

Development of Web-Based Industrial Revolution 4.0 Implementation Monitoring System Prototype for Academic Programmes

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Universiti Malaysia Sarawak has moved forward to transform the conventional academic curriculum in line with Industrial Revolution 4.0 and the Ministry of Education's aspiration for future-ready curriculum transformation in academic programmes. The process of monitoring the implementation of Curriculum 4.0 in UNIMAS academic programmes involved a significant number of documents that are done manually due to records being kept in writing, printed using files and manual form. Thus, access to information is less organised, time consumed and require storage space. Furthermore, unsystematic, ununiform reporting on transformative teaching and learning with different formatting. A proposed system is developed by using Unified Modelling Language that consists of Use-Case Diagrams, Activity Diagram and Sequence Diagrams to interact between the users. In this prototype, all lecturers are required to fill in 14 criteria covering future-ready curricula such as curriculum structure, transformative learning teaching delivery, and alternative assessments. This system replaced the manual way of managing to monitoring, recording, analysing, and reporting the implementation of curriculum 4.0 elements and criteria in academic programmes including the transformative learning and teaching delivery practices. Furthermore, this proposed system is more efficient, accurate and user-friendly compared to manual implementation.

Keywords: Industrial Revolution 4.0 criteria; web-based Monitoring system; Unified Modelling Language; OBE

I. INTRODUCTION

Industrial Revolution 4.0 (IR 4.0) is a global stepping stone for equipping future generation with the current and trending skills and knowledge to meet future world. The IR 4.0 has been dominating the world and human system that revolves with technology such as Internet of things (IoT), Information Computer Technology (ICT) and cyber-physical systems (D'Souza & Mudin, 2018; Umachandran *et. al.*, 2018). As IR 4.0 becomes reality, Education 4.0 gives a big impact to researchers, educators and students to adapt the current situation.

In 2016, all UNIMAS initiative were successfully accomplished to ensure all academic programmes in UNIMAS were compliant with Outcome-Based Education (UNIMAS, 2019). Another initiative is to redesign all academic programmes at UNIMAS to be innovative and IR4.0 compliant programs. In 2018, UNIMAS has set fourteen IR4.0 criteria to be implemented in the academic programmes. There are ten faculties with 59 undergraduate and postgraduate programmes at UNIMAS. Curriculum program monitoring was executed by the Center for Academic Development and Management (CADM) manually using a paper form in which the lecturers were required to fill

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and make submission to CADM. There are fourteen (14) criteria listed in a form that is primarily to check the opinions and suggestions of lecturers about the syllabus and courses offered in the academic programmes against IR 4.0. The form is fourteen pages document and it is too thick and tedious which can result in inefficiencies, data errors, and time-consuming for CADM staff to monitor, enter and calculate criteria mapped to the programme. To ensure a holistic implementation of IR 4.0 criteria for academic programmes at UNIMAS, a web-based IR4.0 implementation monitoring system (IR4IMoS) is proposed. IR4IMoS is a web-based system developed to monitor the implementation of 4.0 curriculum elements and criteria in academic programmes. In this system, it is used to record, monitor and report the IR4.0 criteria in academic programmes including the transformative learning and teaching delivery practice. The users and administrators filled in the curriculum 4.0 criteria form online and the data were stored in database. Moreover, the IR4IMoS also expedites the process of calculating the percentage of curriculum IR 4.0 implementation in courses and academic programmes. The pattern of selected curriculum IR 4.0 criteria by the faculties, and the practice of curriculum IR 4.0 in academic programmes can be determined using IR4ImoS, thus allowing the university to monitor the practice of Curriculum IR 4.0 by the academic programmes in UNIMAS. A few studies has been adapt similar features with this project such as web based, print, platform-friendly, login page, implementation cost reasonable and logout (Sunehra D & Ramakrishna P, 2016; Lalas G & Marcial DE, 2016; Adagale *et al.*, 2016). However, these studies (Sunehra D & Ramakrishna P, 2016; Lalas G & Marcial DE, 2016; Adagale *et al.*, 2016) have different application, purpose and methodology used in the system.

The problems and limitations of the project were discussed in Section I. In Section II, Section III and Section IV, the prototype development, implementation and result analysis related to prototype to solve the mentioned problems were explained. Conclusion and future work is explained in Section V.

II. METHODOLOGY

In this project, object-oriented systems analysis and design has been adapted to run the system development that must

change rapidly. In the software industry, object-oriented methodologies are often used. It breaks down the system into a use case model using the unified modelling language (UML) as depicted in Figure 1.

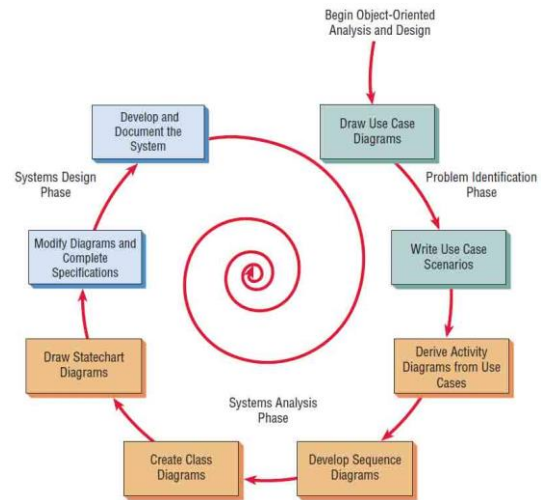


Figure 1. Steps in the UML development process.

A. Define the Use Case Model

First, the actors are identified by the analyst and the key events initiated by the actors. The actors in the Use Case Diagram are the Administrators and Users where the actors can be any stakeholders, whether an organisation, person, device or external system that interacts directly with the system (Sunehra & Ramakrishna, 2016; Nurmoslim *et al.* 2017; Vino & Rubby, 2018). The Use Case Diagram is used to show the proposed system functionality to the user. It is a simple and powerful strategy for determining the nature of an important system as mentioned by (Solet *et al.*, 2010). As for the IR4IMoS, CADM staffs are the administrators and the lecturers are users of this system. There are six matching functions namely login, select criteria, fill a form, update criteria form, delete criteria form, print summary, and log out as shown in Table 1. Users from different faculties cannot select and print summaries from other faculties. It can only be done by the administrators and the faculty themselves. Figure 2 illustrates the Use Case Diagram for IR4IMoS.