CODE SAMURAI 2022

20 - 21 December 2022

</ INTER - UNIVERSITY HACKATHON>

University of Dhaka 1921-2021 ঢাকা বিশ্ববিদ্যালয়

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# Plan Public Projects In Your City

**CODE SAMURAI 2022**

Inter-University Hackathon

Problem Description

# Plan Public Projects in Your City

# Introduction

Your city is constantly undergoing various development projects to improve and maintain its infrastructure. The sheer number of projects being implemented by different government agencies at the same time often leads to traffic congestion, impacts the prices of fuel and goods, and confusion among local residents.

This hackathon aims to develop an app that can assist in planning and visualizing the various aided and GOB*-financed development projects being implemented in Bangladesh on a map. The app should be able to analyze information about the type of project (e.g., road work, drainage repairs, sewer maintenance, power line installation, flyover construction), the agency responsible for the project, and the estimated duration of the project.

By providing residents with transparent and accessible information about upcoming and ongoing public projects, this app has the potential to improve communication between government agencies and citizens.

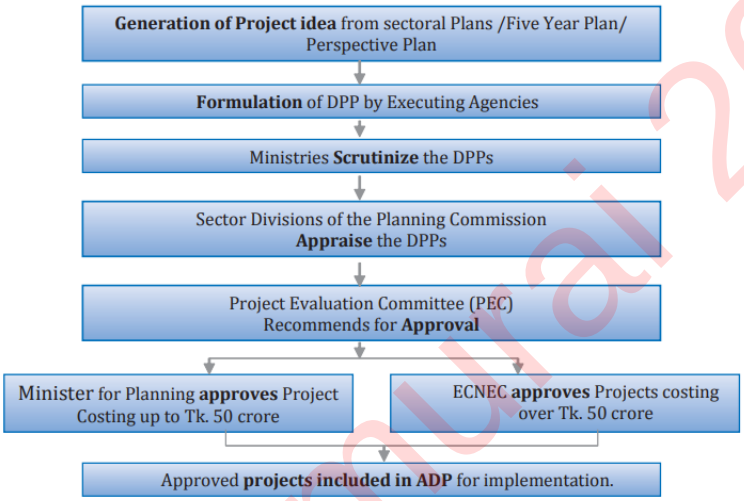
A development project involves a set of activities undertaken to achieve some predetermined objectives in a stipulated time, using a certain amount of resources. Depending on the nature of objectives and mode of financing, projects are generally categorized into two major groups:
(1) Investment Projects and
(2) Technical Assistance Projects.
For this problem, we are interested in investment projects.

Investment Projects generally involve a large amount of capital investment from either local or both local and foreign resources for the development of physical or socio-economic infrastructures (e.g., construction of roads, embankments, bridges, and power plants). Project proforma is the basic document for placing required information of a certain project in a prescribed format in order to get

approval from the appropriate government authority. All Investment projects are to be formulated in DPP*.

To get approval for a development project from the relevant government agency, the executing agency must prepare the DPP. Processing of development projects (both GOB financed and Aided) for approval involves several steps. At the formation stage, a project may be an idea with preliminary studies of its desirability in terms of national needs and likely cost and benefits. At the formulation stages, it has to be spelled out in greater detail and in specific terms in order to enable the decision-making bodies to evaluate it and to approve (or postpone or reject) it. The following chart highlights the basic approval workflow involving various government agencies.

Figure 1: Steps Involved In Approval Process of Investment Projects




For interested readers, the process of preparing and managing DPP is outlined in the document in reference.

The full process is quite long and complicated. For this problem, we will limit our focus to the formulation of DPP, a simplistic Approval mechanism, and project progress tracking methodologies.

A development project summary includes the following major sections:

- Project Title
- Basic Information
- Objectives
- Targets
- Implementation Timeframe
- Estimated Cost
- Mode of Financing
- Location
- Log Frame
- Yearwise Plans

The executing agency will collect and document all of these records in the DPP. An estimated cost is calculated based on the objectives, targets, location, and mode of financing. Depending on the available funding, strategic resources, output components, and location availability, the implementation timeframe is proposed in the DPP. The time frame consists of various different time parameters. For example:

- Tender advertise date
- Tender opening date
- Tender evaluation date
- Tender approval date
- The date for the signing of contracts
- Proposed completion of contract dates

For simplicity, we will group these various timestamps into two aggregated values, the start and end dates. The start date will represent the beginning of the invitation process, and the end date will represent the end of project completion, including all components of the project.

# The Problem

As we have seen with a lot of government projects, the planning of the project timeframes is often suboptimal. This causes projects to take longer than the planned duration. Sometimes a project is planned over a longer period of time than is necessary. Shortcomings in the financing, management, and annual procurement plans can sometimes put projects on hold or cause significant delays.

For running projects, it is also imperative to collect progress reports and present revised timelines so that the executing agencies and the citizens can get a clearer picture of the true nature of the project progression. Continuous reporting can also help pinpoint bottlenecks and optimize the annual procurement plans.

For this hackathon problem, we want you to develop an app that will allow users to execute the following functionalities:

1. User registration, authentication, authorization, and role management system.
2. CRUD operations on most entities in the system.
3. Different types of users can log into the app. Namely, executing agency officials, government agency officials, citizens, and administrators. A list of various agencies will be provided.
4. Executing agency officials can create/update project proposals (DPP). The app should be able to suggest timeframes based on the information contained in the database at that time.
5. Government agency officials can approve/reject project proposals. Approved and running projects will be eligible for receiving progress reports.
6. Executing agency officials can add progress data on running projects. Progress data will contain work done on the components of the project and the percentage of the allocated yearly budget for that project.

7. The reporting module of the app should be able to show real-time progress reports utilizing various charts and visualization features. It should be able to keep projecting the estimated completion time and cost against the planned completion time and cost.
8. The app should include text search features with various filters for finding projects and export features to download data in the form of CSV or JSON files.
9. The app should allow general users to add feedback on the project progress status. They can also add ratings (1 to 5 stars) to the project plans. Agency officials should be able to sort the projects based on ratings or read the feedback from general users on the ongoing projects.
10. Show locations of the running projects on a map with various tags for users to easily glance over the ongoing projects in their neighborhoods.

The hackathon judging focus will be split into four different stages as described in the subsequent sections:

# Section 1 - Loading the Database

You'll be given a number of CSV data files containing various information regarding projects under planning, approved, and ongoing development projects. You should be able to build a database system to properly clean, load, and create necessary relationships among the data points.

## Input:

1. projects.csv: A CSV file containing information about the approved and running projects, for example, project title, basic project information, components, objectives, goals, approving agencies, executing agencies, project location, project type, source of funds, approval time, start time, planned completion timestamp, yearly allocated fund, etc.
2. proposals.csv: A CSV file containing information regarding the proposed project ideas, for example, project information, most of which are listed in projects.csv (point #1), estimated cost, and estimated start and end times (simplified parameters as described in the introduction section).
3. components.csv: A CSV file containing information about components of the project and dependency relationships among the project components. It will also contain completion percentages of components and costs (projected and actual) for the projects.
4. agencies.csv: A CSV file containing the look-up information for various agencies. These values must be used to verify and authorize various approval processes done by respective agency users. All agencies listed in projects.csv (point #1) and proposals.csv (point #2) will be present in this file.
5. constraints.csv: One or more CSV files containing constraints to be applied when evaluating the optimal timeframes for the proposals. For example, time/location constraints will tell you how many projects can be run at a given location, or what is the timeframe when no projects can be run. Another type of constraint will be given related to project components, for

example, how many concurrent components can a given executing agency run at the same time.

## Output:

1. A database system that is built from these initial datasets.

## Scoring:

Scoring will be rewarded for successfully parsing the files, designing and creating database tables, filtering bad data points, writing query APIs to fetch and update relevant data points from the backend programs, etc.

# Section 2 - Optimal Timeframe

The first computational problem for this hackathon will be calculating the start and end time for all the projects in the planning stage every time a new project plan is added. The program must consider the existing projects to estimate the start and end times in the project proposal every time a new proposal is added, a proposal is accepted by the approving agency, or an ongoing project is canceled or finished. The timeframe must consider the completion of all of the project components.
The program will consider a few constraints:

1. There will be a limit on the number of project components an executing agency can run at the same time.
2. There will be a limit on the number of project components that can be run in the same location.
3. There will be a limit on the yearly funding an executing agency can spend for project components.
4. There will be interdependencies among the project components. For example, component 1 of project 1 must be finished before component 5 of project 2, and so on and so forth.

## Input:

1. Data files are shown in the previous section.

## Output:

1. Estimation of start and end times for project plans ensuring the earliest possible end times and the least amount of project timespan.

## Scoring:

This behavior is not an accurate representation of the real-world scenario; however, this is added as a challenge for the teams. Scoring will be awarded for producing the optimal timeframe for each project plan based on the initial data set.

# Section 3 - Build an App

As described in the problem section, your team should be able to build a web app, or a mobile app, the underlying services, and a storage framework. The approval system will have to be simulated utilizing various types of agency officials logging in and finding the list of pending plans and approving or rejecting them based on agency allocation of the projects.

## Input

1. Initial database
2. Data points added or modified by the user

## Output

1. An interactive app performing all the features as mentioned in the Problem section of this document

## Scoring

1. Scoring will be awarded based on the number of features correctly implemented in the app.
2. Bonus points will be awarded for adding any extra feature on top of the primary requirements, especially the visualization of project progress and cost allocations.

# Section 4 - Dynamic Progress Reporting

For this stage, there will be changes made to the database during the runtime through the app interfaces or directly inside the database, and your application must react to adjust the project timelines and costing graphs accordingly. The progress reporting can only be done by users from authorized agencies.

## Input

1. The reports will include various parameters. It can be uploaded using a form or a CSV file. For a special test, some data on the database may be manually changed by the judging team. Some example parameters: reporting timestamp, the percentages of work completed for each project component, and the total budget spent since the last report.
2. Changes may include
    a. Removal of a budget,
    b. Modifying the completion percentage of a component to a lower or higher value.
    c. Reducing the remaining funds for a project.

## Output

The reporting modules should reflect the revised project completion timeline for the ongoing projects accordingly. The apps can manually reload the data or output the new timeframe in a CSV file format.

## Scoring

Points will be awarded based on the app's ability to adapt to the changes. The same evaluation criteria will be used in Section #2 will be used here as well. First priority will be given to the earliest project completion, and then the least amount of idle time spent.

# Trivia

## Scoring Criteria:

| | |
|---|---|
| Design (30%) | Team Work |
| | Dependency & Risk Analysis |
| | Solution Design |
| | Color & Typography |
| | Layout, Composition & UI/Visual Elements |
| | User Experience (intuition & engagement) |
| Technology (25%) | Technical Demonstration |
| | Technical Feasibility & Operability |
| | Technical Architecture/Process Flow |
| | Engineering Practices & Scalability |
| | Testing & Deployments, Security |
| Learning (10%) | Mentor feedback |
| | Overall Communication/Pitch |
| | Scalability, Sustainability |
| Innovation (10%) | Solution Overview (Unique Selling Point) |
| | Value Proposition |
| Presentation (25%) | Running Demonstration |
| | Presentation Skills |
| | Complete & Incomplete modules + Future Improvements |
| | Logical Justification |
| | Team Composition |

## Abbreviations:

- GOB - Government of Bangladesh
- DPP - Development Project Proforma
- CRUD - Create, Read, Update, Delete

## References:

http://bcsadminacademy.portal.gov.bd/sites/default/files/files/bcsadminacademy.portal.gov.bd/page/6a28f1e5_7ded_44a1_a531_bd13881c8e0c/DPP-Manual-Part-1.pdf