Project Team 6
Deliverable 2
Arjun Chauhan
Geena Chernyak
Serena Choi
Tony Nguyen
Professor Paul Vroomen
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Deliverable 2 - African Health Services: An App For Health and Wellness

1. Project Estimation
   a. T-Shirt Sizing Table

User	T-Shirt Size	FTE Ideal Days	FTE Months	User Story Description & T-Shirt Sizing Justification
Possibly Ill Patient	XL	120	6	As a possibly ill patient, I want to be able to use my portable device to accurately and easily diagnose if I have malaria, so that I can receive proper treatment.
				T-Shirt Sizing is set at XL because the process of satisfying this user is highly complex and will require the most effort of any user story. To satisfy this user, it requires a user-friendly interface, a patient information database, creation of a questionnaire, and creation of a diagnosis algorithm, which specifically will require the most time, effort, and developers.
Worried Person	XS	5	0.25	As a health-conscious individual, I want to use my portable device to obtain relevant information about malaria, so I can look out for symptoms and learn about self-treatment options.
				T-Shirt Sizing is set at XS because the process of satisfying this user is not complex and requires very low effort. This user requires only a user-friendly interface and a collection of relevant information, such as symptoms, self-treatment options, and non-prescription drugs.

Hospital Coordinator	M	20	1	As a hospital coordinator, I want to use my portable device to show me potential malaria-positive patients, so I can reach out and facilitate scheduling.
				T-Shirt Sizing is set at M because the process of satisfying this user is moderately complex and requires moderate effort. The hospital coordinator requires a clinic database in order to display and organize patient information and responses in order to perform their tasks, such as scheduling.
Doctor	M	20	1	As a doctor, I want to use my portable device to show me the patient information and questionnaire responses at the time of visit, so I can create a course of treatment for the patient.
				T-Shirt Sizing is set at M because the process of satisfying this user is moderately complex and requires moderate effort. Similar to the hospital coordinator, the doctor will also require a separate database to display and organize patient information and responses, along with the ability to also add relevant notes.
Nurse	S	10	0.5	As a nurse, I want to be able to use my portable device to see the doctor's treatment plan so that I can implement that course of treatment.
				T-Shirt Sizing is set at S because the process of satisfying this user is not complex and requires low effort. The nurse will utilize the clinic and doctor database in order to implement the doctor's treatment plans.
Pharmacist	S	10	0.5	As a pharmacist, I want to be able to use my portable device to display patient information, responses, and treatment options, so I can assist patients in procuring proper medications.
				T-Shirt Sizing is set at S because the process of satisfying this user is not complex and requires low effort. The pharmacist will utilize a prescription and

				doctor databases to manage the medicinal needs of patients.
Hospital Transport Coordinator	XS	5	0.25	As a hospital transport coordinator, I want to be able to use my portable device to show me which patients require transportation, so I can assist in redirecting them to the most efficient form of transportation.
				T-Shirt Sizing is set at XS because the process of satisfying this user is not complex and requires very low effort. The transport coordinator utilizes the clinic database to display and organize the information of patients, and provides transportation information or assistance.
Taxi Coordinator	S	10	0.5	As a taxi coordinator, I want to be able to use my portable device to display location information of patients utilizing the taxi service, so I can provide a ride to the clinic.
				T-Shirt Sizing is set at S because the process of satisfying this user is not complex and requires low effort. This user utilizes patient information from the clinic database to arrange taxi services for patients.
Total	~XXL	200	10	Total FTE Ideal Days / Days in FTE Month = Estimated Development Time in FTE Months 200 / 20 = 10 **Estimated Development Time in FTE Months: 10** Development Time in FTE Months / Number of Developers (3) = Development Time with 3 Developers 10 / 3 = 3.333 **Estimated Development Time with 3 Developers in FTE Months: 3.333**

b. Planning Poker & Story Points Table

Coding Task	SP	FTE Hrs	Description & Story Point Justification
Building Out Questionnaire	2	40	Compile a list of relevant and selective questions to gather information about patient conditions regarding malaria.
			Story Point is set at 2 because this is not complex. It's a relatively

			simple research task and will not require a large time-investment or coding-intensive process.
Patient Profile Database	5	100	Create a database that contains and organizes patient profile information from responses received using the patient questionnaire.
			Story Point is set at 5 because building a functional and organized patient database is moderately complex and will require moderate time and moderate coding process.
Database of Clinics	5	100	Create a database within the hospital's system containing patient profile information and responses received from the patient profile database.
			Story Point is set at 5 because building a functional and organized clinic database is moderately complex and will require a moderate time-investment and moderate coding process.
Diagnosis Algorithm	50	1000	Create a diagnosis algorithm able to accurately diagnose malaria using patient profile information received from the questionnaire responses.
			Story Point is set at 50 because this is our most important and most complex coding task. It will require the most coding-intensive process, time-investment, and developer effort to create a functional and, most importantly, accurate diagnosis algorithm using machine learning.
Self-Treatment Information Webpage	2	40	Compile a catalog of information regarding self-treatment, such as symptoms, non-prescription drugs, remedies, self-care procedures, and potential risks.
			Story Point is set at 2 because this task is not complex. It requires a relatively simple research task and will not require a large time investment or intensive coding process.
Doctor's Notes Database	5	100	Create a database that contains patient profile information received from the clinic database along with relevant information that the doctor elects to include.
			Story Point is set at 5 because building a functional and organized database for the doctor's uses will require moderate time and coding.
Prescription Database	5	100	Create a database containing information regarding prescription drugs, such as inventory, orders, cost, and timeline.

			Story Point is set at 5 because building a functional and organized database for prescription drugs is moderately complex and will require moderate time and moderate coding process.
Estimate Notification System	2	40	Create a system that estimates the cost of taxi services depending on patient location information received from the clinic database.
			Story Point is set at 2 because building an automated notification is not complex and will not require a large time investment or an intensive coding process. While other automated systems may require a more in-depth process, our system only has the simple task of calculating an estimated cost of taxi services.
Payment Platform Integration	2	40	Integrate an existing payment platform, such as Flutterwave or Stripe, to charge patients utilizing the hospital's taxi services.
			Story Point is set at 2 because integrating a payment platform is not complex and will not require a large time-investment or coding-intensive process. We've decided that the most efficient and secure way to process payments is through the integration of an existing certified payment platform.
Total	78	1560	Total Story Points * FTE Hours Per Story Point = Total FTE Hrs 78 * 20 = 1560 **Estimated Total FTE Hrs: 1560** Total FTE Hrs / Time Per Sprint (FTE Hrs) = Number of Sprints 1560 / 160 = 9.75 **Estimate Number of Sprints: 9.75** # of Sprints * Days Per Sprint = Total Development Time in Days 9.75 * 20 = 195 **Estimated Total Development Time in Days: 195** Total Development Time / Number of Developers (3) = Total Development Time with 3 Developers 195 / 3 = 65 **Estimated Development Days with 3 Developers: 65** Development Days with 3 Developers / Days in Month = Total Development with 3 Developers in Month 65 / 20 = 3.25 **Estimated Development Days with 3 Developers in Months: 3.25**

c. Use Case Point Analysis

Function Point Estimation Worksheet

Unadjusted Actor Weighting Table

ACTOR TYPE	DESCRIPTION	WEIGHTING FACTOR	NUMBER	RESULT
Simple	External system with well-defined API	1	1	1
Average	External system using a protocol-based interface, e.g., HTTP, TCT/IP, or a database	2	3	6
Complex	Human	3	8	24
	Unadjusted Actor Weight Total (UAW)			31

Unadjusted Use Case Weighting Table

USE CASE TYPE	DESCRIPTION	WEIGHTING FACTOR	NUMBER	RESULT
Simple	1-3 transactions	5	4	20
Average	4-7 transactions	10	3	30
Complex	> 7 transactions	15	1	15
	Unadjusted Use Case Weight Total (UUCW)			65

Unadjusted Use Case Points (UUCP) = UAW + UUCW   96

Technical Complexity Factors

FACTOR NUMBER	DESCRIPTION	WEIGHT	ASSIGNED VALUE (0-5)	WEIGHTED VALUE	NOTES
T1	Distributed system	2.0	3	6	
T2	Response time or throughput performance objectives	1.0	2	2	
T3	End-user online efficiency	1.0	3	3	
T4	Complex internal processing	1.0	3	3	
T5	Reusability of code	1.0	3	3	
T6	Easy to install	0.5	5	2.5	Ease of use is paramount for patients using the app
T7	Ease of use	0.5	5	2.5	Ease of use is paramount for patients using the app
T8	Portability	2.0	4	8	
T9	Ease of change	1.0	2	2	
T10	Concurrency	1.0	2	2	
T11	Special security objectives included	1.0	4	4	Patient data has security concerns
T12	Direct access for third parties	1.0	3	3	
T13	Special user training required	1.0	0	0	App interface should not require additional training
	Technical Factor Value (TFactor)			41	

Technical Complexity Factor (TCF) = 0.6 + (0.01 * TFactor)   1.01

Environmental Factors

FACTOR NUMBER	DESCRIPTION	WEIGHT	ASSIGNED VALUE (0-5)	WEIGHTED VALUE	NOTES
E1	Familiarity with system development process being used	1.5	3	5	
E2	Application experience	0.5	4	2	
E3	Object-oriented experience	1.0	4	4	
E4	Lead analyst capability	0.5	3	2	
E5	Motivation	1.0	3	3	
E6	Requirements stability	2.0	2	4	
E7	Part time staff	-1.0	0	0	Project should only require a few full time staff
E8	Difficulty of programming language	-1.0	2	-2	Languages will largely be SQL, Python, and HTML/CSS
	Environmental Factor Value (EFactor)			17	

Environmental Complexity Factor (ECF) = 1.4 + (-0.03 * EFactor)   0.89

Adjusted Use Case Points (UCP) = UUCP * TCF * ECF   86.2944

If PHM = 999, Then risk of Project Failure is too high

PHM (run the RunPHMComputattion macro after filling in the workshe   20

Effort in Personal Hours = UCP * PHM   1725.888

Total FTE Hours / Number of Developers (3) = Development Time with 3 Developers in FTE Hours
1725.888 / 3 = 575.296
Estimated Development Time with 3 Developers in FTE Hours: 575.296

Development Time with 3 Developers in FTE Hours / Hours FTE Day = Development Time with 3 Developers in FTE Days
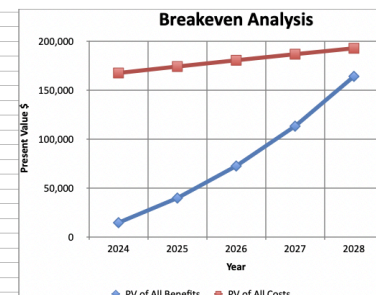575.296 / 8 = 71.912

Estimated Development Time with 3 Developers in FTE Days: 71.912

Development Time with 3 Developers in FTE Days / FTE Days in Month = Development Time with 3 Developers in FTE Months
71.912 / 20 = 3.596
Estimated Development Time with 3 Developers in FTE Months: 3.596

    d. Of the methods conducted to estimate the most accurate development time, it was evident the Story Points method would yield the best results. Due to its direct alignment with our development tasks and the process of creating story points based on the needs of the user stories, we understood the complete scope of the project and narrowed in on our most essential tasks. Using this method, we were further able to hone in on different factors, understand the complexity of each task, and provide the number of hours it took to complete each goal. Simultaneously, using the Planning Poker method helped eliminate the cognitive bias of any individual, and allowed the group to come to a consensus regarding the importance of each task. Our calculations concluded the development time for 3 developers was around 3.25 months or 65 days. In opposition to the T-Shirt and Case Point analysis, we found the calculation process of these methods were too broad to yield the accurate estimates, despite having similar results to the chosen method. Specifically within the T-shirt method, we couldn't conclude which tasks needed the most effort, due to its emphasis on actors rather than specific needs and tasks.

Economic Feasibility Analysis Template							
Discount Rate (WACC)	3.00%						
	2024	**2025**	**2026**	**2027**	**2028**	**Total**	**Notes**
Year	1	2	3	4	5		1.5 million users after year 1 ~ $45,000 (iOS) + $8400 (android) /2 = avg $26700
Increased sales	15,000	26,700	35,800	45,850	59,000		1.95 million users after year 2 ~ $61,000 (iOS) + $10600 (android) /2 = avg $35800
Reduction in cost	0	0	0	0	0		2.5 million users after year 3 ~ $78,000 (iOS) + $13700 (android) /2 = avg $45850
TOTAL BENEFITS:	15,000	26,700	35,800	45,850	59,000		3.3 million users after year 4 ~ $100,000 (iOS) + $18000 (android) /2 = avg $59000
PV of BENEFITS:	14,563	25,167	32,762	40,737	50,894	164,124	Estimates made using Google AdMob revenue estimator for Africa, Medical app, Averaged between iOS and Android
Cumulative PV of ALL BENEFITS:	14,563	39,730	72,492	113,230	164,124		
Cost of Hardware	15,123	0	0	0	0		SQL Server at $15,123
Cost of Computing Equipment	25,000	0	0	0	0		3 Employee Workstations at ~$4000 + 1 Storage Server at ~$5000 + 1 General Development Server at ~$8000
Cost of Software	5,500	0	0	0	0		IDE License at $1000 per year per user + Miscellaneous Development Tools
Development & Installation Costs	125,000	0	0	0	0		Y1: 10 Months FTE Development Time divided between 3 full-time employees at $150,000 per year
TOTAL DEVELOPMENT COSTS:	170,623	0	0	0	0		
On-Going Maintenance (Suppliers)	2,000	2,000	2,000	2,000	2,000		Web Hosting at $300/Yr + Cloud Database Hosting at ~1000 + App Publishing Fees
Internal Maintenance & Support	0	5,000	5,000	5,000	5,000		Cost to maintain app and release occasional bug fixes
TOTAL OPERATIONAL COSTS:	2,000	7,000	7,000	7,000	7,000		
TOTAL COSTS:	172,623	7,000	7,000	7,000	7,000		
PV of COSTS:	167,595	6,598	6,406	6,219	6,038	192,857	
Cumulative PV of ALL COSTS:	167,595	174,193	180,599	186,819	192,857		
Total Project Benefits - Costs:	(157,623)	19,700	28,800	38,850	52,000		
Yearly NPV:	(153,032)	18,569	26,356	34,518	44,856	(28,733)	
Cumulative NPV:	(153,032)	(134,463)	(108,107)	(73,589)	(28,733)		
Project NPV:	(28,733)						
Return on Investment:	-14.90%						
Breakeven Point:	6						
Intangible Benefits:							

Breakeven Analysis

Chart: Present Value $ (y-axis, 0 to 200,000) vs Year (x-axis, 2024–2028), with series: PV of All Benefits and PV of All Costs.

2.

Link to the original spreadsheet is available at the end of the document

3. Feasibility Conclusion
    a. On the road to project success, we will face technical challenges including ensuring that the questionnaire accurately detects symptoms of malaria and can identify the regional factors that influenced the disease. Detecting a disease through a questionnaire requires a highly refined and tested prediction algorithm to sift through different questionnaire answers and receive diagnosis feedback for further improvements. Another technical challenge we face is certifying that patients arrive at their designated clinic in a timely and safe manner. Including geolocation services adds another layer of complexity to the app. We have concluded that developing this app is technically feasible, though not without challenges. These technical challenges are compounded by our projected user base and its growth. We will have to compensate for technical issues of scale, especially given the limited technical infrastructure of our target market.
    b. One major organization challenge we will encounter will be establishing an effective cross-functional team. Success for this project will require input from healthcare professionals, transportation officials, and app developers. We plan to address this issue by maintaining a small, collaborative team and establishing an effective managerial structure. Another challenge we will face is ensuring that each coding task meets the needs of our users, and functions effectively and efficiently. This can be addressed with clearly defined sprint objectives and continually testing the effectiveness of each function of the app. An additional organizational challenge will arise from the need to maintain strict data security and build in safety measures in compliance with applicable law and regulations on handling health data. This will require continual input from subject matter experts in the realm of both law and healthcare. All these are challenges we must be mindful of, but despite these challenges, we are confident that this project remains feasible on an organizational level.
    c. After a thorough analysis, our team is confident that this project is feasible, and recommends moving forward to our stakeholders. This project has the potential to make significant differences in malaria fatalities through convenient predictive diagnosis and increased access to treatment. The time necessary for ensuring this project's success, especially through the refinement of the diagnosis algorithm, has been considered and factored into our predictions presented here. Our team will continue to track and evaluate progress throughout the development of this app, understanding that the predictions made will not be perfectly accurate. We are confident that they represent our best predictions of both the project timeline and costs. Potential long-term risks that we may encounter include technical glitches and compliance requirements. Technical glitches and server downtime can affect access to real-time data in our app and potentially cause errors and other unexpected behavior in the app's functionality. To ensure the app's success,

we intend to maintain responsible code control practices, as well as extensive testing to ensure released versions are stable and do not result in development delays or reduced functionality. Additionally, we will have to be mindful of the multitude of differing laws governing user data, particularly as it relates to sensitive health data. This issue is compounded by the app's operation in multiple countries, each of which will have their own data security laws. However, we intend not only to spend significant time on educating our own team on the practices required by the various areas the app will operate in, but also consult with subject matter experts in these areas to ensure compliance.

Economic Analysis Template 2.xlsx