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INTERNATIONAL JASIN MULTIMEDIA & COMPUTER SCIENCE INVENTION AND INNOVATION EXHIBITION (I-JaMCSIIX) 2023

EXTENDED ABSTRACT

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Assessment Marks Management System: A Excel VBA Approach

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Abstract— **The administration of course grades within higher education institutions has seen significant improvements thanks to the introduction of Teaching and Learning (T&L) technology. Integrated platforms like UiTM's e-Result Exam System (eRES) have been instrumental in storing, analyzing, and producing accurate results swiftly, reducing the time and effort compared to traditional methods that often led to inconsistencies. Consequently, instructors, who were traditionally responsible for this task, can now benefit from this convenience and focus on more impactful academic pursuits within their institutions and for their career advancement. However, the emergence of Outcome Based Education (OBE) and specific accreditation requirements have necessitated a precise alignment of systems to be truly beneficial. This alignment can sometimes make the data input appear more abstract or derived, requiring manual preprocessing of raw marks before they can be entered into such systems. This manual step introduces the potential for inaccuracies and inconsistencies, even in an otherwise excellent implementation. To address this challenge, this innovation has introduced an Excel VBA-based program capable of transforming raw marks from various assessments, questions, labels, performance indicators, and weightings into a format better suited for the system or any potential future variations, as long as they adhere to the label descriptors. Additionally, this tool offers flexibility in handling multiple contributors, multiple assessments, question breakdowns or combinations thereof, label string descriptions, marks or grade proximity, and more. In summary, this tool complements the existing system's functionality, resulting in improved computational accuracy and the resolution of complexities at a fraction of the time and cost.**

Keywords— Excel VBA tool, marks processing, academic, computation

I. Introduction

Campbell [1] presented an ICT assessment tool with the primary objective of minimizing the labor-intensive tasks associated with grading, record-keeping, and delivering feedback on assessments. In contrast, Koushik et al [2] put forward an automated system employing character recognition techniques for the purpose of handling grades extracted from handwritten answer scripts. This system holds the potential to significantly economize both time and effort for evaluators long used to conventional or manual processes so prevalent at one time in the education sector.

On this note, eRES was developed and employed by UiTM relying upon web-based technology to create a gateway for students to retrieve their examination outcomes. To utilize eRES, students must log in using their SIMS (Student Information Management System) account credentials. It serves as UiTM's primary mechanism for overseeing student academic data. Beyond eRES, UiTM offers a mobile application called MyStudent, enabling

students to access fundamental student-related information, including current course details, class schedules, and examination results for the ongoing semester.

However, from the point of view of the instructors, eRES demands the input of derived data rather than unprocessed, raw data. This stipulation means that before data can be entered into the eRES system, a preceding step of data derivation or transformation is necessary. However, this preprocessing stage can be an intricate process that involves additional effort, consumes more time, and introduces the potential for errors. The need for data derivation stems from the fact that raw data, in its original form, may not align with the specific format or structure required by eRES. Therefore, it becomes imperative to manipulate and mold the data to meet the system's criteria, which can encompass tasks like data cleansing, formatting, and organizing. To address this challenge, the implementation of supplementary tools or automation mechanisms can be invaluable.

Leveraging Excel VBA (Visual Basic for Applications) for crafting a data preprocessing tool, such as one tailored for eRES, confers several significant advantages [3]. Primarily, VBA excels in automation, enabling the streamlining of repetitive tasks associated with data manipulation. This translates into a substantial reduction in time and labor required, as VBA can be employed to automatically clean, format, and transform raw data into the precise format demanded by eRES. Customization is another pivotal benefit, with VBA allowing the tool to be meticulously designed to meet the exact data requirements of eRES, ensuring seamless integration. Through automation, the risk of errors is considerably diminished, as VBA-equipped tools meticulously apply predefined rules and validations to the data. Scalability is another key facet, as VBA is capable of handling substantial datasets, making it eminently suitable for universities and institutions dealing with vast amounts of information. Furthermore, VBA's capacity to create user-friendly interfaces within Excel means that individuals with varying degrees of technical proficiency can effectively employ the tool. This accessibility enhances its utility across diverse user groups. Lastly, the transparency and auditability of VBA code ensures compliance with data handling regulations and offers an opportunity for continuous improvement and adaptation to evolving requirements. Overall, Excel VBA presents a robust, cost-effective, and adaptable solution for universities seeking to optimize their data preprocessing workflows for eRES and similar systems.

II. MATERIALS

A. Tools for Assessment Marks Procsesing

Assessment marks compilation and processing tools can be categorized into several distinct categories namely manual tools, computerized tools, specialized assessment management systems, integrated educational platforms, customized and in-house solutions, assessment data analytics tools, and cloud-based solutions [4]. Manual tools, such as pen and paper or physical gradebooks, are still employed in some educational settings but are gradually being phased out in favor of more advanced options. Computerized tools such as Learning Management Systems have become integral in modern education. Specialized assessment management systems and online assessment platforms have gained popularity, especially in higher education and distance learning contexts. Integrated educational platforms that combine various educational tools, including assessment marks compilation and processing, have simplified data management and communication within educational institutions. With cloud-based tools, educators and administrators can access assessment data from anywhere, facilitating remote learning and administrative tasks.

Regardless, customized and in-house solutions are still used in institutions with specific requirements, offering tailored solutions for assessment data management [5]. Additionally, assessment data analytics tools are becoming increasingly crucial, providing educators and administrators with valuable insights into student performance and helping institutions fine-tune their educational strategies. Approaches like OBE are especially well-suited for this kind of treatment.

B. Outcome Based Education (OBE) in Assesssment

OBE in course assessment is a comprehensive educational framework that fundamentally shifts the way we plan, deliver, and evaluate education [6]. At its core, OBE centres on defining explicit and measurable learning outcomes as the foundation of the entire educational process. Educators begin by meticulously outlining what students should achieve in terms of knowledge, skills, and competencies by the conclusion of a course or program. These outcomes serve as the guiding compass for curriculum design, instructional methods, and assessment strategies.

As such, OBE has introduced another level of complexity in the compilation of assessment marks [7]. In traditional education systems, assessment and grading often revolve around a simple accumulation of points or percentages earned on individual assignments, tests, and exams. However, OBE challenges this conventional approach by necessitating a more nuanced and comprehensive assessment of student performance. These include aligning assessments with the predefined learning outcomes, the use of varied assessment methods, the need for ongoing assessment and feedback, and the aggregation of assessment data from various sources and over extended periods.

III. METHODS

The marks processing tool was developed using the Waterfall model. In Excel VBA program development, the Waterfall Model represents a structured and sequential approach to project management [8]. It involves a series of distinct phases, each building upon the previous one, much like a waterfall flowing steadily from one stage to the next as indicated in Figure 1. It typically begins with a comprehensive and detailed requirements gathering phase. Once the requirements are well-defined, the next phase focuses on system design. The implementation phase involves the actual coding of the VBA program based on the design specifications. Following implementation, the testing phase begins. Once testing is complete and the VBA program meets all requirements and quality standards, it moves on to deployment and maintenance.

In the context of the specific project at hand, it's essential to highlight that the Excel VBA project's requirements are well-defined and stable. This means that the project team has a clear and comprehensive understanding of what the VBA program needs to accomplish and how it should function. The stability of these requirements implies that they are unlikely to undergo significant changes or revisions as the project progresses. Given this scenario, the Waterfall Model presents itself as an advantageous choice for managing the development process. The Waterfall Model's strength lies in its structured and sequential approach, which aligns well with projects where the scope and specifications are well-established from the outset.
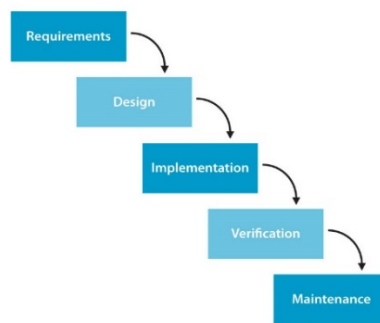
Fig. 1. The Waterfall Model

A. Requirements

During this stage, developers work closely with stakeholders to define and document the specific functionalities and features required for the VBA program. Basic information such as student information, course information, assessment components and unprocessed assessment scores are gathered at this stage. In addition, grading scale, calculation method, final grades, and other pertinent information are also defined to ensure consistency, fairness, and transparency in evaluating and reporting students' academic performance.

This initial phase is crucial, as it sets the foundation for the entire project.

B. Design

In Excel VBA, this entails planning the architecture, data structures, and the overall logic of the VBA program. The architectural plan includes defining the organization of the VBA code, the creation of modular components for distinct functionalities, the establishment of a user-friendly interface, the consideration of error handling mechanisms and the delineation of program flow. Next, the data structures embody the selection of appropriate data types for variables and objects within the program, and the validation procedures to uphold data integrity. In the broader context of logic, the high-level objectives of the VBA program must be explicitly outlined and rigorous testing and debugging strategies devised.

Detailed design documents are created to guide the coding phase.

C. Implementation

. Developers write, test, and refine the code to ensure it meets the requirements and functions as intended. This phase requires meticulous attention to detail to ensure accuracy and reliability.

D. Verification

In Excel VBA, rigorous testing is essential to identify and rectify any errors or bugs in the program. This includes functional testing to confirm that the VBA program performs its intended tasks and integration testing to ensure it works seamlessly within the Excel environment.

E. Maintenance

Deployment involves making the program available to users, and maintenance includes ongoing support, updates, and bug fixes as needed.

IV. RESULTS AND FINDINGS

The program's architecture is thoughtfully divided into three well-defined tab sections: data, calculation, and query, each playing a pivotal role in managing and utilizing vital information effectively. At the heart of this structure lies the data section, acting as the central repository for essential inputs. Here, users can meticulously record a plethora of information crucial to the academic assessment process. This encompasses comprehensive student profiles, including names, identification details, and contact information, as well as specific course-related data, such as course names, codes, and semester specifications. Additionally, the data section facilitates the systematic management of assessment components, allowing users to define and organize various factors contributing to students' overall grades, including exams, assignments, quizzes, and participation scores. It also serves as the storage ground for the raw assessment scores, laying the foundation for accurate grading and analysis.

Moving to the calculation section, this segment serves as the computational powerhouse of the program. Here, complex mathematical operations and logical algorithms come to life, enabling the precise determination of final marks and grades based on the meticulously gathered input data. Leveraging the assessment scores and predefined grading criteria assigned to each assessment component, the calculation section ensures that grading is consistent, fair, and in line with institutional grading standards. It provides not only the calculated scores but also translates them into letter grades, thereby encapsulating the essence of academic achievement accurately.

Finally, the query section adds a layer of sophistication to the program's functionality. Designed for users to extract tailored insights from the amassed data, this section empowers educators and administrators with the ability to request specific information, be it class averages, top-performing students, or assessment score trends. What sets the query section apart is its capacity to present these insights in visually compelling formats. Users can choose from an array of options, including informative graphs that visualize trends and patterns over time, concise tables that summarize data comprehensively, or statistical parameters that provide in-depth analytical insights. This feature equips educational professionals with a robust tool to make data-driven decisions and gain a deeper understanding of academic performance, thereby enhancing the overall educational process. In summation, the tripartite structure of data, calculation, and query sections seamlessly integrates data management, precise grading, and insightful analysis, offering a comprehensive and efficient solution for academic assessment and administration.

V. CONCLUSIONS

The VBA-based assessment marks management system has proven to be exceptionally proficient in its performance, going above and beyond the anticipated outcomes. It has demonstrated its ability not only to meet but also to exceed expectations by efficiently and effectively carrying out the tasks it was designed for, ultimately contributing to enhanced academic administration and assessment processes.

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