

Systematic Reporting of Sustainable Green Campus Activity

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ABSTRACT

The UiTM Green Centre (UGC) plays an important role in implementing the sustainability agenda at the Universiti Teknologi MARA (UiTM), community and beyond level globally. It is also in line with the commitment to support the government's agenda in achieving the 2030 Sustainable Development Goals (SDGs) through activities, initiatives, and sustainability movements under various selected clusters. UGC is responsible for collecting, analyzing and validating sustainability activities within six clusters for the purposes of Ui Green Metric University (UiGM) ranking. However, collecting the sustainability data across UiTM has been a challenge. To address this, the Integrated Sustainable Campus Report (IS-CARE) system has been designed as a solution. The system will be developed as a responsive web-based information system to ensure accessibility across different devices, including desktops and mobile devices. The system allows seamless reporting and consolidation of sustainability activities at all university levels. The data will contribute to the UiTM Annual Sustainability Report, UiGM, Times Higher Education Impact Rankings, QS World University Rankings on Sustainability 2023 and Low-Carbon City 2030 Challenge (LCC2030C) rankings. The system will benefit to strengthen the Strategic Core 8 (Smart Campus) of the UiTM 2025 Strategic Plan through the university sustainability agenda.

Keywords: SDG, sustainability, system.

1. INTRODUCTION

Universiti Teknologi MARA (UiTM) is the largest comprehensive university in Malaysia that provides innovative education with the latest infrastructure and technology that includes 34 campuses, 17 faculties, seven academic centres and two study colleges in the whole country. Sustainable and green initiatives have always been at the forefront of Universiti Teknologi MARA's (UiTM) plans in pursuit of delivering continuous value to its stakeholders. The 8th Strategic Theme (Smart Campus) under UiTM 2025 Strategic Plan upholds the sustainability agenda of the university headed by the Development Office [1]. Initiative on 'Smart Campus' is aimed at preserving UiTM's visible and sustainable eco-system for the benefit of the entire University community including staff, students, alumni, strategic partners, suppliers, and the surrounding community.

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UiTM Green Centre (UGC) is positioned under the Office of Infrastructure & Infostructure Development has implemented and planned many initiatives to be embarked in supporting UiTM to transform into a sustainable green campus. These projects build upon the work UGC is doing on localizing the Sustainable Development Goals (SDGs) and making the SDGs real to the campus community. The university focuses on six (6) key clusters of Ui Green Metric (UiGM) University Ranking. They include Setting and Infrastructure (SI), Waste (WS), Water (WR), Energy and Climate Change (EC), Education and Research (ED) and Transportation (TR) [2]. The category of UiGM provides the basic guideline on UiTM's commitment towards green and environmental sustainability as each cluster will outline its own specific aim to support the environmental sustainability agenda of UiTM. UiGM is the measurement of UiTM's efforts towards campus sustainability at the global level. The effort is currently focused on UiTM main campus in Shah Alam. To ensure the effort and ideas are accepted, UGC has initiated 'Sustainable Green Campus' Festival in all branch campuses and faculties. The UGC Coordinator at faculty and campus plays a role in helping the existing UGC coordinator portfolio in realizing the sustainability agenda in this UiTM. This paper is highlighting a systematic reporting of sustainable green campus activity through the development of Integrated Sustainable Campus Report (IS-CARE), a solution strategy used through a sustainable campus integrated reporting system.

2. AWARENESS OF SUSTAINABILITY ISSUES IN UNIVERSITY

A sustainable green campus is a place where environmentally friendly and sustainable activities are coupled with education to encourage green living practices on site. The status obtained by significantly improving cross-campus community collaboration in one or more of the following areas: settings and infrastructure, energy and climate change, waste, water, transportation, and education. Participation in sustainability ranking competitions can help to increase awareness in the university and beyond about the importance of sustainability issues. The world faces unprecedented global challenges such as population trends, global warming, over exploitation of natural resources, oil-dependent energy, water, and food shortages, and other sustainability issues. UiTM as the higher education has a crucial role to play in addressing these challenges. The issue of the study was the difficulty in collecting sustainability activity data from the entire UiTM system. The difficulty of gathering sustainability data is expected if this activity is done manually. Experience at the Sustainability Committee level in the previous UiGM data collection has been the basis for this issue. While the solution strategy used is through a sustainable campus integrated reporting approach. The process developed is expected to help integrate reporting for all sustainability activities at various university levels.

Previous trend shows increased budget being allocated by the university in relation to sustainability efforts since 2018. This verifies the commitment given by the top management in pursuing the environmental sustainability agenda in UiTM, specifically UiTM Shah Alam campus. The allocated budget for sustainability efforts were based on these six major clusters. The average university yearly budget for sustainability for the years 2019, 2020 and 2021 was recorded at USD13,652,591 [3].

Thus, indicating the need to provide centralized knowledge enhancement to all UiTM stakeholders in materializing the journey to Green Campus. Sustainability Rankings serves as a tool for universities to deal with sustainability challenges the world is facing. Currently, UiTM participated in three world university sustainability ranking competitions; UI Green Metric (UiGM), Times Higher Education Impact Rankings (THE Impact Rankings) and QS World University Rankings on Sustainability 2023. Figure 1 shows the UiGM mapping to SDGs, where cluster Education represents 13 elements of SDGs.

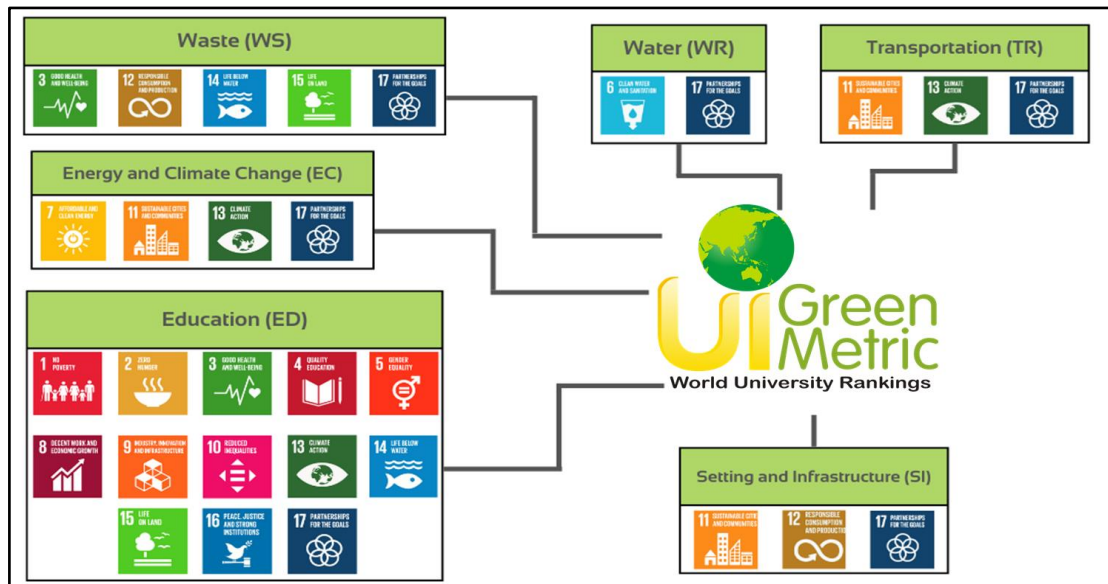


Figure 1. UiGM Mapping to SDG [4]

3. INTEGRATED SUSTAINABLE CAMPUS REPORT (IS-CARE) OVERVIEW

Integrated Sustainable Campus Report System known as IS-CARE is being developed a system to document the activities and performance of UiTM Green Campus initiatives so that it can be measured for a sustainable impact in line with the Sustainable Development Goals (SDGs) and University's aims toward low carbon cities by 2030. Using the IS-CARE platform, the report will then provide disclosures on an organization's most significant impact, whether positive or negative, and on activities toward a sustainable environment, society, and economy. It is critical for UiTM to recognize the impact of green efforts to measure the strategic plan prior to 2030 with the goals of supporting low carbon emission and the green agenda toward sustainability. The dashboard of the system will illustrate visualization tools through descriptive analysis and provide a summary of the project performance carried out by the faculties and branch campuses of UiTM in Malaysia. A comparison of their performance is necessary so that administrative management can strategize their plan to ensure the performance and aspirations of campuses in UiTM are aligned with the main campus in Shah Alam, Malaysia.

4. SYSTEM DEVELOPMENT APPROACH

Developing an information system requires a suitable approach to ensure its successful implementation. The next sections describe the agile system development life cycle (SDLC) and the methodologies that going to be adopted throughout the development.

4.1 Agile System Development Life Cycle (SDLC)

IS-CARE is a totally new information system. It has to be developed immediately in order to assist the existence of UGC purposes and operations. Therefore, Agile SDLC is the most suitable development methodology because of the flexibility and iterative process where requirements may evolve. The Agile manifesto is to deliver a working information method by responding immediately to the requirement changes [5]. Figure 2 shows the six processes in the Agile model.

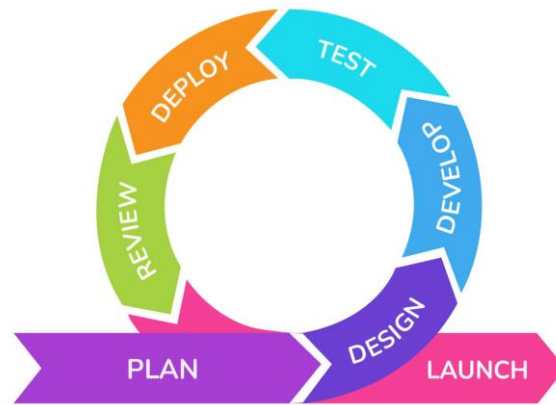


Figure 2. Agile SDLC [5]

Generally, there are six processes in the Agile model [6]. All the processes are explained in the Table 1:

Table 1. Six processes in the Agile model

Process	Description
Plan	Define the project plan and the user requirements
Design	Design the system based on identified user requirements
Develop	The development begins with the aims to develop a working product
Test	Testing all the requirements to meet with user expectation
Deploy	Deploy the system to user's work environment
Review	Developer team receives feedback from the user and works through the feedback

The Plan process is a crucial process where the project plan will be discussed. It includes determining the information system stakeholders, architecture, specification and requirements. User requirement collection sessions with targeted stakeholders will be conducted to identify the user requirements. Then, a system requirement which is based on the user requirements will be documented in a proper documentation will be done at the Design process. Figure 3 shows a draft of IS-CARE use case diagram which shows the system requirements that are going to be developed. The Develop process will be started once the system requirements have been confirmed by the stakeholders. Any completed system requirements will be tested at the Test process during the system testing by the developer and User Acceptance Test (UAT) activities by the stakeholders. The Deploy process means any tested and approved system requirements will be deployed at the production environment while any system requirements which fail the testing activities will be reviewed and go through enhancement activities. Lastly, the Review process comes next where the deployed system requirements will be monitored and reviewed by the system user. Every feedback from the system user will be taken into consideration for future enhancements.

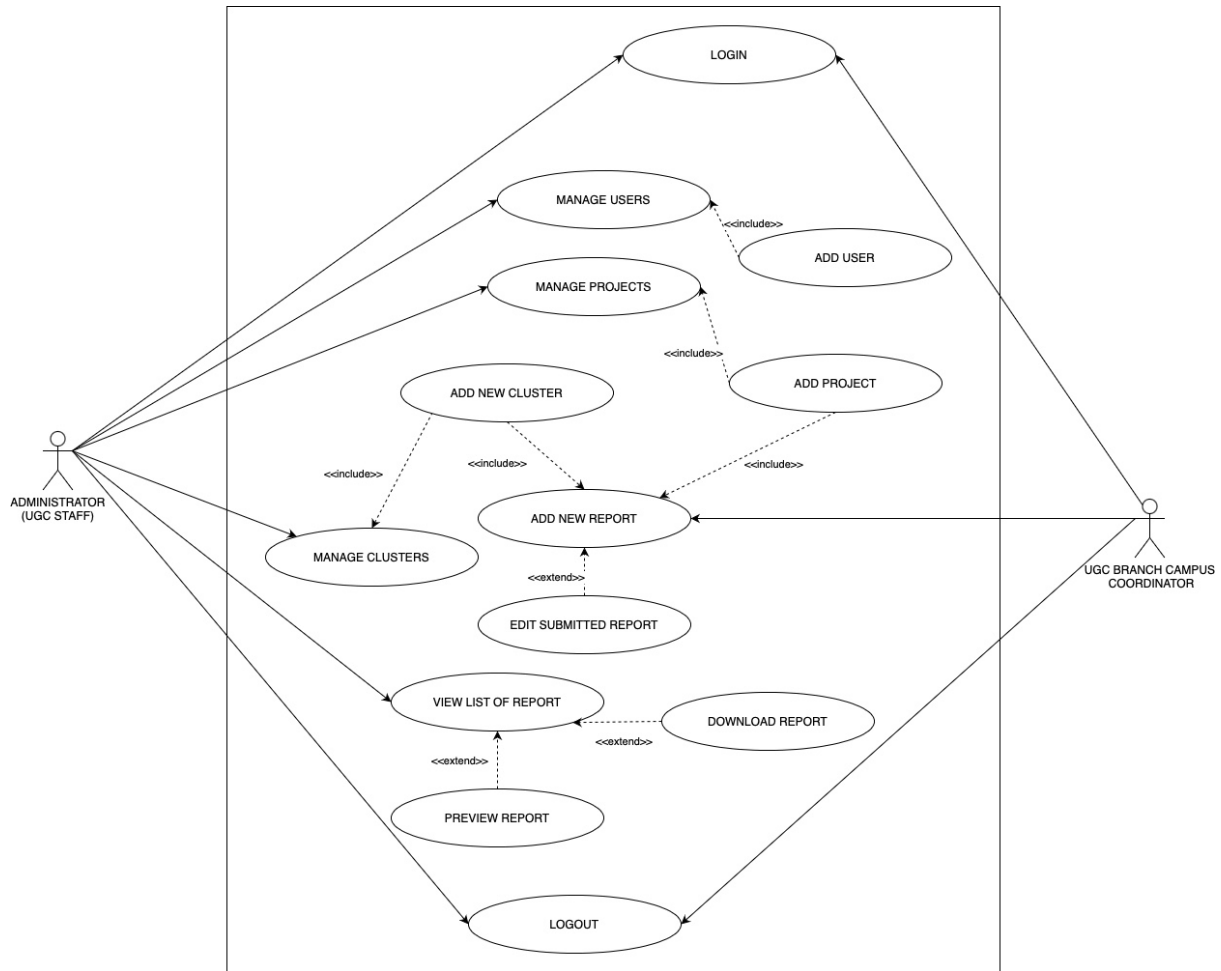


Figure 3. IS-CARE use case diagram

Figure 3 shows the IS-CARE use case diagram. The use case diagram illustrates the interaction between the system user (actor) and the information system. Based on the preliminary study, there are two information system users which are the Administrator (UGC staff) and the UGC branch campus coordinator. The UGC branch campus coordinators are appointed by the UGC in UiTM Shah Alam. The Administrator has functionalities manage IS-CARE user, manage cluster, manage project and also accessibility to the submitted report either to view the list of report, preview the report and download the report in PDF format. The UGC branch campus coordinators have functionalities to submit the report and edit any submitted report after a request for edit is approved by the UGC staff. Those are core system requirements that must exist in IS-CARE.

Since agile development is an iterative process, IS-CARE can be developed quickly. If there are new user requirements, the use case diagram is expected to be expanded in the future. There will be enhancement towards the working prototype as well.

4.2 Agile System Development Life Cycle (SDLC)

Agile SDLC has several well-known methodologies such as Scrum, Kanban, Extreme Programming (XP), Adaptive Project Framework (APF), Extreme Project Management (XPM), Adaptive Software Development (ASD), Dynamic Systems Development Method (DSDM) and Feature Driven Development (FDD) [7]. This IS-CARE project will apply the Scrum method and the Extreme Programming method. The methods are chosen based on the time frame of the project and the size of the developer team.

First, the Kanban method is chosen as project management tool [13-14]. An online project management tool named Trello as depicted in Figure 4 will be used for the task management and

tracking. All the necessary tasks in the development will be identified, setting the task priority, assign to the person in charge and later all the identified tasks will be put in a Kanban cards in Trello. The task priorities are classified into three which are Low, Medium and High. Three stages or columns named To-Do List, In Progress and Completed will be created in Trello. Each Kanban card will be moved to the columns once the tasks completed at certain stage. This method allowing every team member to aware the progress of every task in the development.

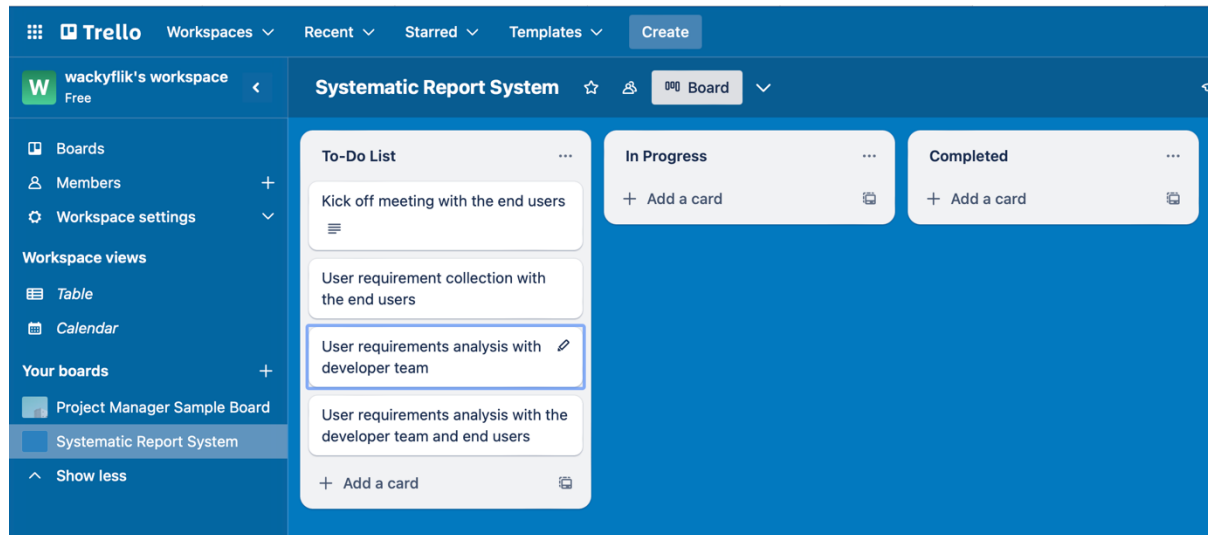


Figure 4. Trello project management dashboard

Then, the Scrum method is chosen because everyone must know about every progress of the project. There will be daily team meetings to discuss the identified tasks, progress of every task including anything that may affect the development [7-10]. The result of the team meeting will be updated in the Trello, an online project management tool as depicted in the Figure 4. Trello also allows user's feedback being logged and available to the whole development team. Therefore, everyone knows and is able to respond immediately to the feedback.

Then, the Extreme Programming (XP) is chosen because XP focuses on teamwork [8, 10-12] to improve software quality in response to the requirement changes. XP is chosen to speed up the development and produce a quality prototype. XP method is shown in Figure 5. Because the user requirements may keep changing, XP is believed to be suitable to be implemented in this project as well. Prototypes can be quickly produced and go for user testing. If the testing is successful, the developer team will focus on the next tasks. If the testing fails and the prototype requires changes, there are developers assigned to fix the problem while other developers continue the current or next tasks.

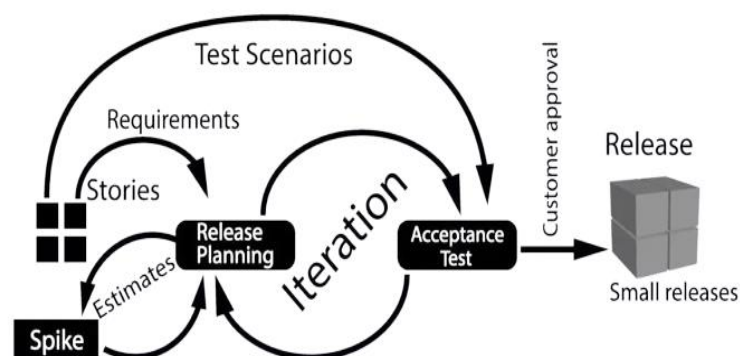


Figure 5. Extreme Programming method [5]

The procedure development will be using the Bootstrap CSS framework. The Bootstrap is a popular framework that allows the system being accessed conveniently on desktop or mobile devices. Several Bootstrap Admin templates such as AdminLTE, CoreUI, SB Admin 2, Dash UI, Tailwind CSS and a few others will be taken into consideration and finally will be chosen for the IS-CARE. The approach will be developed using the PHP server-side scripting. PHP is chosen because the infrastructure is already in place. MariaDB is chosen as the Database Management System (DBMS) to keep all the data for the IS-CARE. Other programming languages such as JavaScript, jQuery, Asynchronous JavaScript XML (AJAX) also will be used throughout the development. These languages are required to allow the Bootstrap responsiveness to work on devices and generating charts. PDF libraries such as FPDF, HTML2PDF, TCPDF or DOMPDF also will be used in IS-CARE to generate PDF files. The approach requires reports to be generated in PDF format and it can be used for audit purposes. Highcharts or ChartJS libraries will be used as well to generate charts in the system. There are many charts that must be displayed on screen; bar graph, pie chart, and line chart are among the output that will be generated from the process.

5. EXPECTED OUTCOME

Several outputs that can be generated in the set-up are statistical data such as number of programs based on faculties and campuses and number of programs based on UiGM six clusters. Besides, charts based on faculties, campuses, program levels, UiGM six clusters and categories will be available in the system. The proposed arrangement is expected to produce several crucial outcomes that will reinforce UiTM's sustainability initiatives and strategic objectives. Through consolidating the integrated reporting of sustainability activities across UiTM's multiple campuses into one centralized platform, the system will provide unified data and analytics to inform decision making benchmarking as well. This is likely to make it easier for UiTM to monitor sustainability KPIs and strategic goals such as SDGs and the Low Carbon Cities 2030 Challenge.

The approach will also automate sustainability reporting in formats such as PDFs for audit purposes and to go into the annual UiTM Sustainability Report. Additionally, the system's data and analytics will facilitate involvement in external sustainability rankings such as UI Green Metric and Times Higher Education. All in all, by enhancing the centralized data collection and monitoring functions of IS-CARE approach UiTM is aspiring to become a pioneer among Malaysian universities regarding campus sustainability initiatives. The anticipated results are improved collaboration, informed strategy development, streamlined benchmarking and comprehensive documentation of sustainability initiatives throughout the university administration.

6. CONCLUSION

The key success factor in greening the university is through optimum cooperation with the university's strategic partners both internally; within faculty, campus, students, and externally; local agencies, alumni, and local community. Both inner drive and smart cooperation will result in a systematic, comprehensive, and impactful program/activity towards greening the university. Such formulas aim towards a greener and healthier lifestyle for human well-being. This paper has introduced the development of the Integrated Sustainable Campus Report method as a response to UiTM's challenges of systematically assessing and documenting sustainability activities in its various campuses. The IS-CARE presented is a centralized point for aggregating sustainability initiatives and performance data from across UiTM campuses and programs. Some Agile development methods, such as Scrum and Extreme Programming, will ensure adoption of such a strategy in the organization, facilitating quick prototype building and system iteration based on the changing user needs. Bootstrap and responsive web design principles will also make the procedure easy to access on the desktop and mobile devices. The system implementation has large potential to reinforce UiTM's strategic goals under the Smart Campus core, through the facilitation of more coordinated and transparent monitoring of sustainability efforts. More integrated reporting will provide UiTM with an opportunity to compare its green campus initiatives and identify areas that need to be improved to bring each branch campus in line with the institutional-level strategic goals.

The system execution will be a significant milestone in UiTM becoming a pioneer in the field of campus sustainability among the Malaysian universities.

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