Enhancing Career Readiness: An Online Platform for Competency Assessment and Workplace Selection in Cooperative and Work-Integrated Education for Thai University Students

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Abstract—The Cooperative and Work-Integrated Education (CWIE) program can be seen as a great opportunity to gain professional experience prior to entering the real-world job market for Thai university students; as a result, choosing a workplace in this program wisely is vital for students. They should choose an organization that is a good fit for their circumstances. However, many of them still do not know what sector of employment they are competent at or like, lack of confidence in their skills and knowledge, or are unaware of what positions are now available on the job market. As a consequence, the search for a workplace is postponed, perhaps resulting in a late graduation. Particularly in the field of information technology, where it is continually evolving and there are several occupations available, each with its own set of requirements. As a result, the researcher conducted a literature review on student job search and information system development for cooperative and work integrated education in universities and proposed online platform components to assist students in determining their competencies as well as searching for an organization that provide opportunities for them.

Index Terms—cooperative and work-integrated education, on-line assessment platform, automate data extraction

I. INTRODUCTION

In today's employment market, graduates must have good academic credentials, transferrable skills, and the ability to start working soon after graduation. To respond successfully, colleges and universities must equip students with the abilities and traits required in today's job market. As a result, excellent education and career guidance are critical to producing well-prepared graduates.

In Thailand, the Cooperative and Work-Integrated Education (CWIE) program is one of many programs that has been identified as an effective technique in satisfying this educational demand [1], [2]. Rajamangala University of Technology Rattanakosin acknowledges values of the CWIE program for students, and so incorporates the program's subjects within the Faculty of Engineering's curriculum. Participating in the CWIE program provides students with valuable opportunities to gain professional knowledge and experience prior to entering the workforce.

To be successful in the CWIE program, students must possess the essential knowledge, skills, and competencies required to effectively engage with individuals, exhibit appropriate behavior, and demonstrate a sufficient level of maturity and personal growth to navigate professional environments. Therefore, it is imperative for students to carefully select a workplace that aligns with their future job demands, as well as their individual skills and preferences.

However, the career decisions of the majority of students are often influenced by their peers or experienced individuals who have previously been employed in the respective sector or organization. Such influence may not align with their personal preferences. Consequently, there exists the potential for an erroneous selection, leading to adverse consequences for the student's collaborative and experiential learning endeavors. Moreover, a considerable number of students encounter the predicament of lacking awareness regarding their aptitudes and interests, or harboring doubts about possessing adequate information to pursue their desired career within a business. Despite having a clear career goal, students may lack the knowledge and skills required to effectively search for employment opportunities and make informed decisions regarding the organizations they wish to join in order to initiate their professional journeys [10]. The aforementioned concerns have the potential to impede students' participation in the CWIE program, which may consequently lead to a postponement in their graduation.

As a result, the researcher is encouraged to propose online platform components to assist students in recognizing their competencies in the field of application development, as there are so many diverse employment opportunities available. In addition, the proposed system is intended to facilitate the search, collection, and categorization of job position information so that students can easily locate a workplace that meets their needs. The researcher anticipated that the proposed system would aid students in gaining a deeper comprehension of employment opportunities and labor market demands in application development, as well as aiding them in acquiring crucial labor market skills.

The remaining sections of this paper are structured as follows. The literature review is located in Section II. Section III describes the proposed system. Conclusions and recom-

mendations for further research are provided in Section IV.

II. LITERATURE REVIEW

In this section, the researcher aims to provide a comprehensive literature review pertaining to the advancement of information systems for cooperative and work-integrated education. The objective is to gather noteworthy concepts and viewpoints that may be effectively included into the present study.

The pursuit of employment is a pivotal and often anxiety-inducing endeavor, particularly for recent university graduates [13]. For these individuals, the journey extends beyond a mere job search; it signifies a significant life transition known as the school-to-work transition (STWT), marking the shift from academia to full-time employment [10]. This transition is fraught with uncertainty, as new entrants to the workforce may find themselves unfamiliar with the myriad options available to them [11]. In navigating this crucial phase, enrolling in the university's Cooperative and Work-Integrated Education (CWIE) program becomes a strategic choice [12], offering a structured pathway to bridge the gap between academic learning and professional work [14].

Addressing the challenges of employability and unemployment among young individuals, Adedeji et al. [15] proposed a web-based Work-Integrated Learning (WIL) platform, specifically in the construction field. This platform aims to enhance employability skills by connecting students with available WIL positions, utilizing a comprehensive system block diagram and activity diagram, along with employing HTML, CSS, C-Sharp, and MySQL for interface design and database functionality.

Meanwhile, Mernkratok et al. [7] focused on evaluating the efficacy of an e-Learning program in a Pre-Cooperative Education Course, emphasizing the enhancement of students' report-writing abilities—a crucial skill before embarking on their work placements. Jewpanya et al. [8] employed the Analytic Hierarchy Process (AHP) to assist students in the intricate process of selecting a company for cooperative education.

Simultaneously, research in the past decade has been devoted to developing information systems facilitating routine document work related to cooperative and work-integrated education. These systems include features for storing, searching, and reporting data over the Internet, ultimately enhancing the efficiency of managing cooperative and work-integrated education projects in universities [3]–[6]. Also, Brink, Mearns, and Plessis [16] emphasized the need for structured information management (IM) in work-integrated learning (WIL) at South African higher education institutions, drawing insights from international frameworks for potential implementation.

Furthermore, Batpho, Perkhiao, and Kanlaor [17] delved into the design and development of a database system for managing Cooperative and Work Integrated Education at Thonburi University. This study, conducted using PHP, JavaScript, Bootstrap, and MySQL, adhered to the System Development Life Cycle (SDLC) and demonstrated high efficiency, as validated through Black Box Testing. User satisfaction, assessed among 149 participants, revealed instructors as the most satisfied
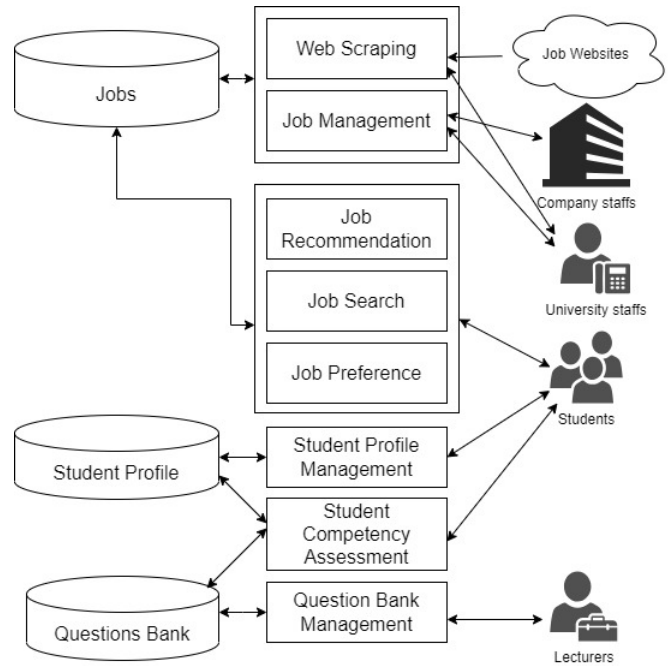

Fig. 1. The proposed system block diagram

group, followed by staff from the major, students, and individuals from the cooperative education department. Collectively, these studies underscore the multidimensional efforts in enhancing the effectiveness of Cooperative and Work-Integrated Education programs through technological interventions and strategic frameworks.

Nevertheless, previous studies have not adequately addressed the comprehensive information required to enhance students' preparedness for job searching and work placements in cooperative and work-integrated education programs. Therefore, the objective of this study is to address this deficiency by presenting a holistic online platform for evaluating competencies and selecting candidates for employment, with a specific focus on Thai universities as a case study.

III. THE PROPOSED SYSTEM

The primary objective of this study is to propose an online platform to assist university's CWIE students with self-evaluation and employment selection. In Section II, the researcher reviewed the literature on student employment finding and information system development related to cooperative education in universities in order to address the issues.

This section encompasses the presentation of the system block diagram, use case, and detailed explanation of each component inside the proposed system. The proposed system, as depicted in Fig.1, comprises of five components:

A. Web Scraping and Job Management

The Web Scraping and Job Management component plays a crucial role in the proposed system. It is specifically designed to collect, arrange, and oversee job-related data on the

TABLE I
EXAMPLES OF ARGUMENTS FOR RETRIEVING EACH ATTRIBUTE OF THE ADVERTISED POSITIONS IN JOBBKK, JOBTHAI, AND JOBTH WEBSITES

| Data	JOBBKK	JobThai	JobTH
Position name	"//h6[@class='applying']"	"//h2[@class='ohgq7e-0 frNqfE']"	"//a[@class='w3-large LinkVisited']/b"
Company name	"//div[@class='col-md-8 col-sm-8 col-xs-8 name-company']"	"//span[@class='msklqa-2 bLKwZm']/h2"	"//a[@class='w3-large']"
Advertisement time	"//div[@class='col-md-4 col-sm-4 col-xs-4 time-company']"	"//div[@style='text-align:right']"	"//div[@class='w3-light-gray w3-padding w3-leftbar w3-border w3-medium w3-round'][text()]"
Salary	"//div[@class='col-md-12 col-sm-12 col-xs-12 list-company-salary']/h6[1]"	"//span[@id='salary-text']"	"//font[@class='w3-text-red'][2]/b"
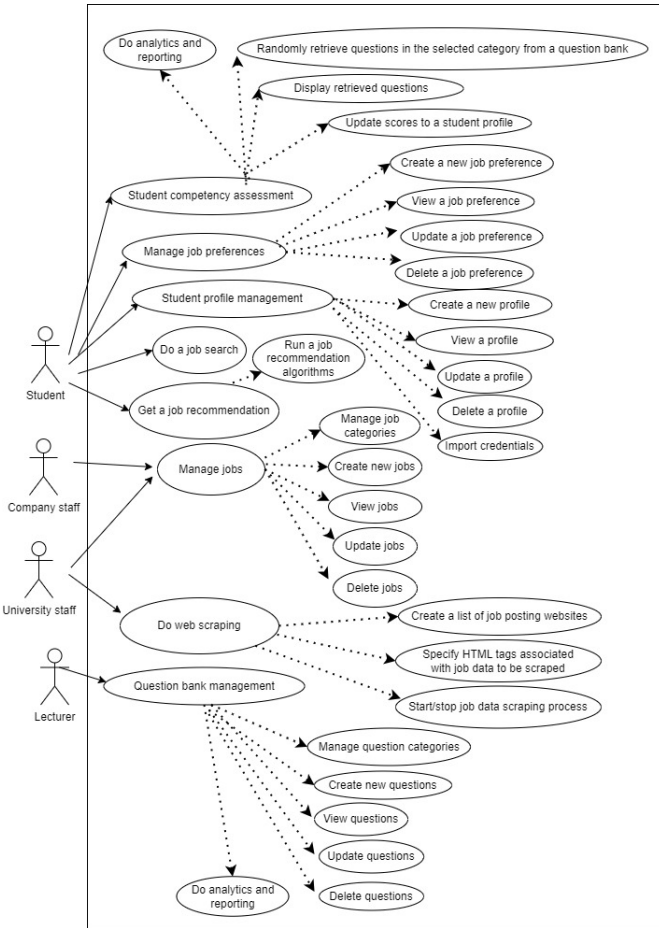
Fig. 2. The proposed system use case diagram

Internet. These modules effectively streamline the process of aggregating and managing job information.

The Web Scraping functions as the mechanism for gathering data from diverse web sources. Utilizing automated algorithms, this process routinely retrieves employment-related data from diverse online sources, including websites, job boards, and corporate career pages. The functionality of this module includes proficiently traversing web pages and efficiently identifying and extracting targeted data items, such as job titles, descriptions, requirements, and application details.

The constant and up-to-date supply of job postings is ensured by the Web Scraping module through the automation of the data extraction process.

After the collection of pertinent job data, the Job Management module is activated. The primary function of this module is to systematically arrange and store the extracted data in a well-organized format. The system classifies employment positions according to diverse factors, including industry, geographical area, and job classification. This results in the establishment of a centralized database that enhances the effectiveness of job administration and retrieval processes. Furthermore, the module has the potential to integrate functionalities pertaining to data cleansing and validation in order to guarantee the precision and reliability of the job-related data.

The primary purpose of the Job Management module is to offer a user-friendly interface that facilitates the interaction between university staffs (or administrators) and company staffs (or recruiters) with the accumulated data. Individuals have the ability to conduct searches, apply filters, and arrange job postings in a desired order according to their personal tastes and specific criteria. The provision of a well-structured and user-friendly platform significantly improves the entire user experience, as it allows for efficient navigation and access to a wide range of job prospects.

The incorporation of these modules facilitates the automation and streamlining of the work aggregation process. The practice of web scraping serves to maintain the job database's currency by continually incorporating the most recent employment prospects, while job management optimizes the arrangement and availability of this data. Consequently, this has advantageous implications for job searchers, companies, and recruiters as it effectively reduces time consumption, offers a thorough overview of the accessible job market, and facilitates well-informed decision-making during the hiring process.

Additionally, it is worth noting that these modules may incorporate notification functionalities, which serve to inform users about newly available job opportunities that align with their specified preferences. This feature further augments the system's proactive nature. By implementing automation for the laborious tasks involved in collecting and managing job data, these modules enable users to allocate their attention towards

more important elements of job search, recruitment, and career development.

For the proof of concept, the researcher used Selenium WebDriver [9] in conjunction with the Python programming language and XPath, the language used to locate nodes in an XML document, to extract the necessary data from various HTML components on Thai job posting web sites, as shown in Table I, and update it in the MySQL database. The researcher must first manually located the correct web page containing a list of programmer and web developer positions for cooperative employment, and then located HTML elements containing the requisite attributes of the advertised positions. After locating the desired web page, the researcher utilized Google Chrome Developer tools to identify the HTML element that displayed the position name and then converted it to XPath format, as shown in Table I. Then, by specifying the arguments in XPath format to method find_elements_by_xpath() in our Python program, the researcher retrieved each attribute of the advertised positions. For example, a position and company name on JOBBKK were retrieved by passing arguments "//h6[@class='applying']" and "//div[@class='col-md-8 col-sm-8 col-xs-8 name-company']" respectively.

B. Job Recommendation, Job Search and Job Preference

The integration of the Job Recommendation, Job Search, and Job Preference constitutes a comprehensive system within the domain of career services and employment assistance. These modules play a crucial role in facilitating the connection between job searchers and appropriate career possibilities, taking into account their unique interests and qualifications.

The Job Search module serves as a platform via which users can access and explore a wide range of employment prospects. The platform serves as an interface that is designed to be easily navigable by users, enabling them to input various parameters such as industry, location, job type, and experience level in order to refine their search. This module enhances the efficiency of the job-seeking process by offering a centralized platform that enables users to access a wide range of employment ads, hence optimizing time and effort for individuals searching for work opportunities.

In addition to the Job Search module, the Job Recommendation module employs algorithms and data analytic techniques to propose pertinent employment prospects to individuals, taking into account their profiles, abilities, and previous job inquiries. The customized recommendation system improves the job search process by providing customised suggestions that correspond to the individual's qualifications and professional goals. This not only enhances efficiency for individuals seeking employment but also enhances the probability of identifying work opportunities that may have been disregarded.

The Job Preference module has been specifically developed to effectively collect and retain individual preferences and career objectives. Individuals have the ability to provide their desired sectors, professional settings, occupational positions, and additional pertinent variables. The provided material becomes a great resource for those seeking employment oppor-

tunities as well as employers in need of potential candidates. For individuals seeking employment, this tool aids in the process of narrowing down job searches and obtaining more precise recommendations. Employers may enhance their job advertising and recruitment tactics by gaining a comprehensive grasp of the preferences of prospective candidates.

Collectively, these modules establish a comprehensive ecosystem that enhances the efficiency of the job search and recruitment process. Students derive advantages from a streamlined and tailored experience, whereas employers acquire the opportunity to tap into a reservoir of applicants whose interests and talents correspond with their organizational requirements. The use of recommendation algorithms and preference tracking improves the efficiency and efficacy of the job matching process, hence facilitating successful and satisfactory employment outcomes for all stakeholders.

C. Student Profile Management

The Student Profile Management component plays an important role within educational institutions, functioning as a comprehensive system for the organization and maintenance of vital student information. Fundamentally, this module operates as a centralized repository that acquires and oversees a wide range of data points pertaining to every student that is registered in the educational institution.

One of the principal purposes of the module is to enable the efficient generation and maintenance of individual student profiles. The aforementioned information encompasses fundamental personal particulars such as one's name, contact details, and date of birth, with more academically-oriented characteristics such as enrollment status, class timetables, and academic achievements. By centralizing this data within a unified platform, administrators, educators, and other authorized individuals can conveniently oversee and evaluate the academic advancement of each student throughout their educational trajectory.

Additionally, the Student Profile Management module frequently has functionalities that facilitate the documentation of extracurricular activities, accomplishments, and disciplinary records. The implementation of a holistic approach to student data allows educational institutions to cultivate a thorough comprehension of the entire growth and progress of individual students, hence facilitating the creation of a more tailored and supportive educational milieu.

Another key element of this module is to its significance in facilitating communication and fostering teamwork. The system enables effective communication among the educational institution, students, and their parents or guardians by ensuring that contact details and communication preferences are kept current. This practice guarantees that significant notifications, updates on progress, and other pertinent information are promptly delivered to the intended recipients.

In addition, the Student Profile Management module enhances administrative efficiency through the automation of various routine operations, including enrollment procedures,

grade computations, and attendance monitoring. The implementation of this approach not only serves to alleviate the burden on administrative personnel, but also serves to mitigate the potential for errors that may arise from the human handling of data.

The Student Profile Management module functions as a versatile tool that surpasses mere record-keeping capabilities. Educational institutions are enabled to improve their overall operational efficiency, facilitate a more individualized learning experience, and nurture a collaborative environment that promotes the comprehensive development of every student.

D. Student Competency Assessment

The Student Competency Assessment component holds significant importance within the realm of education and workplaces, as it is specifically crafted to assess and gauge the proficiencies and abilities of students across diverse disciplines. This module functions as a structured framework for evaluating and monitoring pupils' advancement in terms of both scholastic and non-scholastic abilities.

The module primarily serves to enable the development and management of assessments that are in accordance with the targeted competences and learning objectives established by the educational institution and companies that signed MOUs with universities. The evaluations have the capacity to encompass a diverse array of talents, which may include, but are not restricted to, academic disciplines, critical analysis, the ability to solve problems, effective communication, and collaborative work. Through the process of defining and quantifying these skills, educators are able to get significant insights on the strengths and areas requiring development of individual pupils.

The primary purpose of the Student Competency Assessment module is to offer a thorough perspective on student performance to fit the requirement of their prospective companies. By conducting an analysis of assessment outcomes, instructors are able to discern particular areas in which a student has exceptional proficiency, as well as those that may want further focus and support. The utilization of a data-driven methodology facilitates the implementation of focused interventions and individualized learning plans, so guaranteeing that every student is provided with the necessary assistance tailored to their own educational trajectory.

In addition, the module frequently incorporates elements for ongoing evaluation, enabling educators to monitor the advancement of students over a period of time in the Cooperative and Work-Integrated Education. The utilization of a longitudinal perspective is crucial for comprehending the progression and enhancement of students' competencies over the course of their academic trajectories. Additionally, it serves as a foundation for modifying instructional approaches and educational plans in order to more effectively address the changing requirements of learners and targeted companies.

The Student Competency Assessment module not only facilitates personalized learning but also plays a significant role in enhancing institutional improvement endeavors. The utilization of aggregated data derived from assessments has the potential to provide valuable insights that can impact various aspects of curriculum design, teaching approaches, and the overall efficacy of educational programs. This information can be utilized by institutions to make well-informed decisions that contribute to the improvement of education quality and the effective preparation of students for forthcoming difficulties.

In addition, the module has the potential to integrate reporting and analytics functionalities, which would allow various stakeholders such as educators, parents, and administrators to conveniently access and analyze assessment outcomes. The promotion of transparency in the educational process facilitates effective communication and collaboration among all stakeholders, thereby cultivating a collective dedication to the achievement of student success.

In conclusion, the Student Competency Assessment Module serves as a crucial component in improving the caliber of education through the provision of a systematic framework for evaluating and cultivating a wide range of competencies. This module facilitates the empowerment of educators and institutions in fostering a learning environment that promotes the comprehensive development of students, encompassing personalised learning plans and institutional enhancements.

E. Question Bank

The Question Bank component is a crucial element inside educational systems, functioning as a centralized repository for the storage, organization, and management of a wide range of questions utilized in assessments and examinations. This module assumes a crucial function in facilitating the optimization of the procedure for generating, disseminating, and assessing evaluations across diverse academic fields.

The major purpose of the Question Bank component is to enable the generation and retention of an extensive collection of questions. These inquiries may involve many formats, such as multiple-choice, true/false, short response, and essay-based questions. Educators and administrators possess the ability to classify and label inquiries according to subject matter, levels of complexity, and additional pertinent factors. This process facilitates the creation of a flexible and readily available tool for the formulation of assessments.

The utilization of this module greatly enhances the efficiency of the assessment creation procedure. Educators have the option to utilize a pre-existing question bank in order to construct personalized tests that align with specific learning objectives and curricular requirements, rather than creating assessments from the ground up. This practice not only results in time efficiency but also guarantees a uniform and standardized methodology for the development of assessments across various courses and teachers.

Additionally, the Question Bank component facilitates the use of diverse assessment methods. Educators have the ability to create tests that accommodate various learning styles and cognitive levels by providing a wide array of questions. This particular assortment of factors enhances the overall assessment of pupils' comprehension and proficiency in the given field of study.

The module frequently integrates functionalities pertaining to version control and security. Educators possess the capability to exercise control over the accessibility of particular questions, so averting any illegal alterations and upholding the overall integrity of assessments. Furthermore, the implementation of versioning facilitates the systematic monitoring and documentation of modifications made over a period of time, so establishing a comprehensive record that ensures responsibility and guarantees the maintenance of high standards.

Collaboration constitutes an additional fundamental component of the Question Bank component. Educators have the ability to engage in knowledge exchange with their peers, so cultivating a collaborative atmosphere conducive to the collective development and enhancement of assessment materials. The adoption of a collaborative approach in assessments serves to improve the overall quality of evaluations and facilitates the sharing of effective teaching methods and evaluation strategies. In addition, the module may incorporate analytics and reporting functionalities that empower educators to assess the long-term effectiveness of questions. The utilization of data-driven insights facilitates the identification of the efficacy of certain inquiries, enabling educators to consistently enhance and refine the repository of queries for forthcoming evaluations.

The Question Bank component is a multifunctional instrument that effectively improves the efficiency, uniformity, and caliber of the assessment procedure inside educational establishments. This module enhances the efficacy of teaching and learning by facilitating a centralized repository of questions and promoting collaborative endeavors among educators.

IV. CONCLUSIONS AND FURTHER RESEARCH

In summary, this research highlights the significance of the Cooperative and Work-Integrated Education (CWIE) program for Thai university students, emphasizing the need for informed workplace choices, especially in the dynamic field of information technology. Challenges such as self-assessment issues and a lack of information contribute to delays in workplace searches and potential graduation setbacks.

The proposed online platform components offer a holistic solution by facilitating competency assessments and guiding students in selecting organizations aligned with their skills and preferences. This research sets the stage for future work in testing, validating, and refining the platform for optimal usability and effectiveness.

Moving forward, the platform requires rigorous testing and validation, incorporating user feedback for continuous improvement. Long-term studies can assess its impact on students' career trajectories, and updates should reflect the evolving job market. Collaboration with institutions and industry partners can enhance the platform's capabilities and broaden its reach, contributing to more informed decisions during the CWIE program.

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