

Urban waste collection aid - UWC 2.0

Urban waste management is one of several significant problems faced by many countries in the world and thus considered one of the important points to be improved in Sustainable Development Goal (SDG) 11: sustainable cities and communities and SDG 6: clean water and sanitation. Particular attention is given to developing countries that continue to prioritize development and economic growth. In urban context, solid waste management is costly and ineffective. Improvement of waste collection and management is emphasized by governments and organizations for positive impacts on cities, societies and environments.

Waste collection is often designated to an organization that provides professional waste management services. A typical waste collection process involves (1) back officers, who operate a central system to create calendar, coordinate front collectors and janitors, (2) collectors, who drive different types of vehicles and (3) janitors who manually collect garbage from Major Collecting Points (MCPs). Calendar and tasks were assigned among teams of janitors and coordinated by back officers. These assignments are often arranged in a weekly basis. Back officers also plan which vehicles to use and their routes. This planning activity happens every month. Everyday, the back officers sent messages with information about collecting route and time to collectors and janitors. Janitors use trollers (see Figure 1b) to collect garbage in their assigned areas and deliver to the MCPs. Collectors will pick up garbage from all janitors at an MCP. One collector drives only one vehicle during his working shift. The collector will drive through several MCPs with a predetermined route by back officers.



Organization X is contracted to develop an information management system called UWC 2.0 in order to improve efficiency of garbage collection of Service provider Y. The solution will include a Task Management module that allows:

Back officers to:

1. Have an overview of janitors and collectors, their work calendar
2. Have an overview of vehicles and their technical details (weight, capacity, fuel consumptions, etc)
3. Have an overview of all MCPs and information about their capacity. Information should be updated from MCPs every 15 minutes with the availability of at least 95% of their operating time.
4. Assign vehicles to janitors and collectors
5. Assign janitors and collectors to MCPs (task)
6. Create a route for each collector. Assigned route is optimized in term of fuel consumption and travel distance.

7. Be able to send message to collectors and janitors

Collectors and janitors to:

1. Have an overview of their work calendar
2. Have a detail view of their task on a daily and weekly basic. All important information should be displayed in one view (without scrolling down).
3. Be able to communicate with collectors, other janitors and back officers. The messages should be communicated in a real-time manner with delay less than 1 second.
4. Check in / check out task every day
5. Be notified about the MCPs if they are fully loaded

There are some constraints to the development of UWC 2.0. There exists a current system UWC 1.0 with a database. UWC 2.0 is expected to import and to use the existing data from UWC1.0. It is expected that the Task Management to be inter-operable with the UWC 1.0 as much as possible. The system should be able to handle real-time data from at least 1000 MCPs at the moment and 10.000 MCPs in five years. UWC 2.0 system interfaces should be in Vietnamese, with an opportunity to switch to English in the future.

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Task 1: Requirement elicitation	1.1	Who are relevant stakeholders? What are their current needs? What could be their current problems? In your opinion, what benefits UWC 2.0 will be for each stakeholder?
	1.2	Describe all functional and non-functional requirements that can be inferred from the project description. Draw a general use-case diagram for the whole system
	1.3	For the Task assignment module, draw its use-case diagram and describe the use-case using a table format
Task 2: System modelling	2.1	Draw an activity diagram to capture the business process between systems and the stakeholders in Task Assignment module
	2.2	Think about a possible way for a back officer to assign vehicles to janitors and collectors. Draw a sequence diagram to visualize this process
	2.3	Draw a class diagram of Task Assignment module as comprehensive as possible
	2.4	Develop MVP 1 as a user interface of either a Desktop-view central dashboard for Task Management for back-officers OR a Mobile-view Task assignment for Janitors and Collectors. Decide yourself what to include in the view. Use a wireframe tool like Figma or Adobe XD, or Illustrator
Task 3: Architecture design	3.1	Use a layered architecture to design the WMC 2.0 system. Describe how will you present your User Interface. Describe how will you store your data. Describe how you will access to external services/ APIs.
	3.2	Draw a component diagram for the Task Assignment module
Task 4: Implementation – Sprint 1	4.1	Setting up an online repository (github, bitbucket, etc) for version control.
	4.2	Adding documents, materials and folders for Requirement, System modelling and Architectural design. Use the selected version control system to report the changes to these files.

	4.3	Conducted an usability test with the user interface you developed in MVP1. Summarize the feedback and improve the MVP1 into MVP2 (with better User Experience).
Task 5: Implementation – Sprint 2	5.1	Develop MVP3 by implementing (with both frondend and backend) the interface in MVP2. You are free to choose the programming language (HTML, Javascript, Python, C#, etc). It is not required to implement a database in the backend. Data can be hard coded in code files.
	5.2	Demonstrate the whole project from Task 1 to Task 5

