



Task 1: Requirement elicitation

1.1. Identify the context of this project. Who are relevant stakeholders? What are their current needs? What could be their current problem? In your opinion, what benefits UWC 2.0 will be for each stakeholder?

a/ Identify the context of this project?

- Urban waste management is one of the important issues that many countries around the world have to face and solve because if not solved, it can adversely affect all aspects of economic development and development. society. Bad environmental risks may occur in the future such as air pollution, soil pollution and water pollution. This directly affects everyone's health as well as economic development. The problem if it becomes severe can take a lot of money to fix and therefore the task of waste management is considered as one of the key points to be improved under the Sustainable Development Goals. In the current urban context, solid waste management is costly and inefficient. Improving waste collection and management with modern technological tools that can increase work efficiency as well as reduce labor burden is emphasized by governments and organizations for its positive impacts on the city, society and environment.

b/ Who are relevant stakeholders?

- Janitors
- Back officers
- Collectors

c/ What are their current needs?

Stakeholders	Current needs (User's story style)
Janitors	As a janitor i want to feedback about my task to to balance the work arrangement
	As a janitor I want the app to be able to run on mobile devices so I can access my schedule any time
	As a janitor I want to interact or communicate directly and incontinently to back officers
	As a janitor I want to be able to apply for a day off through the app
Back officers	As a back officer i want a smart system to easily schedule jobs for janitors and collectors
	As a back officer, I want the information/feedback from collectors to be updated
	As a back officer I want the app to send a notification to collectors and janitors immediately when their schedules are set or changed
	As a back officer I want the system/app have to be promptly updated
Collectors	As a collector I want to be informed of any schedule changes at least 12hrs beforehand
	As a collector i would like to get an optimal route to the assigned MCPs in terms of time and fuel
	As a collector I want to be informed of the state of my vehicle if there are any problems with it
	As a collector I want to have an exact and detailed map avoiding rush hour



d/ What could be their current problem?

Stakeholders	Current problems
Janitors	Assignment schedules between janitors may overlap
	Forget to check attendance
	Late for work because of traffic jam
	The calendar is not up to date if there is no internet
Back officers	Having to arrange schedule manually
	No information about the status of the next MCPs for routing is received
	May not be informed of sudden absence of employees on time
	Not interact immediately to janitors and collectors
Collectors	Error not getting route to next MCPs for routing
	Ineffective routes planning
	Does not arrive at MCPs on time due to traffic
	Schedule was not updated due to internet error



e/ In your opinion, what benefits UWC 2.0 will be for each stakeholder?

Stakeholders	Benefits
Janitor	Have an overview of their work calendar
	Be able to communicate with other employees
	Can check and confirm their next tasks anywhere anytime
	Work route will be completely optimized avoiding traffic congestion
Back officers	Have an overview of janitors and collectors, their work calendar
	Be able to assign tasks automatically
	Assign tasks using preset options
	Have an overview of all MCPs and information about their capacity
Collectors	Check in/ check out task every day
	Be able to communicate with collectors, other janitors and back officers
	Be notified if MCPs r fully loaded
	Having a predetermined optimal route

1.2. Describe all functional and non-functional requirements that can be inferred from the project description. Draw a use-case diagram for the whole system

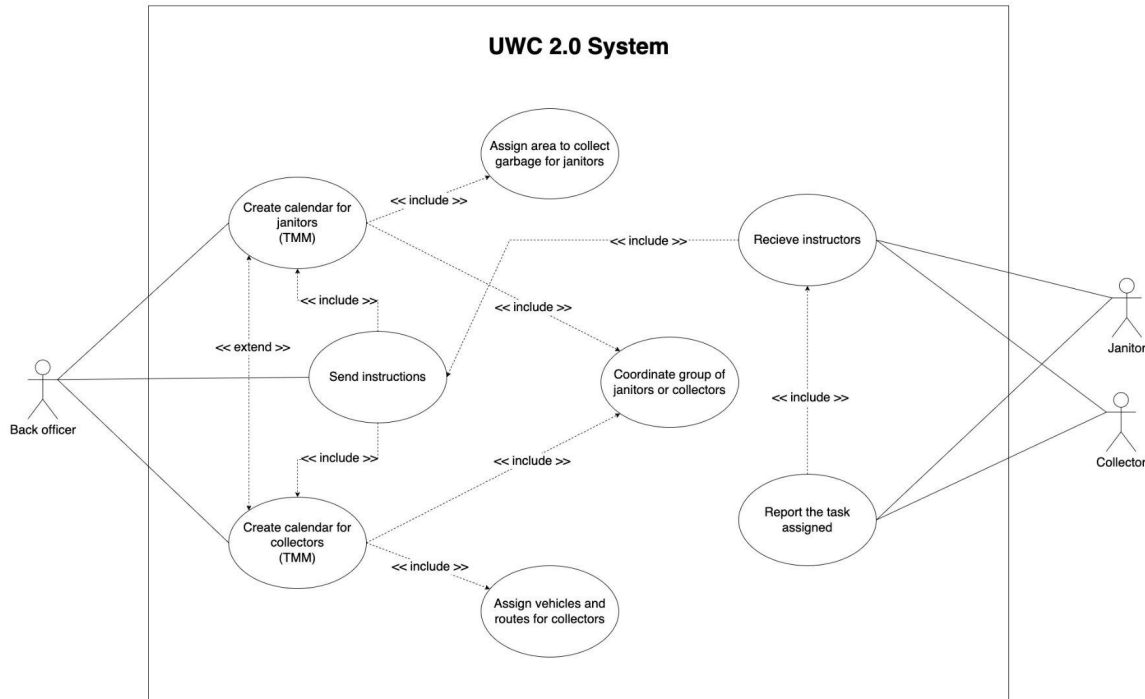


Figure 1.2: Use-case diagram for UWC 2.0 System
*TMM stand for Task Management Module

***Functional requirements:**

- Have an overview of Janitors and Collectors, their work calendar: "Back officers" have a user interface that can view information of "Janitors" and "Collectors" including: location, number of tasks completed out of total assigned tasks, working schedule of the day, week and in the month.
- Have an overview of vehicles and their technical details (weight, capacity, fuel consumptions, etc): "Back officers" have a user interface that can view information about vehicle location and vehicle weight, capacity, and fuel status.
- 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: "Back officers" have a user interface that can view the capacity information of the MCPs.
- Assign vehicles to janitor and collector: Have a list of available vehicles and unassigned janitors or collectors.

- Assign janitors and collectors to MCPs: Have an overview of MCPs in the area and addresses of janitors and collectors to assign suitable MCPs.
- Check in/check out tasks everyday: Simple check in/check out method.
- Create a route for each collector: Back officers have an interface of collectors and MCPs detail and vehicle states so that it is easier to optimize the route.
- Be able to communicate with each other: A messenger for employees to read and send messages.
- Be able to send messages to collectors and janitors: Back officers have a platform to communicate with the others for further information or editing if needed.
- Have an overview of their work calendar: Using to know about assigned tasks for weekly and monthly.
- Have a detailed view of their task on a daily and weekly basis. All important information should be displayed in one view (without scrolling down).

***Non-functional requirements:**

- Scalability of the system to handle more tasks in the future. For example, increasing the number of vehicles, increasing the number of workers,...
- An easy-to-use interface is required for janitors, collectors.
- Any update to the schedule is notified to collectors and janitors immediately through both in-app and push notification. In case the device does not have access to the internet yet, the push notification appears immediately when there is internet connection.
- Maintenance should be out of working hours.

1.3 For the Task assignment module, draw its use-case diagram and describe the use-case using a table format



Figure 1.3: Use-case diagram for Task management module



***Use case Specification**

Use Case ID	TM1.1
Use Case Name	Overview work calendar
Description	As a user, i want to see overview work calendar
Actor(s)	Back officer, Janitor, Collector
Priority	Must have
Trigger	Users want to see overview work calendar
Pre-Condition(s):	The task has been assigned
Post-Condition(s):	Users can see the information
Basic Flow	1. Access the system 2. Authenticates identity 3. Use feature
Alternative Flow	None
Exception Flow	2a. Authentication failed 2a1. Cancel authentication - Use case stop 2a2. Re-authentication - Return 2
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	Time out for login screen under 60 seconds.

Use Case ID	TM1.2
Use Case Name	Overview of vehicles and technical details
Description	As a user, i want to see overview vehicles and technical details
Actor(s)	Back officer
Priority	Must have



Trigger	Users want to see overview vehicles and technical details
Pre-Condition(s):	None
Post-Condition(s):	Users can see the information
Basic Flow	<ol style="list-style-type: none">1. Access the system2. Authenticates identity3. Use feature
Alternative Flow	None
Exception Flow	<p>2a. Authentication failed</p> <p>2a1. Cancel authentication</p> <ul style="list-style-type: none">- Use case stop <p>2a2. Re-authentication</p> <ul style="list-style-type: none">- Return 2
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	Time out for login screen under 60 seconds.

Use Case ID	TM1.3
Use Case Name	Overview all MCPs
Description	As a user, i want to see overview all MCPs status
Actor(s)	Back officer, Janitor, Collector
Priority	Must have
Trigger	Users want to see overview all MCPs
Pre-Condition(s):	None
Post-Condition(s):	Users can see the information
Basic Flow	<ol style="list-style-type: none">1. Access the system2. Authenticates identity3. Use feature
Alternative Flow	None
Exception Flow	2a. Authentication failed



	2a1. Cancel authentication <ul style="list-style-type: none">- Use case stop 2a2. Re-authentication <ul style="list-style-type: none">- Return 2
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	Time out for login screen under 60 seconds.

Use Case ID	TM1.4
Use Case Name	Assign vehicles to janitors and collectors
Description	As a back officer, I want to assign suitable vehicles to janitors as well as collectors
Actor(s)	Back officer
Priority	Must have
Trigger	Back officer need to have the authority to control and assign working vehicles
Pre-Condition(s):	Have an overview of work calendar and vehicles availability
Post-Condition(s):	Back officers can assign vehicles according to known conditions
Basic Flow	<ol style="list-style-type: none">1. Check work calendar2. Check availability of vehicles3. Assign vehicles



Alternative Flow	None
Exception Flow	2a. Not enough vehicles available for said work calendar 2a1. Rearrange work calendar 3a. Overlapped vehicles assigned 3a1. Assign another vehicle
Business Rules	There must be enough vehicles for janitors and collectors everyday.
Non-Functional Requirement	Back officers must be able to see the overlapped issue easily

Use Case ID	TM1.5
Use Case Name	Assign janitors and collectors to MCPs (task)
Description	As a back officers, I want to assign suitable MCPs to janitors and collectors
Actor(s)	Back officer
Priority	Must have
Trigger	Officers want to assign the most suitable MCPs to help increase efficiency.
Pre-Condition(s):	Back officers have an overview of MCPs' locations and conditions



Post-Condition(s):	Back officers assign the best MCPs
Basic Flow	<ol style="list-style-type: none">1. Check MCPs' conditions and locations2. Check work calendar3. Assign MCPs
Alternative Flow	None
Exception Flow	3a. Overlapping of MCPs assigned 3a1. Change the said assignment
Business Rules	Janitors and collectors be assigned at least a specific workload(MCPs).
Non-Functional Requirement	Easily check if workload requirement for each janitor and collector is met

Use Case ID	TM1.6
Use Case Name	Create a route for each collector. Assigned route is optimized in term of fuel consumption and travel distance.
Description	As a back officers, I want to create the best fixed route for collectors to reduce time consumed and fuel fees.
Actor(s)	Back officer
Priority	Must have
Trigger	Back officers want to assign a route.



Pre-Condition(s):	Overview of work schedule and vehicles conditions
Post-Condition(s):	Have a route for each collectors
Basic Flow	<ol style="list-style-type: none">1. Check the work schedule2. Check vehicles conditions3. Assign routes
Alternative Flow	None
Exception Flow	None
Business Rules	Prioritize fuel costs
Non-Functional Requirement	Routes should be shown through Google maps/...



Use Case ID	TM1.7
Use Case Name	Be able to send message to collectors and janitors
Description	As a back office, I want to conveniently communicate to collectors and janitors
Actor(s)	Back officer, Janitor, Collector
Priority	Must have
Trigger	Back office want to exchange information with collectors and janitors for further editing
Pre-Condition(s):	None
Post-Condition(s):	Back office can easily talk to collectors and janitors
Basic Flow	1. Access the system 2. Communicate with the others
Alternative Flow	None
Exception Flow	2a. Authentication failed 2a1. Cancel authentication - Use case stop 2a2. Re-authentication
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	An easy-to-use user interface



Use Case ID	TM2.1
Use Case Name	Have an overview of their work calendar
Description	As a janitor and collector, I want to easily view my work calendar
Actor(s)	Janitor, Collector
Priority	Must have
Trigger	Janitor or collector want to see overview of their work calendar
Pre-Condition(s):	Back office assigns vehicles, optimized route and MCPS for janitor and collector
Post-Condition(s):	Janitor or collector can clearly view work calendar everyday and every week
Basic Flow	1. Access the system 2. Authenticates identity 3. Use function
Alternative Flow	None
Exception Flow	2a. Authentication failed 2a1. Cancel authentication - Use case stop 2a2. Re-authentication
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	An easy-to-use user interface

Use Case ID	TM2.2
Use Case Name	Have a detailed view of their task on a daily and weekly basis. All important information should be displayed in one view (without scrolling down).
Description	As a janitor and collector, I want to easily view my task everyday and every week.
Actor(s)	Janitor, Collector
Priority	Must have
Trigger	Back office want to exchange information with collectors and janitors for further editing
Pre-Condition(s):	Back office assigns vehicles, optimized route and MCPS for janitor and collector
Post-Condition(s):	Back office can easily talk to collectors and janitors
Basic Flow	<ol style="list-style-type: none"> 1. Access the system 2. Authenticates identity 3. Use function
Alternative Flow	None
Exception Flow	2a. Authentication failed 2a1. Cancel authentication - Use case stop 2a2. Re-authentication
Business Rules	Users who enter incorrect login information for the 5th time in a row will have their account locked for 30 minutes.
Non-Functional Requirement	An easy-to-use user interface



Use Case ID	TM2.3
Use Case Name	Be able to communicate with collectors, other janitors and back officers
Description	As a janitor, I want to send and receive message
Actor(s)	Janitor, collector, back officer
Priority	Must have
Trigger	Janitor wants to send a message
Pre-Condition(s):	none
Post-Condition(s):	The receiver receive the message
Basic Flow	<ol style="list-style-type: none">1. Janitor send message to other janitor, collector or back officer2. The receiver is notified about the message
Alternative Flow	none
Exception Flow	none
Business Rules	Delay time of message is less than 1 second
Non-Functional Requirement	Message should be sent immediately

Use Case ID	TM2.4
Use Case Name	Check in / check out task every day
Description	As a janitor, I want to let others know that I am at work
Actor(s)	Janitor, collector
Priority	Must have
Trigger	Janitor or collector want check for their presence
Pre-Condition(s):	none
Post-Condition(s):	The checker check in/out successfully
Basic Flow	<ol style="list-style-type: none">3. The checker chooses to check in



	4. System notify that the checking is succeed
Alternative Flow	1. The checker chooses to check out 2. System notify that the checking is succeed
Exception Flow	none
Business Rules	Delay of check in/out time is minimize
Non-Functional Requirement	Easy to use interface

Use Case ID	TM2.5
Use Case Name	Be notified about the MCPs if they are fully loaded
Description	As a collector, I want the system to notify me about the state of MCPs
Actor(s)	Collector
Priority	Must have
Trigger	MCP(s) are fully loaded
Pre-Condition(s):	Collector is assigned to a fully loaded MCP
Post-Condition(s):	Collector is notified about the fully loaded MCPs
Basic Flow	1. The system notified collector about the MCPs
Alternative Flow	none
Exception Flow	none
Business Rules	Delay of notification time is minimize
Non-Functional Requirement	Easy to read and understand notification

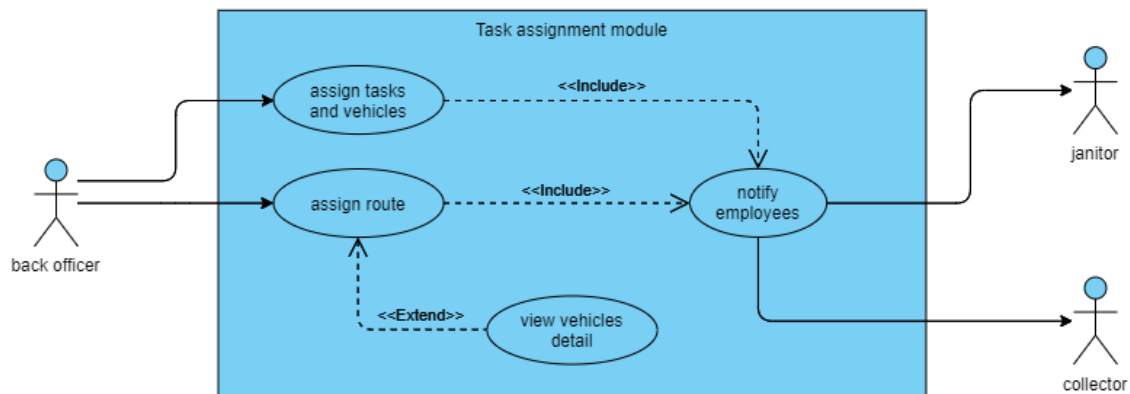


Another Approach (Optional)

Use case ID	TA-M1
Use case name	Task Assignment module
Description	Allow back officer to assign tasks to collectors and janitors and notify them when doing so
Actor(s)	Back officer, collector, janitor
Priority	Must have
Trigger	Back officer wants to assign tasks to janitors and collectors
Pre-condition(s):	There are janitor(s), collector(s) and vehicle(s) available for assignment
Post-Condition(s)	Back officer assigns tasks successfully Collectors and janitors received the notification
Basic flow	1. Back officer assigns tasks and vehicles to janitors and collectors 2. Back officer assigns routes to collectors 3. Back officer confirms the assignment 4. The system notifies collectors and janitors about the assignment
Alternative flow	2a1. Back officer views vehicles detail. 2a2. Back officer assigns routes to collectors Use case continues step 3 3b. Back officer cancels the assignment Use case returns to step 1
Exception flow	none
Business rules	Assigned routes are optimized in terms of fuel consumption and travel distance
Non-functional Requirement	Notification of assignment should be send immediately to janitors and collectors after back officer has confirmed the assignment

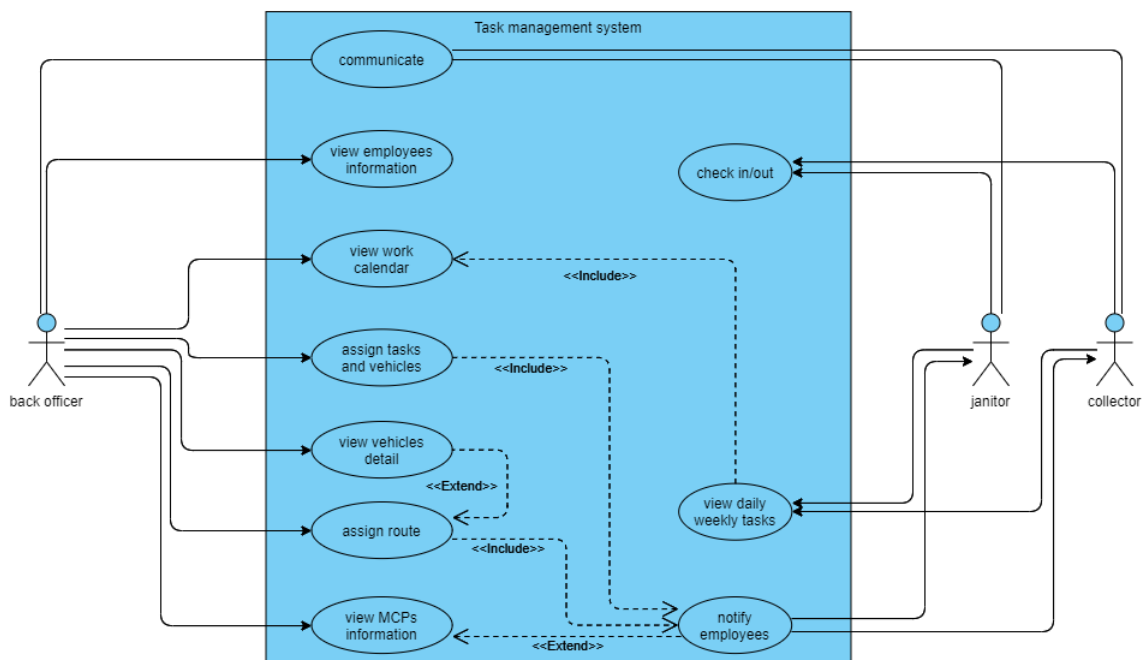
While doing this task we have found another approach to how we draw the use case diagram. In this approach we try to include the modules in the whole system diagram. By this, we can see clearly parts of the modules and what they do in the system.

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Notice that everything that involves in tasks assignment process can also be seen in the whole system diagram. This helps to have an overview and a detailed view of the system at the same time.