### Assignment 4 - Resourced Project Plan with Leveled Schedule, Budget, And Project Evaluation

SE 638: Software Project Management

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### Work Summary

Each team member researched each question individually before meeting up to share their findings. After debating and gathering insight for each question, the parts were divided equally between team members. The team met twice to assign sections and perform a group review.

Shaima Albugami

* Section 1.2 – Phase 2 Overlapping tasks
* Section 1.3 - Level the plan
* Section 2.2 - Total cost of ownership
* Section 3.2 - How the project would evaluate and report progress

Michelle Ibarra

* Section 1.2 – Pre-Development Overlapping tasks
* Section 2.4 - Present a return on investment analysis (a cost-benefit analysis)
  + Clinic Staff schedule, Profit and Loss (Before), Profit and Loss (After), Benefit, and Cost-Benefit worksheets.
* Section 3.1 - Summarize the main points of the project plan across all assignments

Steven Greulich

* Section 1.1 - (Re)sequence the plan around allocation of human resource to tasks
* Section 1.2 - Phase 1
* Section 1.4
* Section 2.1

Yiyun Zhang

* Section 1.2 - Phase 3 Overlapping tasks
* Section 2.3 - Quantify project benefits
* Section 3.3 - Recommendation

## 1. Produce a resource plan and a leveled plan schedule that has minimal resource under-utilization and no over-utilization of resources

### 1.1 (Re)sequence the plan around allocation of human resource to tasks, planning at least two streams of parallel activity where possible

When the project plan was initially being developed, there were assumptions made regarding the staffing of the project. The original plan was to develop each module in sequential order and not commence the start of the next module until all the tasks from the previous module was complete. In addition, the development was going to be done by one front end development resource and one backend resource. However, after consideration, we have added a few more resources to the project, mainly a resource trainer, an additional business analyst, an additional back end developer and an additional technical architect. The reasoning for the resource trainer, was that we wanted to have one of the medical staff create the training and perform the training to the staff. With the original plan, there were a lot of dependencies on the sole medical staff resource doing both the testing and the training development. To move tasks up, we needed to add in a resource so that we could have these tasks run in parallel.

In terms of the secondary business analyst, we saw that there was some delay in starting the client app related tasks due to that same business analyst working on the back-end requirements first. To move up the client app related tasks to run in parallel with the back end, we added in a second business analyst. The first analyst would primarily be working on the back-end requirements whereas the second analyst would be working on the client app requirements. In the ongoing theme of being able to run more tasks in parallel, the same thought approach was taken when adding a second technical architect and second back-end developer. By adding in these additional resources, we were able to move up more tasks to run in parallel.

### 1.2 Allow Some Overlap between tasks

There are many roles required for supporting the overall design and development of the Philadelphia Medical Group System. The Pre-Development phase includes work to prepare the team for the regular design and development work in numbered phases, Phase 1, 2, and 3. During the Pre-development phase, the Business Analysts will begin to gather high-level business requirements for the project. This work is done so that the Business Analysts can prioritize the requirements elicitation for the subsequent numbered phases. The subsequent numbered phases will include more in-depth requirements elicitation based of the priorities of the client. While the Business Analysts gather these high-level business requirements, the Project Manager will begin to assess and create a Project Schedule. This Project Schedule will document the work sequence or parallel efforts that could be taken to deliver the Philadelphia Medical Group System. As the project continues from the Pre-Development phase into the Phase 1, 2, and 3, it will be the Project Manager’s responsibility to modify and adjust the Project Schedule to provide the client and team a projection of getting the work done. Moreover, in the Pre-Development phase, there is a need setup the infrastructure which support the development, building, testing, deployment, and hosting of the system. While the high-level business requirements and Project Schedule are being defined documented, the technical team will be occupied in setting up the system’s infrastructure. The technical team includes the Technical Architect, Infrastructure Engineer, Database Administrator, Front and Back-end Developers, Performance Tester, Security Vulnerability Assessor, and Automation Tester. The technical team can setup the foundational infrastructure in Pre-Development phase so that the technical team can utilize the infrastructure delivering software in the subsequent numbered Phases. Adjustments to the infrastructure, such as deployment into production environments, can be made in Phase 1 when the team is ready to go live with the system.

Originally, we had Phase 2 start when all the Phase 1 tasks were completed. This same logic was applied to Phase 3 as well. However, what we realized, was that there was a lot of idle time for the development team and the business analysts when the final tasks of the previous phase were still being executed. To maximize resource utilization as much as possible, we started kicking off the next phases tasks wherever possible. For instance, we started the requirements elicitation and design work for the REST APIs and the Client App while such things as performance testing, user training and user testing was still in progress. In terms of the database administrator, we had the resource continuously move throughout the phases doing their installations and testing. We did not see a need to keep the resource on standby and only use them for a few hours every phase. There was not a need to bring them in full time for the entire duration of the project. For the development team, we realized that if we added in an extra backend developer, we would be able start subsequent development phases in terms of the backend sooner. However, this was not the same case for the front-end development. Due to the longer lead time to start development due to the user interface design sessions, there was not a need currently to add in an extra front-end developer.

Besides overlap allowance between phases, there are some overlapping of that exist during the module development of each single phase. In general, there are three logic rules we applied on each module development: firstly, database management system development is overlapped with REST API Service Server development, since the database admin does not participate in any REST API Service Server activities and vice versa. Secondly, the start date of the next module is overlapped with the previous module’s testing since the front-end developer and quality assurance personnel are not involved in the initial stages of the module development. Thirdly, the assessment, testing and deployment of each phase are overlapped with next phase’s early module development, since the related personnel quality assurance, client resource, client trainer and project manager does not participate in any development activities.

### 1.3 Level the Plan

Creating the resource sheet helped us assign resources to each task on our plan. Each task had the resources needed presented in the same row. This helped us visualize the plan, along with the resources needed. In addition, it helped us recognize which tasks needed more resources and where the tasks can be used concurrently. In this section, we leveled the plan based on the resources available. We noticed that we had over allocations in our plan. The overallocation happened because of the unavailability of resources and the use of resources on more than one task in the same duration of time.

To solve overallocation, we used the leveling of the plan feature on the Microsoft project. This feature adjusted the duration of our task assignments to avoid overallocation. It delayed the finish date of some of our tasks by delaying the lower priority tasks. This resulted in a delay in our project end date. Our project's original end date was on 6/17/2022, and the updated end date is on 6/22/2022. This feature adjusted our plan in seconds and removed overallocation. It gave us a more realistic project plan but delayed our end date.

### 1.4 Manually adjust tasks on either the original plan, or the leveled plan to balance resource utilization with reducing project duration

During evaluation of the team planner, we noticed that the architect was a victim of overallocation. When we leveled the resource plan, we saw that there was a need to bring in another resource to help offset some of the architect's tasks. In addition, we were able to move some of the tasks originally slated for the architect, to the project manager. Primarily, the tasks that were re-assigned to the project manager from the architect were the go-live related tasks. While the architect may have some input, it would not require a steady load on the resource to keep it assigned to them.

In addition, we noticed that dependencies listed for the requirements sessions were originally planned off the resources assigned and not from the actual flow of the dependencies. By performing these optimization tasks, we were able to reduce the overall project timeline from 6/22/2022 to 4/26/2022. After the optimization was completed, we still saw some number of gaps for the resources within the project plan. This is due in part to the nature of the dependencies that are listed within the project flow. While an optimized plan is always strived for with little downtime for the resources, there will always be some sort of gaps in a schedule.

### 1.5 Briefly discuss your resource utilization and its implications for the project budget

When our group initially created the project estimates, resource plan and schedule, we determined 12 labor categories would be required and the project would take approximately 42 months. Inresequencing the plan around allocating human resources, our group recognized unconsidered needs regarding the estimated plan and human resources. These needs revolved around hiring and ensuring staff were productive towards supporting the development and implementation of the Philadelphia Medical Group System from the Pre-Development phase through Phase 3. This included using technical staff to plan and implement the infrastructure of the Philadelphia Medical Group System before Phase 1.

Moreover, our group identified the need to onboarding a Resource Trainer. The role of the Resource Trainer would be to training the primary users of the system, which are the primary Doctor, Nurse, and Office Admin staff. Not including a Resource Trainer was an oversight as this role would help our primary users successfully adopt the system. Furthermore, the resequencing highlighted the need for staffing an additional Business Analyst, Back-end Developer, Technical Architect. These three specific staff would be utilized to help increase the software development team’s capacity to cycle through the stages of requirements elicitation, development, and testing. The implications of planning to utilize the staff in the Pre-Development phase, adding a Resource Trainer, as well as the Business Analyst, Back-end Developer, and Technical Architect all benefit the project such that the system would be projected to be delivered in 42 months. However, the exchange for delivering the project in 42 months through adequately staffing the project, thus increasing the staff and the staff utilization, will increase the original estimated project budget to **a total of $1,873,216.78**. These updates to the human resources can be viewed in the **“SE638-Grp3-A4-Human Resources-Update.xlsx.”** The update in adding staff to the project and increasing the project’s estimated budget will need to be addressed to the Client to ensure the Client is in agreement with the recommendations on how to properly staff the project. Ultimately, the Client will need to approve the changes made as to house the resources are utilized and the impact to the project budget.

## 2. Prepare a financial analysis of your project

### 2.1 Produce a project cost breakdown

There were a few factors that went into the calculation of the labor costs. We have not included the cost of the internal labor (the Philadelphia medical staff for testing / training), as those were already existing costs to the organization. The labor costs shown in the chart below only factor in the additional costs as part of this project, mainly the outside consulting company that would be brought in to perform the work. In addition, since it would be a consulting organization that would be brought in, the project would only charge for resources as they are needed instead of hiring them full time.

In terms of the Project Manager, while this resource only had a few tasks assigned throughout the duration of the project, we allocated this person as a full-time resource for the duration of the project. This is due in part of while they do not have explicit tasks on the schedule, they will be ensuring that all of the tasks assigned to the other resources are being performed.

For the overhead costs of the consultants, I put in a factor of 30% to the hourly rate of each of the consultants. This would cover such things as benefits for the employee as well as some profit for the consulting company as well. While there was no clear percentage that is utilized for overhead, it could range from anything such as 25-30% (Square. (n.d.)) or even upwards of 40% (Quintana, C.).

**Note:** The breakdown of the Outside Consulting costs can be referenced from the **“SE638-Grp3-A4-Human Resources-Update.xlsx.”**

**Note:** The hardware and software costs came from the **“SE638\_Grp3\_Financial-Analysis.xlsx” Year 0 costs.**

|  |  |
| --- | --- |
| **Category** | **Amount (USD)** |
| Outside Consulting | $745,987.78 |
| Hardware | $40,180.00 |
| Software | $14,249.00 |
| **Total** | **$800,416.78** |
| Risk & Contingency (15%) \* | $120,062.52 |
| **Total with Risk & Contingency** | **$920,479.30** |

\*While we anticipate the total project costing $800,416.78, we are asking for a 15% contingency fund of $120,062.52 be set aside if it is needed due to unforeseen issues or changes.

### 2.2 Calculate the total cost of ownership (TCO) of the system

To calculate the total cost of ownership, we listed the components we need to implement the clinic system along with operations required in a span of five years. We also considered the clinic system's direct and indirect cost, and we accounted for any additional costs. We listed these costs based on four categories: hardware, software, support, and other costs. For the hardware section, we determined the servers' costs (main and backup server), data storage and backup, computers, printer, and routers. For the software, we estimated the license and the operating system costs. The training and support, and maintenance were listed under support. Other costs include the labor and the business process change costs. The prices listed are based on the typical costs of components installed in a small-sized clinic.

We took into consideration the quantity needed for these components. We listed the components we need, and we mentioned the quantity only if we needed more than one. For example: since we have a small clinic that has about six physicians, we had one printer and six desktop computers. For the labor cost, we looked up the average salary that the required roles cost and provided references in the reference section. We included the cost of analyzing the business process change and the required integration and upgrades to the new system. The total cost of ownership of the five years is $6,506,978.

### 2.3 Quantify a range of project benefits to assess whether a project is financially viable and (briefly) justify the basis for these figures

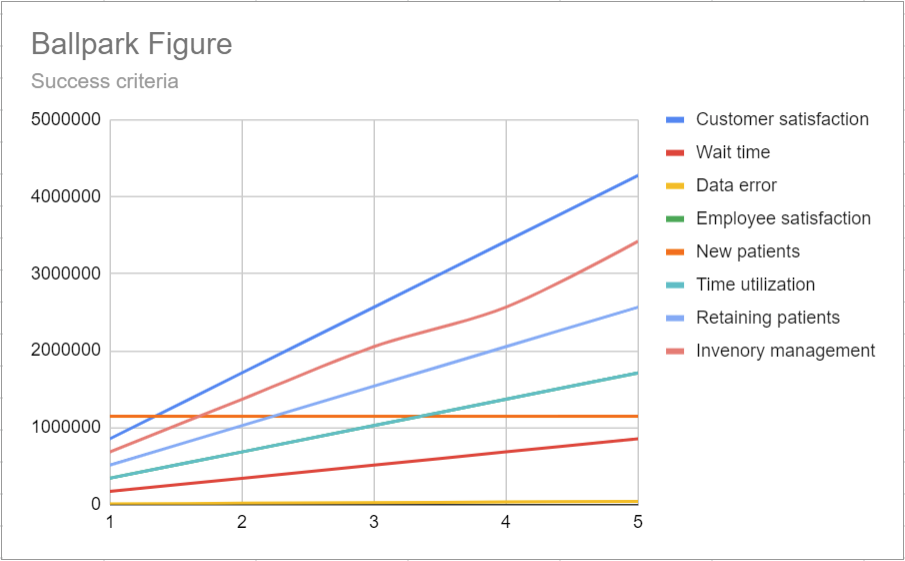


Figure 1

There are 8 success criteria proposed in our Business Scope & POS document. We are using them to quantify the range of project benefits. The Figure 1 is the Ballpark Figure of the POS success criteria that shows the actual result of the calculation of benefits. The first fact is the new system increase customer satisfaction 5% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The second fact is the scheduling module reduce the wait time, increase the benefit 1% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The third fact is the system reduce data error, it increases the benefit 0.05% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The fourth fact is the system increase employee satisfaction, it increases the benefit 2% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The fifth fact is increasing the new patient number; however, this is not a quantifiable fact: we cannot link it to any benefit indicator to calculation the actual benefit, the calculation of this benefit is based on the Profit and Loss data from the Profit and Loss data (Before) and Profit and Loss data (After) analysis. The sixth fact is the system utilizing the employees time, it increases 2% of the benefit over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The seventh fact is the retaining patients, it increases the benefit 3% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year. The last fact is the better inventory management, it increases the benefit 4% over 5 years, the calculation of this benefit is to multiply the turnover with the increment and increase the increment for each year.

### 2.4 Present a return on investment analysis (a cost-benefit analysis)

This section provides the cost-benefit analysis to developing and implementing the Philadelphia Medical Group System. To understand the cost-benefit of the system, it is necessary to document how the clinics operated before the system was implemented. Philadelphia Medical Group operates four clinics in the Greater Philadelphia area. Each clinic operates seven days a week, where staff are expected to work five days per week. On the peak day (Monday), each clinic is staffed with four doctors, two nurses, and two Office Admins. Then on Tuesdays through Fridays, each clinic is staffed with 3 doctors, two nurses, and two Office Admins. Also, on the weekends (Saturday and Sunday), each clinic is staffed with one doctor, one nurse, and one Office Admin. Without the system and working through manual paper processes, each Doctor can manage 12 appointments per day, where each appointment takes approximately 25 minutes. Out of an eight-hour workday, the Doctor’s appointments take up approximately 5 hours. The three-hours of the workday are used for office work (two-hours) and lunch (1-hour). This analysis assumes the schedule Doctor’s appointments are either a Physical, General or Sick Appointment. Also, this analysis assumes 42% of the appointments are Physical Appointments, 26% are the General Appointments, and 32% are Sick Appointments. The “Clinic Staff Schedule” worksheet from the "SE638\_Grp3\_Financial-Analysis.xlsx” calculates the total number of appointments the clinic has capacity to serve each week given the staff and time it takes for each appointment. Before the Philadelphia Medical Group System is implemented, each clinic can provide a capacity of 240 appointments per week.

The original Success Criteria from Assignment 1 to evaluate the benefits of the new Philadelphia Medical Group System. These Success Criteria are:

* Increasing patient satisfaction by 30% in the first 6 months by measuring patient satisfaction score from the surveys that are distributed online and in person.
* The scheduling module will reduce the scheduling wait time to < 5 minutes
* The system will provide accurate data by reduce the number of data error by 99%
* Increase employee satisfaction by 50% in the first year of using the system by calculating the employee satisfaction score.
* Increase the number of new patients by 10% in the first year.
* Utilizing the employees time by 80% by spending less time on paperwork and more on patient care.
* Retaining our patients by 60% in the first year by providing better customer services through faster appointments scheduling and better patient care. Calculating the churn rate will in identifying how many patients are returning to the clinic and how many did not finish their treatment plan.
* Better inventory management and asset losses in the first six months by 80% by calculating the Inventory average.

The calculations were done to evaluate the Cost-Benefit of developing and implementing the Philadelphia Medical Group System. These calculations were based off the Project Software Costs, Total Cost of Ownership, Profit and Loss, and Benefits amounts. Based these calculations in the “Cost-Benefit” worksheet in the "SE638\_Grp3\_Financial-Analysis.xlsx”file, the Return on Investment (ROI) after five years was a total of $22,006,858. Moreover, the Return of Investment ratio after five years as 303.42%. The Payback period for developing and implementing the system was 1.24 years. Drawing from the expenses for owning the system, analyzes the business’ revenue stream, benefits of the system, and cost of the project software, the conclusion from the Cost-Benefit is clear that investing in the development of the Philadelphia Medical Group System was a great investment. Through the implementation of the system, the average appointment times decreased from 25 minutes to 15 minutes. This allowed Doctors to see more patients within the 5 hours. With each appointment taking on average of 15 minutes post-system implementation, each Doctor could now be scheduled for a total of 19 appointments per day. This increase in the number of appointments each clinic could schedule went from 240 appointments to 388 appointments per week - a 61% increase. Of note, while the operational costs of printing equipment (paper supply and printer supplies) was reduced by 50%, this only accounted for a 02% of the total operational costs before and after the implementation of the System. The true benefit of the implementation of the Philadelphia Medical Group system was the ability to increase the Clinics and Doctor’s capacity to add more appointments into their schedules.

Aside from these tangible benefits, the customer and employee's satisfaction were two intangible benefits that were realized with the implementation of the system. Customer satisfaction increased by 30% the first three months and continued incrementally 5% over five years. This initial 30% satisfaction the initial three-months was due to a myriad of actions: customers were satisfied with the reduction of the scheduling wait time, receiving better patient care, ability to view their own patient records, and efficient doctor’s appointments. Furthermore, all clinic staff were satisfied with the speed to which they could perform what once was paper workflows via digital workflows. Also, all clinic staff were satisfied with the reduction in paperwork they needed to process and shift to their true mission in providing the best patient care in Philadelphia.

## 3. Provide a brief summary and evaluation of your project

### 3.1 Summarize the main points of the project plan

This section will provide a summary of the main points of the project plan across all respective assignments. One of the overarching objectives this project plan is to change analog manual business workflows to digital business workflows. The change to digital business workflows the system will provide will be transformational to the Philadelphia Medical Group as the clinic staff have been able to increase the capacity of how many appointments they can provide, increase the opportunities to provide patient care, and increase the revenue generated by the business. Furthermore, the Patient’s access to Patient records have not been readily accessible via the manual business workflows. The development of the digital system will give Patients better access to their own Patient records anytime, anywhere. Furthermore, the system will also impact the loss of paper records, medical equipment, and supplies. Our project plan details the work breakdown structure as to when and what each of the system modules will include and be delivered into production. These details include the components, such as the User Interface, API Gateway, API Services, Databases, as well as the components relationships with one another. Our initial project estimate assumed the work in each phase to occur sequentially. However, upon review of the labor available to work and interest to accomplish the project as soon as practicable, our group re-sequenced the project estimates, resource plan and schedule to have some activities overlap with one another. In doing so, the project team as a whole would be able to operate more efficiently from the Pre-Development Phase through the last phase, Phase 3. From our re-sequenced project estimate, the entire project will cost $1,873,216.78. Moreover, this project will take 42 months. The cost-benefit analysis document the benefits associated with developing and implementing the system. The major benefits included increase in appointment capacity by 61%, customer satisfaction with the changes in the clinic business operations, decrease in the loss of medical equipment and supplies, and more. The main risks this project include overextending funding while maintaining the existing business processes; inability to prioritize mission critical business processes for development; and failure to conduct sufficient usability testing to validate the newly transformed digital business processes.

### 3.2 Briefly define how your project would evaluate and report progress

To ensure our project progress goes according to the plan, we need to have a transparent, established reporting system. The reporting system must be agreed upon by all the project teams. The project team must provide clear and complete information about the status of the project. We will be using two types of reports for our project: cumulative reports and stoplight reports. The cumulative reports will be done by the project team to report all the tasks' progress from the beginning to the end of the project. This report will help the project team and the project manager evaluates the project progress and the variance between the original plan and the actual progress. Using spotlight reporting will help senior managers and sponsors to know how the project is performing. The spotlight report suggests placing a green card on the top of the report to indicate that the project is going as planned. In that case, the senior manager and sponsor do not need to go through the details of the project progress. A yellow card is used to indicate that there is some delay or change in the project plan. In this case, a brief description of the issues faced is provided on the first page, and it refers to the details in the project report. When the project is out of control, a red sticker is used to indicate that there is a serious need to discuss the project obstacles that might be out of the project team's hands.

### 3.3 What would you recommend?

Our recommendation is proceeding with the project as planned. The Cost-Benefit concludes that we have a positive return on total investment after 3 years, the ROI after 5 years will be 349.67%. These numbers are acceptable and fit our expectation. The risk period is the first 2 year, since the annual cashflow is negative as well as the payback period is 1.11 years. According to our strategic benefits analysis, the only thing is success going forward but hard to quantify is the increasing number of the new patients in the first year, while the other strategic benefits can be quantified by one or more indicators. We can observe and measure the increasement of the patient number, but unable to link the number to any quantitative indicators. In the ROI document, our consideration about financial benefits or losses are based on personnel fees, hardware supply costs, rent, appointments and co-pay appointments. Refer to the risk analysis, the critical risk is the negative cashflow in first two years. The unstable cashflow may cause the Doctor, Nurse or Admin staff emotionally anxious or even turnover.

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