Resourced Project Plan, Budget, and Project Evaluation

Each group member provided input and ideas for each section in the report. After initial ideas and input were gathered, one group member authored each section, then all sections were iteratively reviewed and edited by all group members.

1 Team Organization and Project Status

Project Reporting Status

The development team responsible for Medisail's e-procurement system is comprised of full-time employees in varying roles. The Junior Developer, Frontend Developer and Backend Developer report to the Senior Developer. The Database Administrator, two QA Testers, and Senior Developer report to the IT Manager. The IT Manager and the Sales Manager report to the Project Manager. The reporting structure of employees working on the project is described in the figure below.

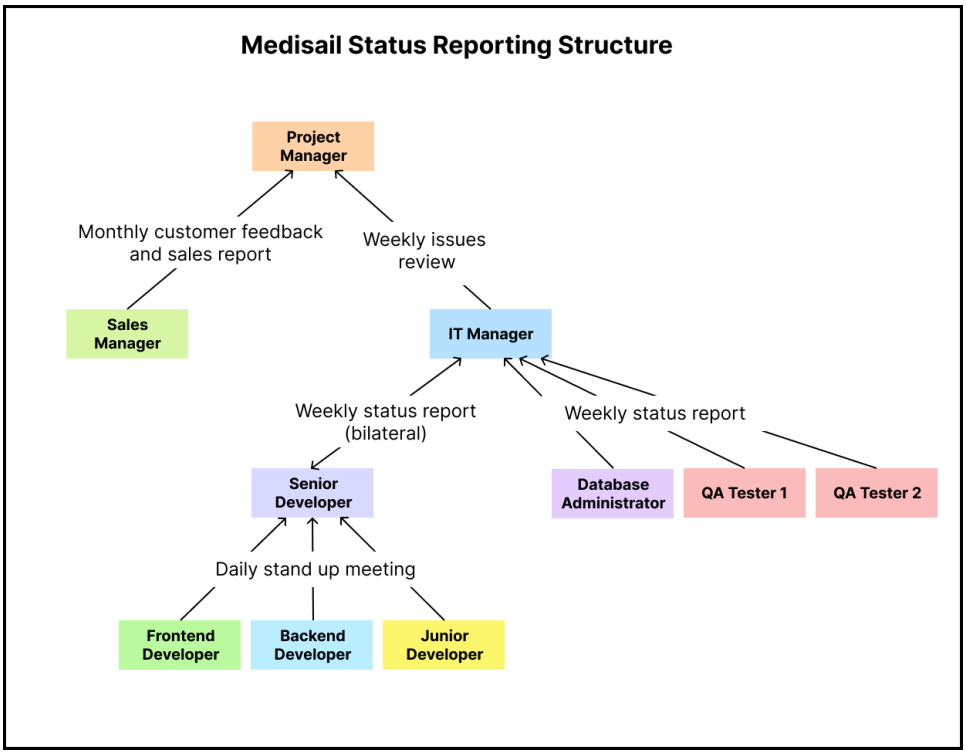

Figure 1 Status Reporting Overview

Medisail has meticulously concluded that adopting a client-server-database architecture represents the optimal solution for our application. In a concerted effort to ensure the singular focus and efficiency of each architectural component, dedicated sub-teams, under the guidance of the Senior Developer, will be assigned to the client, server, and database elements.

Within this framework, distinct responsibilities have been assigned to key team members. The Database Administrator will play a pivotal role in the creation and maintenance of the database, ensuring its seamless functionality. Concurrently, the Backend Developer will spearhead efforts related to the server, while the Frontend Developer will channel expertise towards crafting an intuitive and engaging user interface. The Junior Developer will provide valuable assistance to both the Frontend and Backend Developers, contributing to various tasks as needed.

In the realm of quality assurance, the QA Testers will play a critical role in creating and executing comprehensive tests, ensuring the robustness and reliability of the entire system. Collaboration is key, and under the astute guidance of the Senior Developer, IT Manager, and Project Manager, every team member will synergize their efforts. This collaborative approach will not only streamline the integration process but also address any challenges that may arise during integration and system testing. This ensures a holistic and cohesive development process, aligning with Medisail's commitment to excellence.

While the development plan of the e-procurement system will follow a linear approach in each phase, iterative improvements will be conducted near the end of each phase’s development cycle. The rigidity of the project reporting structure will be maintained during the linear stage of development but will be more flexible as each phase moves into iterative analysis and improvements, and meetings and status reports will become more inclusive of the entire development team. The adaptable nature of this reporting structure will benefit the development of the segmented software architecture while allowing the small development team to effectively communicate and collaborate.

1.1 Project Management Controls

Project management controls will be monitored throughout the development and lifecycle of the e-procurement product, but there are specific milestones in the project where some controls will be monitored more closely. The table below highlights the five primary project management controls of the project, the employees responsible for overseeing them, the key time that that control will be closely monitored during the project, and where input data for the controls will be sourced.

Table 1 Project Management Controls

	Control	**Responsibility**	**Key Monitoring Times**	**Input Data**
1.	Schedule	Project Manager	Before project development begins	Previous projects
			Beginning of each development phase	Employee resources
				Development impediments
2.	Resource Management	Project Manager	Before project development begins	Previous projects
				Availability and expertise of Medisail technical employees
3.	Risk Management	Project Manager	Before project development begins	Previous projects
		IT Manager	When each project milestone is reached	Industry research
		Senior Developer	After deployment of each phase	User feedback
				Application logs
4.	Change Management	Project Manager	Beginning of each development phase	User feedback
				Application logs
5.	System Performance	Sales Manager	After deployment of each phase	User feedback
		Project Manager	After deployment of final development phase	Application logs

The Project Manager is responsible for overseeing all project controls but will share responsibility for some controls with other members of the team. Input data from user feedback and application logs will be received sporadically, which creates a need for continuous integration of input data. In addition to monitoring controls at the key times outlined in the table, those responsible for controls will be expected to keep tabs on them and their input data and share any issues during status report meetings.

Daily Stand-Up Meeting

The daily stand-up meeting will occur each morning for 15 minutes. The Senior Developer conducts the meeting, and the Frontend, Backend, and Junior Developers attend. This meeting provides an opportunity for the developers to discuss progress, plans, and problems related to their components of the project. In addition, the meeting allows developers to share achievements, challenges, and gather feedback. Only technical topics will be discussed. The Senior Developer acts as the facilitator of the meeting to ensure that everyone has a chance to speak and that any unresolved issues or longer discussions are taken offline. The stand-up meeting also assists the Senior Developer in identifying and resolving any risks, blockers, or conflicts that arise. The IT manager and Project Manager are not required to attend stand-up meetings, but they have the option to attend if an issue arises or if updates are needed in between status reports. While the practice of a manager attending stand-up meetings does not follow standard Agile principles, Medisail feels that this is necessary because the development team is relatively small and a rigid reporting structure in this area may inhibit development progress. After the stand-up meetings for the given week have concluded, the Senior Developer will be responsible for relaying applicable information from stand-up meetings to the IT Manager during the weekly status report.

1.1.1 Weekly Status Report

Each week, multiple members of the team will be responsible for preparing weekly status reports. The information contained in these reports will vary based on who prepared. The table below describes the different weekly status reports that occur.

Table 2 Status report definitions

	Prepares Report	Receives Report	Purpose of Report
1.	Database Administrator	IT Manager	Technical updates on the database including development progress, issues, and impediments
2.	QA Testers	IT Manager	Technical updates on software testing including test results and issues and impediments related to test creation Weekly reports may not begin until several weeks before the testing stage of each development phase begins
3.	Senior Developer	IT Manager	Technical updates on the software development process including outstanding issues discussed on daily stand-up meetings and observations made throughout development
4.	IT Manager	Senior Developer	Applicable technical updates on database development and testing progress to ensure that sub-teams remain synchronized during product development

Weekly Issues Review

Weekly issues review meetings will be attended by the IT Manager and Project Manager. The IT Manager and Project manager will each drive half of the meeting. The IT Manager will provide updates on the progress of sub-teams and address technical impediments that affect project costs, schedule, and other critical project controls. The Project Manager will provide updates on external factors affecting the project, such as updated constraints that affect the development team's work. The IT Manager will provide applicable information from this meeting to the development sub-teams.

Monthly Customer Feedback and Sales Report

Monthly customer feedback and sales reports will be prepared by the Sales Manager and presented to the Project Manager. This report will include the results of customer and user feedback surveys and any other feedback received from users in addition to sales statistics for the e-procurement product. The Project Manager will use these reports to adjust tasks at the beginning of each

development phase to facilitate iterative improvements based on user feedback. The Project Manager will also use information from this meeting to convey sales statistics to stakeholders.

2 Project Change Management

As Medisail represents a novel product within our portfolio and given that our product doesn't fall under the category of safety-critical systems, our change management process is geared towards delivering the initial offering to customers. This approach incorporates a responsive feedback loop, enabling prompt updates based on client input regarding these preliminary offerings. Consequently, our project change management plan outlines distinct steps, including New feature development, Defect Resolution, and Design change request.

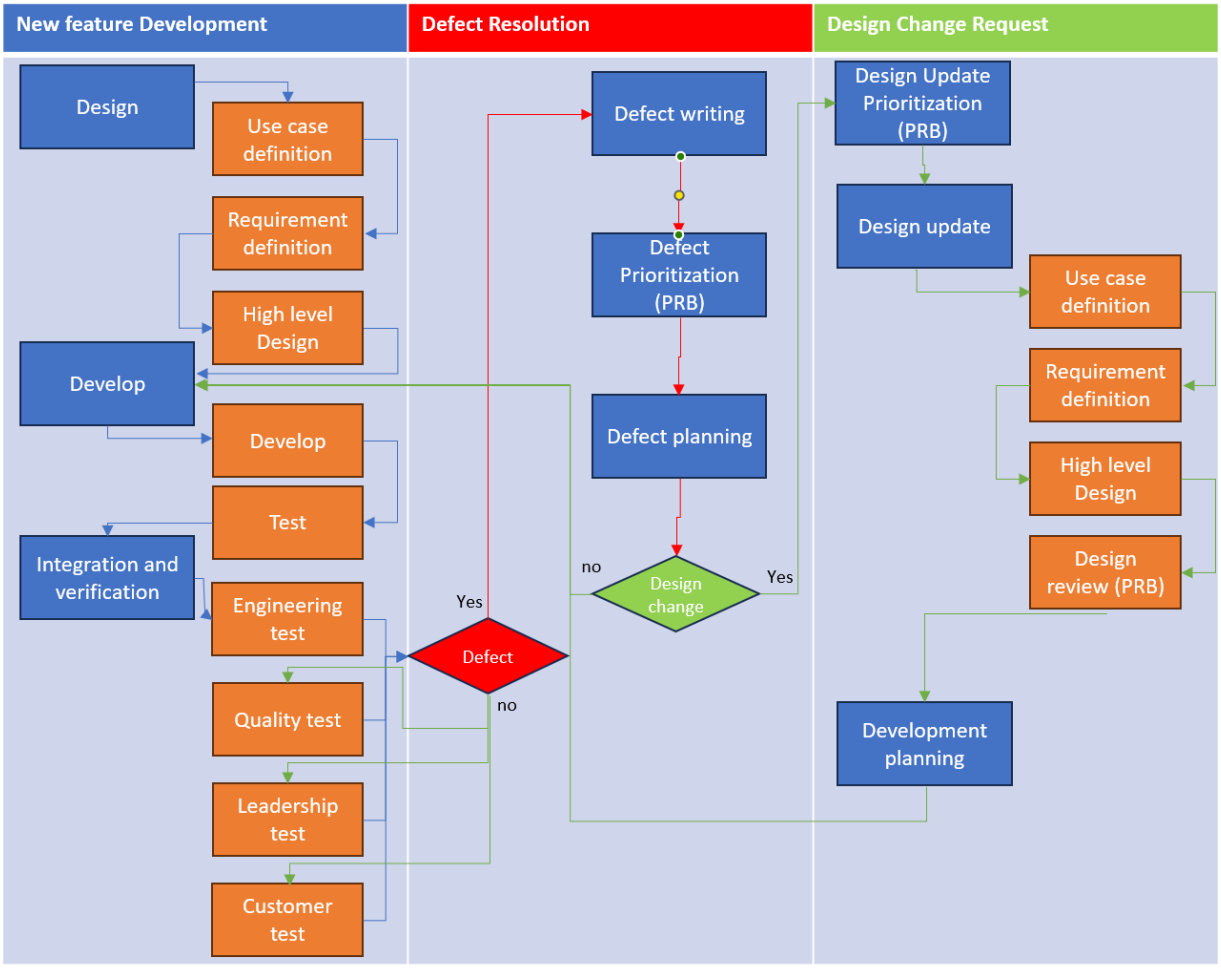

Figure 2 Change management process flowchart

2.1 New feature development

Starting off with our project we will primarily emphasize the development of new features. These features will be relatively straight forward as they will be triggered clear business objectives and drive into lower level tasks that provide a Design Step, a Development step, and an Integration and verification step each of which will be further defined below.

2.1.1 Design Step

This phase of new feature development, business and engineering leadership collaborate to outline high-level use cases that fulfill the desired business needs. Subsequently, Engineering leadership, along with senior engineers, collaborates to formulate the necessary requirements to fulfill these needs. Once a well-defined set of requirements is established, senior engineers and individual contributors collaborate to craft high-level designs for specific software components.

2.1.2 Development step

Once we have established requirements and a high-level design of software components from the Design Step we are now able to start allocating these components to individual engineers. During this stage developers will implement software components meeting these needs. In addition to developing components that satisfy these requirements developers will also follow a modern DevOps development approach and implement automated testing and component deployment in our pipelines.

2.1.3 Integration and verification step

After creating individual software components, the next step involves connecting these components and testing the interfaces between them. Initial testing will be conducted by the engineers responsible for developing the components. Subsequently, QA tests will be conducted to ensure that the desired use cases and requirements are met, and any defects identified will be documented. Following the completion of these steps, business and engineering leadership will review the output product to assess the presence of defects, identify the need for new functionality, or determine readiness for customer review. If the product is deemed ready for customer review, we will arrange demonstrations with selected customers to initiate the next feedback loop.

2.2 Defect Resolution

Defects can be found at nearly any stage of our CM process, however the most common place we expect to find these is during our Integration and verification step. This is largely expected because it is the first stage in development where we begin connecting various software components and bringing in third party reviews to ensure that these distributed services function as intended. As such, defect resolution can come in the form of various priorities. The priority of each of these will

be initially defined by the author of the DR, and then priority will be re-confirmed at a program review board (PRB) meeting which will be held bi-weekly.

The DR criticality will be defined as follows:

- **Critical**: assigned when we have a breaking defect that impacts core functionality of our product
- **Severe**: assigned when a breaking defect impacts new system functionality
- **High**: assigned when a breaking defect would impact common user functionality, but a work around exists
- **Medium**: assigned when a breaking defect occurs to a functionality that isn't considered to be a common use case. Also, nonbreaking defects that may impact non-essential functionality.
- **Low**: nonbreaking changes that could provide a better user experience. This could be performance improvements, ergonomic improvements, desires for new functionalities, etc.

2.3 Design change request

Design change requests are typically expected to be driven by leadership and customer reviews from our Integration and verification step. Like Defect Resolution these items are handled by our PRB where project leaders work together to scope the change before sending changes down the standard Design Step defined in 2.1.1.

3 Resource Plan and Leveled Schedule

3.1 (Re)sequencing of the plan around allocation of human resource to tasks

The Medisail production schedule included quite a bit of overlap and parallel activity once all the tasks were in place. Our tendency was to group similar tasks, with similar resources together in the overall schedule. We were also very thorough when adding dependencies, making sure that each task had a realistic set of predecessor and successor tasks. This resulted in a tight schedule with a very prominent critical path. In fact, 163 out of the total 197 tasks were part of the critical path.

Upon allocating resources to these tasks, it became clear that some adjustments needed to be made to resolve the many overallocated resource warnings (140) that were generated. One of the strategies we used was to divide large teams of people into smaller groups that would be able to work on multiple tasks simultaneously. For example, we had the same six resources dedicated to working on the installation of Maven and Junit scheduled on the same day.

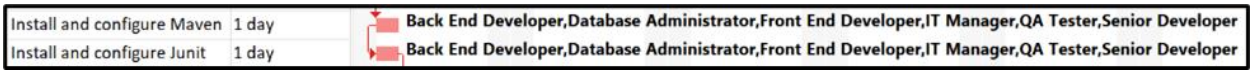

Figure 3 Six Overallocated Resources

Those tasks could easily be accomplished by a team of three given that at least one member of each team has reasonable technical fluency. Our solution was to divide the large team in half, still accomplishing the tasks in the day allotted, but without overextending our resources.

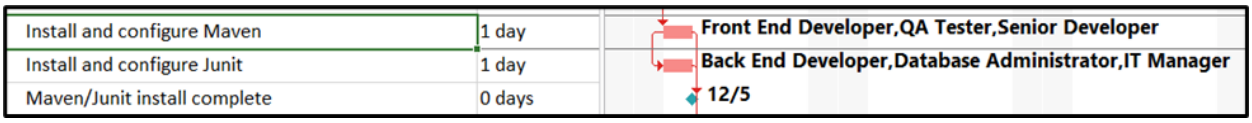

Figure 4 Tasks Distributed Among Team Members

We also found several situations where a single individual was scheduled to complete many tasks in one day. The example below shows how our database administrator was originally scheduled to enter placeholder data into several different databases at the same time.

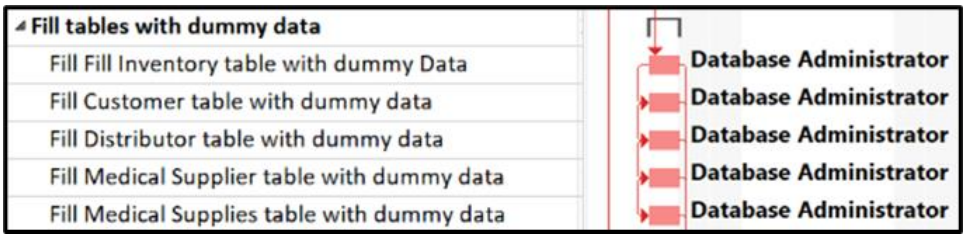

Figure 5 Database Administrator is Overallocated

Given that entering dummy data is a simple task, and that we had members of the team going unutilized on that day, we decided to assign each of the databases to a different resource. This allowed us to keep the project on schedule, while relieving the unrealistic load placed on the database administrator.

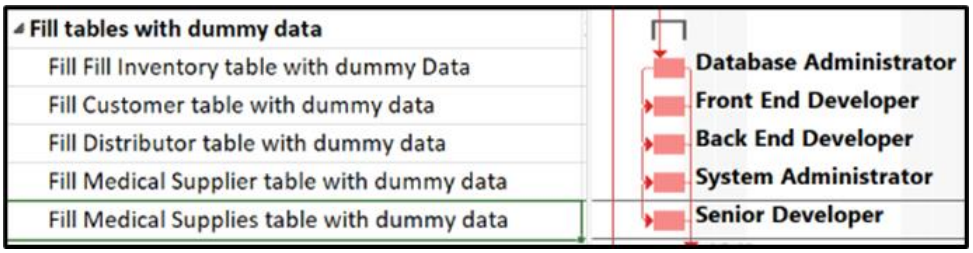

Figure 6: Utilizing Idle Resources to Complete the Tasks

Figure 5 shows another scenario from our original schedule which had the front-end developer overcommitted doing the mockups for various interfaces.

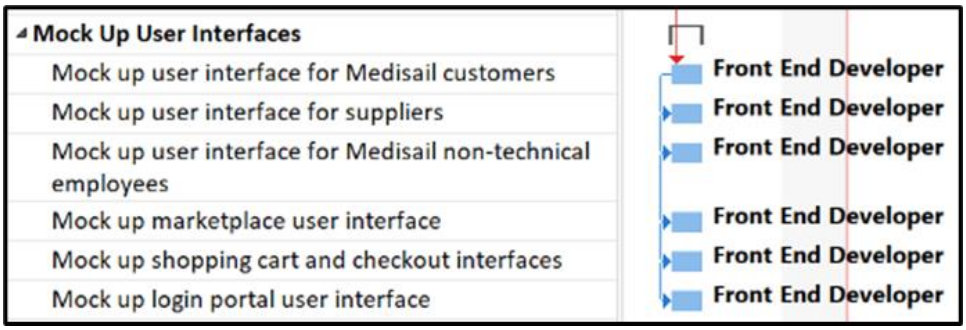

Figure 7 Front End Developer is Overallocated

We decided to divide this work up among the three development resources and adjust the schedule so that the interfaces were tackled three at a time. Given that these tasks were not on the critical path, we did not have to worry about lengthening the overall project time.

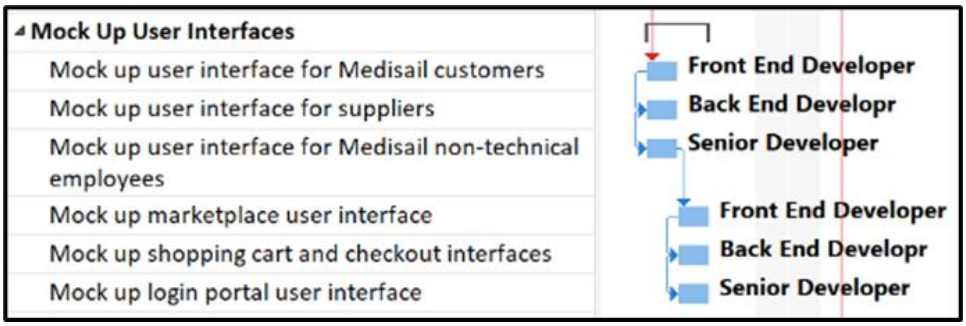

Figure 8 Tasks Are Spread Out and Divided Among Developers

When it came to the writing, conducting, and reporting on tests over the course of the project, we ultimately decided to add an additional QA Tester to the team. The flexibility this brought to the testing schedule and the fact that this additional resource is utilized consistently throughout the project made the added expense worthwhile. Both QA Testers 1 and 2 are used in the figure below. We also made use of our senior and front-end developers to help execute these tests. Each time an overallocated resource was swapped for another available resource we were careful to consider the

skillsets of the resources involved. In the case below, it was reasonable to expect a front end and senior developer to be able to write interface tests.

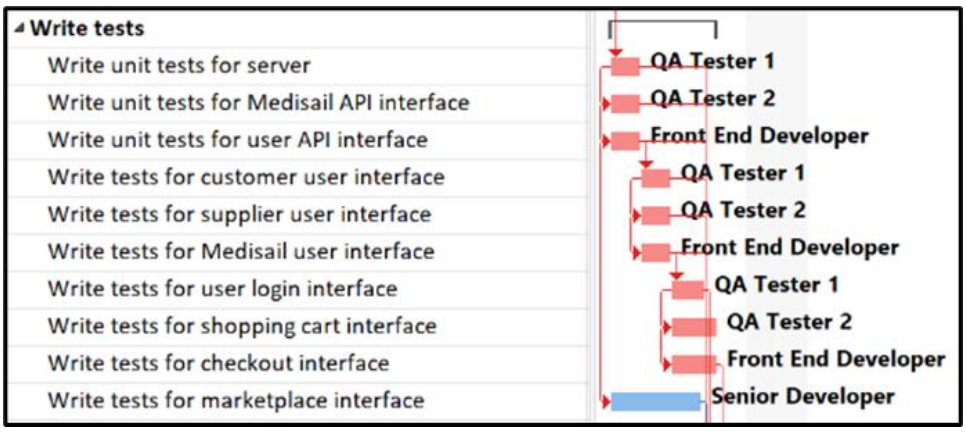

Figure 9 A Second QA Tester is Brought into the Project

We went on to use these strategies to deal with overallocated resources throughout the project schedule, eventually resolving all the issues.

3.2 Task Overlapping & Logic of Changes

There were several places in our schedule where a hard demarcation between the beginning of one task and the end of another was difficult to establish. Most prominent among these was the time spent waiting for the results of customer surveys. At the very start of our vision for Medisail, we decided that the company must be responsive to customer feedback. Thus, we included a customer survey at the end of each phase of our product deployment. Rather than sit idle while surveys are collected and analyzed we decided it would be more efficient to move forward with the development of the next deployment. This approach is shown in the figure below.

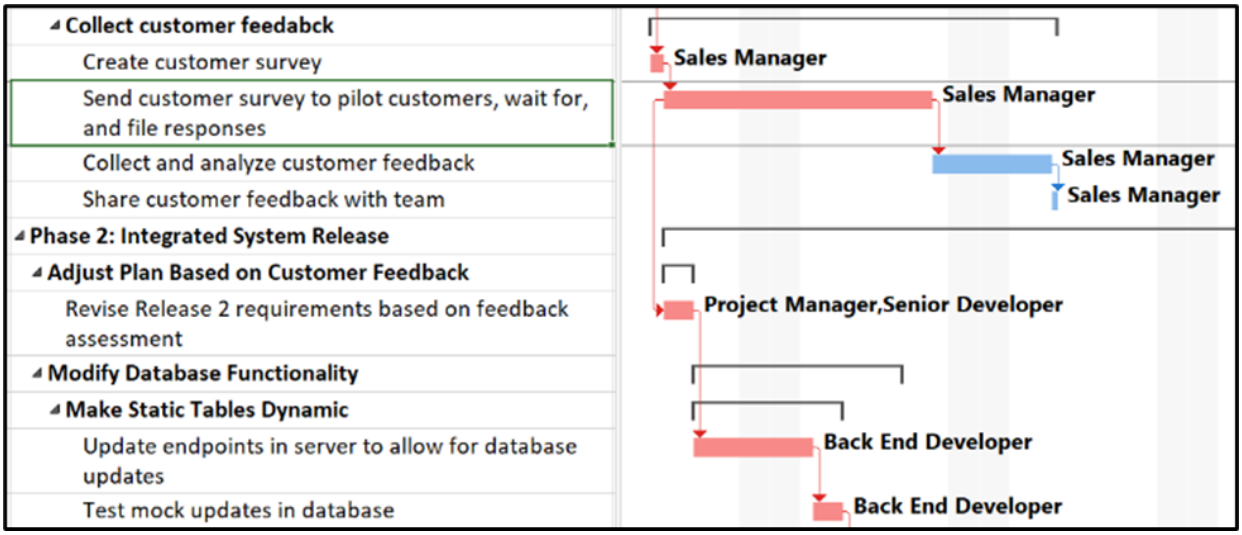

Figure 10: Overlapping the End of One Deployment with the Beginning of the Next

3.3 Leveling of the Plan for Resource Efficiency

By this point in the project schedule, we had carefully reallocated team resources, scheduled parallel tasks where possible, and hired two additional team members. Nervous about the possible impact of the automatic project leveler, we made a backup copy of the project file. However, running the automatic project leveler had literally no impact whatsoever on the project schedule. We attribute this to the carefully crafted dependencies we had put in place, as well as the elimination of all overallocated resource warnings. On the one hand, it was gratifying to see that our project schedule was an apparent success, it was also a bit of a letdown not seeing what the automatic resource leveler is capable of.

We went back to an earlier version of our project file with all of the overallocated resources still in place and ran the automatic leveler. This time, it had a *dramatic* effect on our overall schedule. Whereas with our own adjustments and fixes the end date of our project shrunk from December 2nd, 2024, to November 21st, 2024, the automatic leveler had ballooned the length of the project all the way out to June 2nd, 2025!

Comparing our solution to the automatic leveler's solution for the same problem in our schedule demonstrates some of the reasons for this outcome. Shown below are the original problem, the automatic leveler's solution, and our solution.

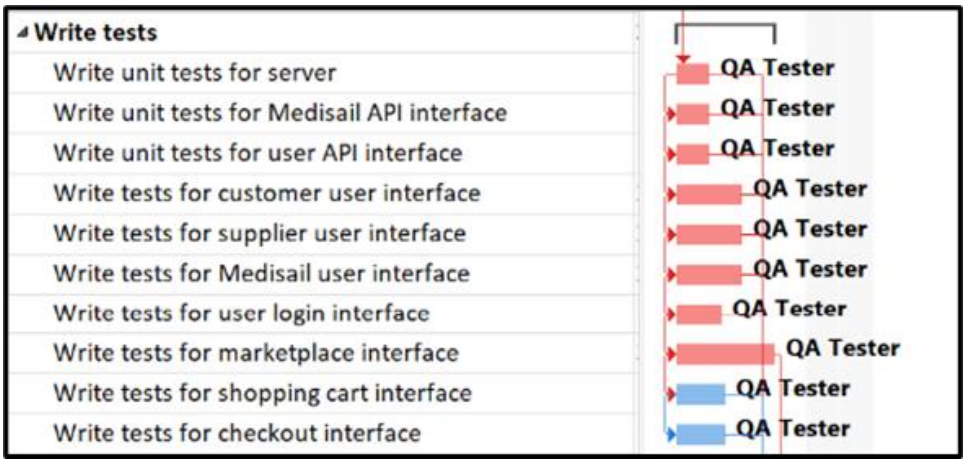

Figure 11 QA Tester is Overallocated

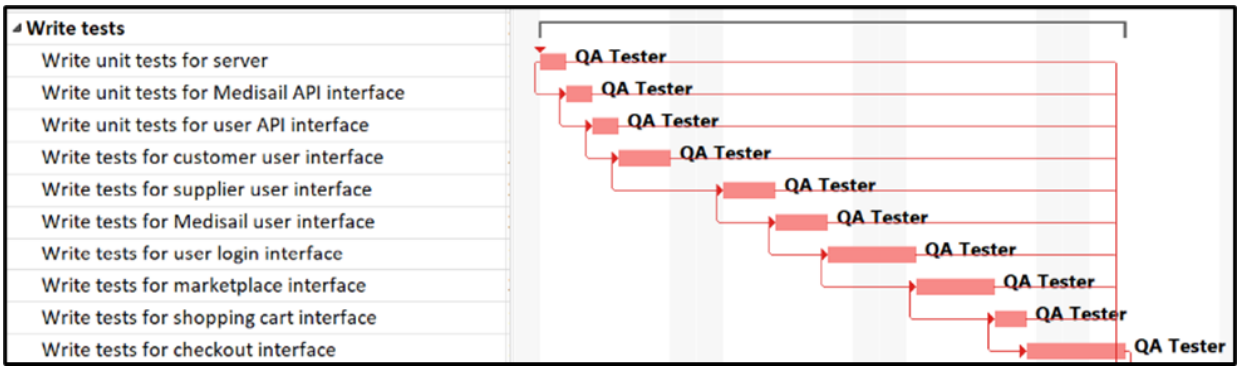

Figure 12 Automatic Leveler Solution

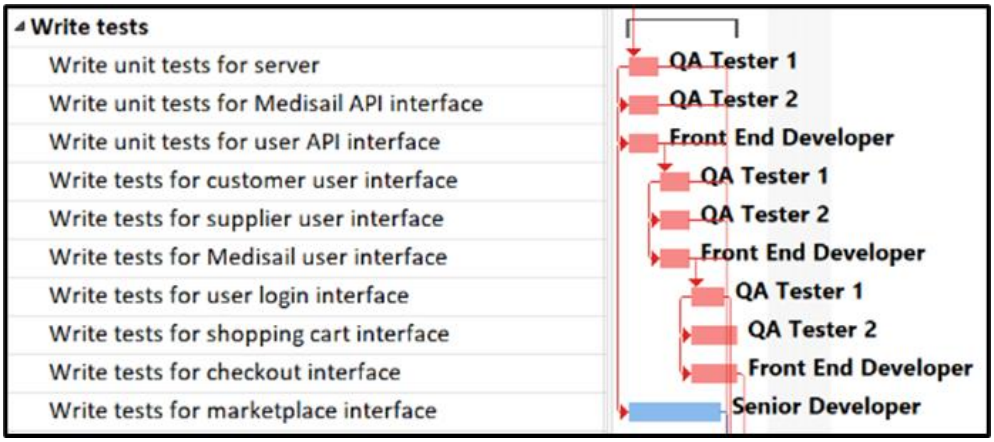

Figure 13: Our Solution

3.3.1 Why Did This Happen?

Microsoft Project's resource leveler will not make changes to the resources allocated for each task. This meant that it had to limit itself to our original lone QA Tester accomplishing all ten of the given tasks. This resulted in all ten tasks being done in sequence rather than in parallel as we had originally planned. Our analysis of the problem uncovered the availability of the front-end developer and the senior developer to aid in the completion of these tasks. We also recognized the recurrence of this scenario several times throughout the project which helped justify the hiring of an additional QA Tester. In the end, we were able to accomplish all ten tasks without sacrificing much of the parallel execution and with only a small impact on our overall finish date.

3.4 Manual Resource Reallocation & Constraints

A final review of the project schedule was conducted to ensure several things:

- That large gaps did not exist in the schedules of any given resource.
    - The team member with the most noticeable gaps was our sales manager. This resource went unused from November 10th – February 5th (61 days), again from March 20th – June 4th (55 days), and again from July 1st – September 19th (57 days). The sales manager operates in spurts at the end of each deployment cycle as a liaison between Medisail and our customers. We felt it was unreasonable to expect them to participate in the coding of the system. We therefore treated the sales manager more as a consultant and were careful to keep them busy for the periods of time they are on the schedule.

- That large tasks were divided among resources rather than falling entirely on one team member.
    - Microsoft Project's task usage view showed that we had done a good job of distributing the load of our most labor-intensive tasks. The one exception to this was that the sales manager was often left alone to complete their tasks. We felt this fell in line with their role as a consultant.
- That the need for overtime pay be limited or eliminated.
    - We were careful throughout the development of our schedule to ensure that no resource was utilized at more than 100%

Examining the schedule using the team planner view uncovered the fact that the documentation tasks for the second and third deployment had been left unassigned. These, (along with the initial phase documentation), were good ways to further use the skills of the sales manager in designing well-formatted, user-friendly documentation.

3.4.1 Time Removed from the Schedule

Our effort to further streamline the Medisail production schedule yielded a time savings of only seven business days (from December 2nd to November 21st). However, this was not a disappointment considering the effort that had gone into streamlining the first draft of the schedule. In our case, the redistribution and overlapping of tasks served more to eliminate our 140 instances of resource overallocation than to reduce the overall time of the project.

3.5 Resource Utilization & Implications

While reviewing the original schedule planned by Medisail, it became clear that there were many areas that there were many aspects of scheduling that could be optimized. Medisail believes that an optimized schedule with overlapping tasks, a leveled plan, and manually adjusted tasks are tantamount to the overall success of the planned e-procurement software. Furthermore, Medisail is acutely aware that each change made to the schedule could greatly impact on the overall success of the planned project. Any failure to optimize the schedule could lead to unused time in the workflow, which imminently threatens the project with a myriad of issues from longer development time to increased project cost.

Keeping this in mind, Medisail Solutions plans to accomplish a range of tasks over a period of 484 days. Each task is planned around an eight-hour workday, with Monday through Friday being the standard work week. This will exclude major holidays, such as religious or national celebrations. However, it is expected that any team member informs the Project Manager about any relevant holiday other than national celebrations. While the overall maintenance of the leveled version of the Microsoft Project schedule is the responsibility of the Project Manager, it will be available for all team members to reference and review despite their position within Medisail. Medisail believes this to be a pertinent course of action because it recognizes the fact that the plan and resources utilization impacts the final budget of the planned project.

Therefore, the budget of $276,775 for overall labor shall encompass all eligible days of work among qualified approved workers. However, it is important to note that the approved workers will only be paid for the expected period, and any alteration to this projected schedule will ultimately need approval from the Project Manager. Any option for overtime will need explicit approval from the Project Manager, with the understanding that this will increase the overall cost of the project. However, Medisail Solutions believes that by following the planned schedule it has adequately allocated the required time to complete this project without the need for overtime.

4 Financial Analysis

The financial analysis of Medisail's e-procurement system project can be found in the attached spreadsheet titled "Financial Analysis.xlxs". The spreadsheet contains tabs corresponding to the items below.

In the spreadsheet tabs containing work breakdown structure items, items highlighted in blue with white text denote project phases. Bolded items in black text denote subcategories of phases. The items not bolded and in black text denote low-level project tasks.

In each of the tabs, some columns used in the calculations are hidden for readability but can be viewed by unhiding all the columns in the sheet.

4.1 Labor Cost Estimate and Total Cost of Ownership

4.1.1 Labor Cost Estimate

The labor cost estimate of Medisail's e-procurement system is calculated in the first tab of the attached Excel spreadsheet titled "Labor Cost Estimate".

While not specifically required, the total labor cost estimate of the project is needed in the calculation of the total cost of ownership calculation. The labor cost estimate was calculated using Medisail's previous low-level work breakdown structure. In the work breakdown structure, the number of hours required by each employee to complete each task was recorded. Using hourly rates in the "Resources" tab, an estimated labor cost for each task was calculated by multiplying the hourly rate for a given employee or multiple employees to complete a task by the number of hours required to complete that task per employee. The sum of estimated labor costs per task was calculated for subcategories of a phase, and total phase labor cost estimates were calculated by summing each subcategory of a phase.

The same calculation was performed for the estimated duration of a task, subcategory of a phase, and phase in hours. Estimated days were derived by dividing estimated hours by 8, assuming an eight-hour workday for employees. Estimated days in this calculation do not account for weekends or holidays.

The hourly rates and daily rates were calculated a bit differently. The hourly rate per task was calculated similarly to previous calculations, but the hourly rate per subcategory and phase was calculated as an average of task hourly rate and subcategory hourly rate, respectively. The daily rate was calculated by dividing the hourly rate for each item by 8, assuming an eight-hour workday, and maintains the integrity of average calculations for subcategories and phases.

At the bottom of the spreadsheet, labor cost estimate totals were calculated. The total labor cost estimate for the project is $307,967.00. This includes a total of 6,197 hours worked by various Medisail employees and a total of just under 774 days worked (which does not account for the overlapping work time of individual employees. For the total length of time accounting for overlapping worked time of individual employees according to the project plan, please refer to Section 3.). The average hourly rate for the project is $53.63 and the average daily rate for the project is $429.03.

4.1.2 Total Cost of Ownership

Total cost of ownership of the e-procurement system was derived by accounting for direct labor and indirect costs of developing and supporting the e-procurement system over a period of five years and is in the second tab of the Excel spreadsheet titled “Total Cost of Ownership”. All costs were calculated conservatively based on the system and industry averages.

4.1.2.1 TCO Costs Rationale

Tableau yearly license fees are based on the mid-tier Tableau enterprise subscription fee of $42 per month. Oracle DBMS yearly license fees are based on the yearly standard enterprise Oracle database management system subscription fee of $950. Yearly data center rental fees are derived from estimates from the University of California Santa Barbara and are based on the use of four CPUs, 128GB RAM, 100TB of standard storage, and 2TB of high-tier storage. None of these three yearly fees are expected to change within the first five years of the project’s life because of contracts with the data center and licensing companies, so these costs are constant for years 0-5.

Product maintenance costs begin in the first year after development. Because of the iterative nature of the project's development, maintenance costs should be limited to updates for new browser versions and bug fixes. Because of this, yearly maintenance costs are constant at $40,000 during years 1-5.

System use training includes activities related to training customers and suppliers on how to effectively use the system. Because system training tasks are already represented in the labor cost estimate via the low-level work breakdown structure and are essential to the development of the product, the additional year 0 system use training cost is $0. For the rest of the 5-year life of the project, system use training will start at $40,000 in year 1 and decrease to $5,000 in year 5 as customers in the market become more familiar with the product.

System enhancements and upgrades costs differ from product maintenance costs because they comprise costs related to improvements to the system. These costs are justified by Medisail's desire to remain the premier provider of e-procurement services to small medical clinics, which will be accomplished by improving the product wherever possible. System enhancement and upgrade costs are not applicable in year 0 and are budgeted at a constant $111,548.21 in years 1-5. This amount was chosen to represent the equivalent the salary of one full-time employee who worked on the project, as determined by the average $53.63 hourly rate for the project in the Labor Cost Estimate, multiplied by eight hours and 260 working days in a year. While there will not be a dedicated employee working on system enhancements, Medisail expects one employee to be always working on enhancements to the system during the life of the product.

System downtime costs include all costs related to events where the system is unavailable for customer use. While this is a significant risk to the success of the project after final deployment, the likelihood of such an event is low because of insurance and redundancy provided by the data center and Medisail's commitment to reserving a developer to always monitor and correct a single point of failure event. Consequently, system downtime is estimated to be a conservative 5% of the total time the system runs. Medisail estimates that 10,000 customers will use the system by the end of year 0, and conservatively estimates an increase in users by 20%, 30%, 35%, 15%, and 10% in subsequent years respectively for this calculation. Assuming most customers will purchase the Tier 1 subscription (the lowest cost tier), system downtime costs were calculated by multiplying the annualized Tier 1 fee by the total estimated customers each year, then multiplying these totals by the 5% likelihood of system downtime. While conservative, this calculation does not account for user attrition.

Technical support in year 0 will be handled by the Sales Manager and is accounted for in the labor cost estimate. In years 1-5, a full-time Technical Support Specialist will be hired at $26 per hour. The total technical support cost in years 1-5 starts at $52,000 per year and increases by 2% per year to account for inflationary raises.

Distribution contracts are estimated to cost an average of 7% of total revenue according to industry averages. While the amount of Medisail customers was estimated to increase significantly in the system downtime estimate, increases in the user base of the product for revenue projections is much more conservative at an increase of 10% per year in years 2-5. Yearly distribution contract expenses were calculated by multiplying expected revenue by 7% in years 1-5 and calculated as half of the cost of year 1 in year 0.

The sum of these indirect costs after year 5 equals $3,336,857.40.

4.1.3 Calculation of the Overhead Multiplier

The total cost of ownership was calculated by adding the sum of all indirect costs with the total labor cost estimate, which is $3,644,824.40. To derive the overhead multiplier from the total cost of ownership, the sum of all indirect costs was divided by the sum of direct labor costs. The overhead for the project is 1.108.

4.2 Project Cost Breakdown

The project cost breakdown is calculated in the third tab of the attached Excel spreadsheet titled “Project Software Cost”. At the bottom of the sheet, a summary of the project cost breakdown by phase is available.

The project cost breakdown builds on the labor cost estimate by accounting for overhead expenses using the overhead multiplier from the total cost of ownership tab and calculates the percentage that each task, subcategory, and phase makes of the total. The Development Cost with Overhead column was calculated by multiplying each task, subcategory, or phase by the overhead multiplier, 1.108. As in the labor cost estimate, subcategory and phase rows represent the total development cost with overhead. Total development cost with overhead for the project was calculated to be $341,335.57.

The project cost breakdown also provides a percentage breakdown of cost for each phase, subcategory, and task. This was calculated as a percentage of each phase in one column and as a percentage of the project's total cost in the next column.

4.2.1 Insights from the Project Cost Breakdown

The project cost breakdown provides many important insights about the cost of the project that may be presented to decision-making stakeholders, especially in the event of a need for cost reduction, schedule reallocation, or shareholder reports.

4.2.2 Insights from Percent Total of Project Cost

While Release 1 and Release 3 each comprise roughly one third of the total cost of the project, Release 2 accounts for about 23% of the total cost. Because Release 2 undergoes the same pre-development analysis activities, testing, and deployment tasks as the other release phases, this difference in cost is attributed to the reduction of new content of the product in the release. Stakeholders might make the decision to move some development tasks from Release 1 or Release 3 into Release 2 because of this.

Another important insight comes from the percentage of each release phase that is dedicated to testing. Release 1 dedicates about 63% of its total phase cost to testing, Release 2 dedicates about 60%, and Release 3 dedicates about 52%. While each development phase includes tasks that thoroughly test the software, this statistic shows that the project planning accounted for solid software development practices that comprehensively test prior releases before moving onto development of the next release.

However, these insights from project cost are constrained by the fact that overhead costs are spread equally across all phases. While the Oracle DBMS license must be purchased before the first release is developed and is needed throughout the life of the project, the Tableau yearly license is not needed until development of the third release begins. The Tableau license is included in indirect costs and thus spread across all phases, which artificially deflates the reported total costs including overhead of the Release 3 phase and beyond compared to prior phases. Likewise, system use training is not accounted for in year 0 in the Total Cost of Ownership because it is accounted for in the labor cost estimate but is used in the calculation of the overhead multiplier and thus included

in the total cost of the project with overhead. This is a limitation of the calculation of total overhead, and while its effect on the total cost of the project with overhead is small, it still exists.

4.2.3 Insights from Daily and Hourly Rates

The daily and hourly rate calculations are especially insightful because they normalize the differences in cost for phases and subcategories based on the type of labor they require, ignoring time. For example, the daily rates of the three release phases are almost equal, while the daily rate of the Pre-Development Activities and the End of Project Activities phases are almost $100 more expensive, likely due to the high hourly rates of the Sales Manager and Project Manager who are more prominently involved with these phases. If Medisail realizes a need for cost reduction, looking at these average rates may be beneficial.

4.2.4 Other Insights

The Pre-Development Activities phase is the least expensive phase, while the Release 3 phase is the most expensive phase. The Pre-Development Activities phase and the End of Project Activities phase account for about 10% of the total project cost, while the three release phases account for about 90% of the total project cost. This is also reflected in the total hours required to complete the pre- and post- development phases versus the release phases: 511 hours and 6,197 hours respectively. While the cost and hours required for the pre- and post-development phases are less than the release phases, their average hourly rates are more expensive at $60.71 and $53.63 respectively.

4.3 Project Benefits

The project's benefits are calculated in the fourth tab of the attached Excel spreadsheet titled "Project Benefits". This sheet compiles the benefits derived from developing the e-procurement system.

The first benefit is the increased revenue that Medisail will realize from the launch of the e-procurement system. Projected revenue in year 1 was calculated by multiplying the target user base by the end of the first quarter of development by the annualized cost of the least expensive e-procurement subscription tier, Tier 1. For each subsequent year, the expected revenue is increased by 10%, assuming a 10% increase in the users per year. While Medisail hopes that user growth

will exceed 10% per year and that users will purchase the second and third tier of the product, this calculation uses conservative projections and totals $5,860,896.00 after five years.

The second benefit is the positive financial effect that the release of the e-procurement system will have on other operating areas of the company. While Medisail intends to pivot its focus from its current operating areas to focus entirely on the e-procurement system, this will take a significant amount of time and existing products will not cease to exist when the e-procurement product is launched. This calculation estimates that revenue from existing products, which is currently $100,000 per year, will increase by 5% each year. The additional revenue from other Medisail products because of the release of the e-procurement project totals $27, 628.16 at the end of year 5.

The final benefit is the additional revenue that will be realized when customers of the e-procurement system upgrade the tier of their subscription. This benefit conservatively assumes that 5% of users will upgrade their subscription each year, half of whom will increase to Tier 2 and half of whom will increase to Tier 3. This benefit was calculated by assuming a user base of 10,000 customers at the end of year 0 which increases by 5% each year, multiplied by the average of the annualized subscription fee of Tiers 2 and 3, multiplied by an increase of 5% in new upper-tier users per year. To remain conservative, this calculation begins in year 2. The additional revenue from subscription upgrades totals $235,332.83 after five years.

Unlike other projects, the e-procurement system does not generate internal benefits for Medisail other than increased revenue directly from the new product and from brand exposure related to the new product's use, such as decreased costs for Medisail due to efficiencies created by the product internally. The total value of business benefits after 5 years is calculated at the bottom of the sheet and equals $6,123,856.98.

4.4 Financial Feasibility Analysis

The financial feasibility analysis is calculated in the fifth tab of the attached Excel spreadsheet titled "Financial Feasibility Analysis". This sheet calculates several important financial metrics, including project cash flows for years 0-5, total return on investment, payback period, and net present value.

4.4.1 Cost Benefit Analysis (Project Cash Flows)

In the cost benefit analysis, project benefit and project cost totals were taken from the calculations done in the "Total Cost of Ownership" and "Business Benefits" sheets. For each of years 0-5, project costs were subtracted from project benefits to determine cash flow in each year per the following formula:

$$Cash\ Flow\ of\ year\ X\ = Benefits\ in\ year\ X\ - Total\ costs\ in\ year\ X$$

The cumulative cash flow of the project after five years was calculated as $2,137,697.01.

4.4.2 Return on Investment

The project's return on investment was calculated by dividing the project's benefits by the project's total costs for years 0-5 per the following formula:

$$ROI\ = \Sigma \frac{Benefits\ in\ year\ X}{Total\ costs\ in\ year\ X}$$

The projected total return on the investment for the project is 53.63%.

4.4.3 Payback Period

The year of the project's payback period was determined by when the project's cumulative cash flow will become positive, which is projected to be sometime during the third year which is when the project breaks even. To determine the ratio of the third year to be included in the payback period, the unrecovered costs in the second year were divided by the cumulative cash flow in year 3. The projected total payback period is 2.03 years.

4.4.4 Net Present Value

To determine the net present value of the project, the discount rate was calculated by adding the risk-free rate and the risk premium of the project. As of November 17, 2023, the risk-free rate of the 10-year US Treasury was 4.44%. The risk premium of the project is based on several factors. First, after the development of the e-procurement project is completed, Medisail plans to pivot its entire business to supporting and growing the product. This presents a significant risk to the company if the e-procurement project fails. Second, while Medisail has thoroughly researched the target demographic and associated logistics considerations, the nature of remote customers also presents a risk. Finally, none of the previous calculations accounted for user attrition. If other companies create a similar product at a lower cost or with more capabilities, user attrition might occur. Because of these factors, the risk premium is set to a conservative 20%, and the total discount rate for the project is 24.44%.

Present value per year was then calculated by taking the cash flow of a given year and discounting it by the discount rate for that year by following this formula:

$$PV\ of\ year\ X\ =\ \frac{Cash\ flow\ in\ year\ X}{(1\ +\ discount\ rate)^X}$$

The sum of the present values of years 0-5 was then added to arrive at the project's net present value of $611,392.74.

Additionally, the internal rate of return was calculated. The internal rate of return is the discount rate at which the net present value becomes equal to zero and is the highest discount rate at which a project should be accepted. The internal rate of return for the e-procurement project is 49.37%.

4.4.5 Insights from the Financial Analysis

All the financial calculations used in the financial analysis indicate that the project is viable and that Medisail should proceed with planning and development.

The return on investment is positive in the first year of the project's life and very high at the conclusion of the project's projected five-year lifetime. For any project, a positive net present value indicates that a company should accept a project. While there is some ambiguity in the calculation of the project's risk premium, the internal rate of return indicates that this ambiguity is negligible as the risk premium can increase to almost 50% while still generating a positive net present value with the same cash flows and risk-free rate.

5 Project Evaluation and Summary

5.1 Main Points of Comprehensive Project Plan

Our main points of the project plan are broken down into 3 main sections; Business Operation Changes, Time & Cost, and Benefits & Risks each of which are detailed below.

5.1.1 Business Operation Changes

Medisail Solution's long-term goal is to create a more reliable e-procurement system by offering opportunities for low-cost medical supplies and a custom service for smaller medical practices. In this effort, Medisail envisions a scenario where it is a premiere service for smaller institutions that offers a mutual marketplace for both suppliers and medical practices. Furthermore, Medisail wishes to design this marketplace to be a symbiotic union between these two entities. By offering a three-tiered subscription service Medisail will offer its clients the ability to customize their experience with its e-procurement system, which will provide major cost-savings. With these cost savings and the efficiency of the software system, Medisail believes it will empower customers to offer better healthcare to its own patients, bettering the lives of many Americans in underserved areas.

To accomplish this goal, business operations must be customized to successfully implement the new e-procurement system. As outlined in Assignments 1 and 2, Medisail differs from many of its present competitors which benefit major medical institutions such as large hospitals in cities, who generally have larger disposable expenditures. Instead, Medisail Solutions will implement a marketplace where smaller medical practitioners can browse a large range of medical supplies from multiple suppliers in one place. Furthermore, Medisail plans on incentivizing suppliers into using its marketplace, by allowing suppliers to post their own medical supplies with their own prices onto Medisail's marketplace. This freedom to post medical goods will promote a healthy competitive marketplace, where smaller medical practices will be able to focus on purchasing exactly what they need at a price that fits their budget.

5.1.2 Time & Cost

The process of implementing Medisail Solutions will require a substantial investment in both human resources and planning. Presently Medisail has five planned development phases, consisting of three major releases. These phases are: "pre-development activities", "release one –

core system", "release two – integrated system", "release three – advanced system", and lastly "end of project activities". While release one will implement the core of Medisail's base functionality, release two and three will add major new features that will continue to improve the overall system's capability and enhance user experience. While planning each development phase, and consequent releases, Medisail identified that the total time for full system deployment will be approximately 16 ¼ months (484 business days), with the core functionality of "release one" taking 78 of those days. Medisail recognizes that any significant amount of development time, will mean an increase in total development cost in dollar value. In this understanding, Medisail has identified the current total cost of the labor including overhead needed for the full deployment to be $307,967. An in-depth calculation of these costs can be found in "Financial Analysis.xlxs".

5.1.3 Benefits & Risks

While considering the total cost for a full deployment of Medisail's new e-procurement system, there are clear benefits validating the need for its creation. Presently, it is known that Medisail's main competitors operate in a market that highly benefits larger medical institutions with larger sums of funds. Larger expenditure capabilities have inadvertently morphed the current market to highly favor large bulk orders of medical goods. Consequently, this has ostracized many smaller medical practices, who have smaller available funds, from taking full advantage of e-procurement systems. Instead of shopping in one marketplace from one e-procurement service, smaller medical practitioners are forced to shop over a series of services to find the lowest cost for medical supplies. Medisail aims to be the premiere solution for this current trend that offers a range of benefits for smaller practices.

Firstly, Medisail aims at providing a service where smaller medical institutions can shop for all their medical supply needs at the lowest cost on one e-procurement software. By doing so, Medisail expects to increase smaller medical institutions' access to low-cost medical goods by 25% within the first year of operation, and 50% by the second year of operation. Consequently, Medisail Solutions expects to receive an increasing majority of business from smaller medical practices, giving Medisail a clear advantage over its competitors with an active user count of 10,000 in the first year, and an expected revenue of $500,000 by the end of the second year. Secondly, by offering low-cost options for medical supplies, Medisail expects a surge of new users looking for a more customizable approach to acquiring business critical resources. Consequently, Medisail expects to attain 10,000 new users within the first year of operation, who had previously been shopping with Medisail's competitors. Lastly, Medisail believes a major benefit for using their service is an overall increase in access to medical care for under serviced Americans in communities such as rural ones. The CDC reports that 18% of Americans living in smaller communities lack access to adequate medical care. Medisail expects that its services will not only be profitable, but also impactful for Americans living in these smaller communities. By offering low-cost options for smaller medical practitioners, Medisail expects that 5% of these underserved Americans will expect better access to medical care from their local medical practices within the first year, with an aim at increasing this to 10% by the second year. If Medisail can retain users, remain profitable, and improve the lives of everyday Americans, Medisail believes the deployment of its services are a worthy endeavor.

In addition to exploring the benefits of employing Medisail Solutions in the current market, it is also important to explore some of the major risks that Medisail will face during its journey from inception to deployment. Firstly, the direst risk to Medisail Solution's continued existence is a lack of customer satisfaction with its services. If customer dissatisfaction is at a high level, Medisail risks its new users reverting to the old model of using multiple e-procurement software systems to find the best deal on medical supplies. If this trend continues, it will either increase the overall cost to fix Medisail's services or put it in an unrecoverable scenario. Secondly, the next biggest risk to Medisail is a delay in development. Presently, Medisail has a high development cost, and any delay in the scheduling could increase that overall cost. This may contribute to an erosion of trust between developers and investors, and this would significantly impact the future of Medisail. Thirdly, another major risk to Medisail would be a nationwide increase in medical supply costs. While Medisail Solutions believes that our suppliers would post low-cost good in a competitive market, it would be detrimental to overall business operations if there was a national hike in supply prices. Lastly, another major threat to Medisail's overall business is saturation in the future market with similar e-procurement software for medical goods acquisition. As stated in the benefits, Medisail will have a head start in this market, however it is inevitable that other e-procurement solutions will begin specializing in servicing smaller practices. If Medisail struggles with any of the previous risks coupled with new competition, Medisail may find itself in a risky situation for future operation.

5.2 Evaluating & Reporting Progress

During each development phase, Medisail shall institute a daily "stand up" meeting, which shall be hosted by the senior developers and attended by both the Frontend, Backend, and Junior Developers. This meeting will last only fifteen minutes, and its overarching goal is to give all developers a chance to bring up and discuss their current work and known issues. This should have a two-fold effect on the development of Medisail. Firstly, it allows senior staff to hear directly from their chosen team leaders, and team members, which should greatly increase the confidence of every Medisail developer. Secondly, it will assist senior staff in validating the system being developed is being done so to the specifications of the written requirements.

In addition to "stand up" meetings, there will be a weekly meeting amongst different senior staff members and the IT Manager, which will include a detailed report on many technical aspects of development. Firstly, every week the Senior Developer will compile a report on updates on development, which includes a discussion on the relevant issues brought up in the "stand up" meetings and technical observations of the current development cycle. Secondly, the Database Administrator will be responsible for reporting on updates, issues, and features of the database Medisail will use. Thirdly, Quality Assurance Testers will give an account of software testing and their results. Lastly, the System Administrator is responsible for detailing technical updates and issues with the growing hardware infrastructure. The overarching goal is to facilitate a reoccurring meeting of high-level management throughout each development phase of Medisail. Furthermore, these meetings offer a chance for the IT Manager to set goals for upcoming weeks, as well as giving them an opportunity to discuss known issues with other high-level managers.

The final meeting format for Medisail Solutions will be the "weekly issues review" meeting, which will include the IT Manager and the Project Manager. This meeting will be the highest level of

meeting between two of the most experienced senior staff. In this meeting, the IT manager and the Project Manager will discuss information about scheduling, technical issues, and relevant information from the weekly stand up meeting, and the weekly status reports. By doing so, Medisail Solutions feel confident that any scheduling or higher-level issues can be addressed quickly, and efficiently on a weekly basis.

5.3 Recommendations for the Project

The detailed benefits of developing and implementing Medisail's e-procurement system outweigh the risks involved with its deployment. Developing Medisail's e-procurement system would not only be advantageous to investors, but also create a more symbiotic relationship between smaller medical institutions and their access to low-cost medical supplies. Not only that, but Medisail Solutions has a tangible ambition to better the lives of Americans living in underserved communities, such as rural. It is the present recommendation of the Project Manager and the senior staff that Medisail Solution is given the green light for immediate development. It is calculated that the labor for creating this system will cost $307,967 over 484 days to finish its planned five development phases. Keeping this in mind, Medisail Solutions expects 10,000 new users in the first year and revenue of $500,000 in sales by the second year. Additionally, the financial analysis indicates that the project will be financially beneficial and viable. While there are many clear benefits to developing Medisail's e-procurement software, there are risks involved. Chiefly among these risks, is customer dissatisfaction with Medisail's system. The second greatest threat to success would be a significant delay in development, which would increase the initial cost of deployment. Lastly, a saturation of similar e-procurement services would threaten the overall viability of Medisail's e-procurement services. However, with these critical issues outlined, it is the belief that Medisail's benefits clearly outweigh their risks and the project should proceed with the adjusted plan outlined in previous sections.