of South Africa, you were appointed as a Project Analyst at Telescopic. As the Project Analyst, you…

> *"act as support to project managers, program managers and PMOs[3]. They're responsible for gathering and analysing data for project management*

[2] The order tracking and delivery service will also be extended to the main payment site and made available for use by Culinary Bargain's main client base. Presently, clients can only purchase coupons to be exchanged in person at restaurants.
[3] "PMO (project management office). "A project management office (PMO) is a group, agency or department that defines and maintains the standards of project management for a company. The PMO retains the documentation and metrics for executing projects and is tasked with ensuring projects are delivered on time and within budget." (Shein, 2023, para. 1)

> *decision-making. Project analysts facilitate the work of other project management roles by creating reports and project documentation, analysing databases, doing quantitative and qualitative research, among other similar activities"* (Landau, 2023, para. 13).

Over the next few months, you and Sarita will engage in software project management principles and practices to deliver a successful and sustainable hunger relief programme.

QUESTION 1 [40]

You and Sarita performed the project's proposal "qualitative risk analysis" (Schwalbe, 2019, p. 470). An unsurprising risk factor is that beneficiaries are mostly located in areas of low socio-economic status, which may be a contributing factor to an order not being delivered to a beneficiary.

1.1. Discuss two risks that the delivery service might potentially encounter when delivering a meal to a low socio-economic area. (4)

1.2. Recommend risk mitigation features that can be build into the service delivery application to prevent the risks that you identified in Question 1.1. (4)

1.3. Following qualitative risk analysis, you and Sarita performed "quantitative risk analysis" (Schwalbe, 2019, p. 470) based on the hypothesis of "risk seeking" (Schwalbe, 2019, p. 469). You hypothesise that the delivery service decides to deliver in an area of low socio-economic status, and the risks that you identified in Question 1.1 materialises.

1.3.1. Describe cost implications if the risk materialises. (4)

1.4. In "planning risk responses," you and Sarita note that risks preventing a meal from being delivered are somewhat reduced by the option of the meal being collected by the beneficiary. However, such a response is ideal if the beneficiary stays in the vicinity of the restaurant that prepares the meal. The results of a questionnaire investigating the challenges of meal collection suggest that 60% of beneficiaries staying more than 10 kilometres from the restaurant cannot afford the travel expense, irrespective of whether they take public or private transport.

1.4.1. Justify features that can be incorporated into Culinary Bargain's online marketplace to allow the beneficiary to cover the travel expense by either own transport or mini-bus taxi. (6)

1.5. In a meeting where the project charter was reviewed, Ryan wanted to know why clients should opt-in to donate. He argues that a percentage of Culinary Bargain's net profit can periodically be contributed to the hunger relieve programme, thus guaranteeing an uninterrupted flow of donations. Sarita explained that client opt-in motivates clients to contribute to and fosters a sense responsibility for a charitable initiative, thus attracting clients who value corporate social responsibility.

1.5.1. Complement Sarita's explanation by justifying why it is better to separate the donation from the meal price in the context of scalable fundraising, profit margins, and meal cost estimates. (10)

1.6. Ryan furthermore wanted to know how you and Sarita will deal with instances where a beneficiary redeems a coupon on the marketplace but fails to collect a meal. He highlights the following implications:

i. An unrealised donation does not achieve its intended objective of a meal consumed to curb hunger;

ii. If donating clients get wind of a pattern of discrepancies between redeemed vouchers and uncollected meals, they might be discouraged from making future donations; and
iii. managing and tracking redeemed coupons that do not lead to a collected meal can incur additional administrative costs.

1.6.1. Evaluate the potential of “coercive power” and “reward power” (Schwalbe, 2019, pp. 385–386) to prevent the behaviour of not collecting meals. (6)

1.7. In a meeting discussing the resource management plan, the Chief Digital Information Officer (CDIO) of Telescopic, Siphokazi Malala, does not recommend using their in-house design team for the order tracking and delivery system. According to Siphokazi, the Telescopic development team can manage GPS system design, but there is better expertise in designing these systems by subcontractors (freelance developers). Specifically, he knows freelance developers who are experts in satellite technology and who develop robust signal encoding methods to ensure accurate data transmission from satellites to receivers. Siphokazi suggests collaborating with and outsourcing the design of the GPS system to subcontractors if they decide to pursue Project O.

1.7.1. Promote the idea of outsourcing the GPS system design to subcontractors. (6)

End of Question 1
Total: 40

QUESTION 2 [60]

Comparing in-house development with outsourcing the development of the order tracking and delivery system is not the only factor that determines whether Telescopic will outsource this functionality to subcontractors. A decision to neither incorporate an order tracking and delivery system via in-house development nor outsource it, but instead join an existing delivery service like Uber Eats, holds cost implications. For example, the initial setup cost of designing their own order tracking and delivery system will be high due to procuring the technological infrastructure and operational setup. Conversely, the setup cost to join a platform like Uber Eats is minimal due to platform onboarding (Deliverect, 2024). The cash inflows generated are partially measured by clients who sign up to occasionally donate to the hunger relief programme while ordering a meal for themselves.

2.1. Examine the cash flow of Project O as illustrated in Table 1.

Table 1: Project O – joining the order and delivery system of Uber Eats.

Year	Cash flow	Cumulative Cash Flow
0	-R55 000.00	
1	R23 000.00	
2	R34 000.00	
3	R52 000.00	
4	R65 000.00	
5	R77 000.00	

2.1.1. Calculate the annual cumulative (Years 0 – 5) cash flow. (6)

2.1.2. Calculate the payback period to the closest[4] approximate year, month and day (illustrate the formula and sequence of calculations).

(8)

2.2. Examine the cash flow of Project T as illustrated in Table 2.

Table 2: Project T – Culinary Bargain creates own order tracking and delivery system.

Year	Cash flow	Cumulative Cash Flow
0	-R98 000.00	
1	R23 000.00	
2	R34 000.00	
3	R52 000.00	
4	R65 000.00	
5	R77 000.00	

[4] Refer to the entry titled "*The subtraction (-) symbol in payback period calculations"* in the Announcements section of the INF3708 module site to help you calculate the payback period to the closest approximate year, month, and day.

2.2.1. Calculate the annual cumulative (Years 0 – 5) cash flow. (6)

2.2.2. Calculate the payback period to the closest approximate year, month and day (illustrate formula and sequence of calculations). (8)

2.3. Examine the cash flow of Project O as illustrated in Table 1. The sub questions below instruct you to calculate total profit and return on investment (ROI[5]); Only write down the answer, do not display the formula and sequence of calculations leading to the answer.

2.3.1. Calculate the net profit. (2)

2.3.2. Calculate the ROI. Consider cumulative cash flow when performing the calculation and round your answer to zero decimal places (i.e., to a whole number). (6)

2.4. Examine the cash flow of Project T as illustrated in Table 2. The sub-questions below instruct you to calculate total profit and return on investment (ROI); only write down the answer, do not display the formula and sequence of calculations leading to the answer.

2.4.1. Calculate the net profit.

2.4.2. Calculate the ROI. Consider cumulative cash flow when performing the calculation and round your answer to zero decimal places (i.e., to a whole number). (6)

2.5. Examine the cash flow of Project O as illustrated in Table 1. The sub-questions below instruct you to calculate the annual discounted cash flow and the net present value (NPV); only write down the answer, do not display the formula and sequence of calculations leading to the answer.

2.5.1. Calculate the annual discounted cash flow based on the following discount factors: Year 0: 1; Year 1: 0.93; Year 2: 0.86; Year 3: 0.79; Year 4: 0.73; Year 5: 0.68. (6)

2.5.2. Calculate the total discounted cash inflow. (2)

2.5.3. Calculate the NPV. (2)

2.6. Examine the cash flow of Project T as illustrated in Table 2. The sub-questions below instruct you to calculate annual discounted cash flow and the NPV; only write down the answer, do not display the formula and sequence of calculations leading to the answer.

2.6.1. Calculate the NPV based on the following discount factors: Year 0: 1; Year 1: 0.93; Year 2: 0.86; Year 3: 0.79; Year 4: 0.73; Year 5: 0.68. (4)

2.7. Based on calculations performed for the questions above, Ryan observes that Project O appears to be the best project to pursue by virtue of having a quicker payback period and a higher ROI and NPV in comparison to Project T. According to Ryan, some of the reasons for pursuing Project O are as follows: (i) Uber Eats already has a vast user base, which will likely boost Culinary Bargain's existing sales and create strong exposure for the hunger relief programme; (ii) Culinary Bargain can rely on the existing and functioning

[5] Adapt Schwalbe's (2019, p. 165) ROI formula to reach the correct answer.

delivery logistics of Uber Eats, which reduces operational burden; and (iii) Uber Eats provides continuous technical support for smooth and secure operation.

2.7.1. While Project T's payback period, ROI, and NPV are not as impressive as those of Project O, justify why Project T could be pursued in terms of cost efficiency in the long run. (4)

End of Question 2
Total: 60

QUESTION 3 [40]

The activities illustrated in Table 3 represent is a 3-week scrum sprint to code the system's ETA (estimated time of arrival) functionality if the project stakeholder decide to pursue Project T.

Table 3. The activities of coding ETA with associated estimated duration and predecessors.

Activity	Description	Duration (days)	Predecessor
A	Design the UI for order placement, order status, and delivery tracking	5	
B	Document APIs (application programming interface), algorithms and overall system	22	A
C	Implement UI components for placing orders and receiving ETA.	3	A
D	Implement UI components for tracking delivery in real-time	5	A
E	Implement real-time notifications for order updates using WebSockets or similar technologies	1	C
F	Develop algorithms to determine the best route for delivery	3	D
G	Integrate real-time traffic data to adjust ETA	5	F, E
H	Use machine learning to predict more accurate ETAs based on historical data	2	G
I	Write and execute unit tests for individual components	2	G
J	Test the integration between different components, including APIs and third-party services	2	H
K	Conduct testing sessions with stakeholders to ensure the system meets their requirements	3	J, I
L	Test the system's performance under different load conditions to ensure it can handle high volumes of orders and tracking data	2	K
M	Deploy the application to a staging environment for final testing	2	B, L
N	Deploy the application to the production environment	1	M

3.1. Illustrate the activities on an activity-on-node (AoN) diagram. (32)

- Add start and end nodes.
- Adopt the legend system illustrated in Figure 2.

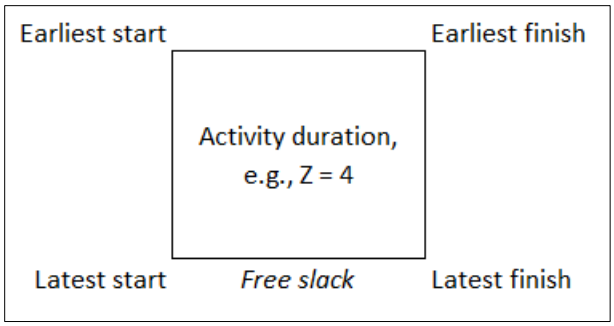

Figure 2: Activity-on-node legend system

3.2. Identify the critical path. (2)

3.3. Identify the activities with slack. (2)

3.4. Identify two activities in a mandatory dependency relationship. Explain what a mandatory dependency is and why the identified activities have a mandatory dependency. (4)

End of Question 3
Total: 40

QUESTION 4 [30]

To test how effectively the website and mobile app can facilitate the activities of the hunger relief programme, 100 smartphones with the installed app are in the process of being issued to beneficiaries located in the East Rand of Johannesburg. The budget at completion (BAC) for procuring and distributing the smartphones and training the beneficiaries on using the app is estimated at R50,000.00 and scheduled over 30 days. The work performed every 10 days is budgeted at a planned value (PV) of R16,667.00. By the end of day 10, R12,500.00 has been spent while 28% of the work has been completed.

4.1. Calculate the earned value (EV) by the end of day 10. (4)

4.2. Calculate the cost variance (CV) by the end of day 10. (4)

4.2.1. What does the CV calculated in Question 4.2 indicates about the cost of performing the work? (1)

4.3. Calculate the schedule variance (SV) by the end of day 10. (4)

4.3.1. What does the SV calculated in Question 4.3 indicates about the duration of performing the work? (1)

4.4. Calculate the cost performance index (CPI) by the end of day 10. (4)

4.4.1. What does the CPI that you calculated in Question 4.4 indicates about the project budget? (1)

4.5. Calculate the schedule performance index (SPI) by the end of day 10. (4)

4.5.1. What does the SPI that you calculated in Question 4.5 indicates about the project schedule? (1)

4.6. Calculate the estimate at completion (EAC) in terms of cost. (4)

4.7. Calculate the EAC in terms of time. (2)

End of Question 4
Total: 30
End of Assessment 3
Total: 170

References

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