Request for Proposal

Assignment 2: Network Models---Project Management

Albert Olea

MSDS 460: Decision Analytics

Professor Thomas W. Miller

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This is a request for proposal that outlines a critical development path for a digital recommender system for a group of restaurant owners in Massachusetts who want a consumer-focused recommendation system. The recommendation system will be designed to recommend restaurants to individuals based on publicly available customer reviews. The software has specific component requirements that are reflected in the skillsets of members of this team of developer consultants. The client has requested that the product recommendation system be implemented using Alpine.js and Tailwind on the frontend, a GraphQL API, and a Go web and database server on the backend. Go, Python, or R may be employed for recommender system analytics on the backend, with persistent storage provided by PostgreSQL, EdgeDB, or PocketBase. The system should be accessible from any modern web browser and may be hosted on a major cloud platform such as Amazon Web Services (AWS), Microsoft Azure, or Google Cloud Platform (GCP). The goal of this request for proposal is to highlight timeline estimates and project costs using linear programming modeling. Gantt charts of proposed timelines will also be included and can be referenced in the GitHub repository.

Having taken these product requirements into account a team will be created with a frontend developer, backend developer, data engineer, database administrator, UX/UI designer, Quality Assurance engineer, and a data scientist/project manager. Each of their respective hourly rates are consistent with industry rates near Marlborough, Massachusetts. The allotted times for each core project task are mapped out with three scenarios: best case, worst case, and most likely. Once those estimates come from our task oriented bottom up approach, we use a triangular or PERT method to estimate the total expected hours it will take for completion. It should be noted that the aggregate hours here do not connect directly to our timeline as there are scenarios where multiple disciplines work in tandem on a deliverable. The most apparent set of parallel tasks in this project are the coding of the digital tool labeled D4 and the development of a marketing strategy (B), a brochure (C), and market surveying (E). There is also the development of system and software design that can be done in parallel with the appropriate team members.

The linear model for our critical pathway relies on total completion time estimates to calculate optimal start and end times for each task based on its dependencies. For example, the best case scenario estimate shows that the team is able to begin coding at the 64 hour mark. It should be noted that the proposed timeline estimates rely on a traditional eight hour workday and do not expect team members to work weekends for any overtime. Python code for the critical pathway linear programming model as well as cost estimates can be found in the repository file msds_460_critical_path_analysis.py. Hourly wages for each of the team members are based on geographical averages sourced from ziprecruiter and include the required skill sets for the project. This was not something that we included directly into our critical path linear programming model. Our linear programming model focuses on time estimates for the three

scenarios and accounts for what is called a precedent event. We follow the provided project tasks in order from A to H to estimate a timeline to completion for the request for proposal. There is a cost estimation model built out with custom consultant pricing in mind but it has a shortcoming of distributing worker hours to total task time uniformly. For example, if we have to do a requirement analysis that involves a data scientist, a project manager, and a software engineer, we take the total hours it takes to do this task and divide by three to estimate the individual contributed hours of each team member. Then we would assign our hourly costs respectively to estimate the total cost of this task. This could mean that our cost estimates are not fully optimized but we do see consistency with the price reflections at the three levels of hourly allotments. Our three cost estimates end up being $27444.00, $32380.00, and $38284.00 for the best, expected, and worst time to completion scenarios. Gantt charts of scenario timelines can be found in the file msds_460_rfp_gantt_charts.xlsx.

The project is expected to take a total of about nine and a quarter weeks. This accounts for the traditional 40 hour work week and assumes the team does not work weekends. This means the estimated timeline projection shows a cost of $32,380 for labor alone. It is recommended to add a 15% buffer for food, travel, and other expenses as well as an optional three month on-call stipend fee of $3,000 for troubleshooting and support. This puts the project at a total estimated cost of $40,237. If development began in the first week of February, the estimated final deliverable date is Tuesday, April 8th. Adding another team member would not change the estimated timeline much as the linear programming model has allocated the time of technical staff to non-technical components of the project already. The methods for dealing with uncertainty in the project timeline can absolutely be expanded upon to include a monte carlo simulation for example.

References:
1. UX Designer (est. $53/hour)
   https://www.ziprecruiter.com/Salaries/User-Experience-Designer-Salary-in-Marlborough,MA
2. Frontend Developer, (est. $56/hour)
   https://www.ziprecruiter.com/Salaries/Java-Frontend-Developer-Salary-in-Marlborough,MA
3. Backend Developer, (est. $53/hour)
   https://www.ziprecruiter.com/Salaries/Graphql-Developer-Salary
4. Quality Assurance Engineer (est. $47/hour)
   https://www.ziprecruiter.com/Salaries/Quality-Assurance-Engineer-Salary-in-Marlborough,MA
5. Data Engineer, (est. $65/hour)
   https://www.ziprecruiter.com/Salaries/Aws-Data-Engineer-Salary-in-Marlborough,MA
6. Database Administrator, (est. $51/hour)
   https://www.ziprecruiter.com/Salaries/Database-Administrator-Salary-in-Marlborough,MA
7. Data science and project management (est. $61/hour)
   https://www.ziprecruiter.com/Salaries/Data-Scientist-Salary-in-Marlborough,MA
8. ChatGPT. *Conversation with ChatGPT*, February 1, 2025.