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Original Article

Development of an Industrial Practical Training Information and Management System

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ABSTRACT

Growing demand exists in the industry for graduate students possessing ample non-technical skills. However, current offerings often fall short of employers' expectations. To address this, both employers and educators are closely monitoring the Industrial Training Management System (IPTMS), which aims to mold engineering students into job-ready professionals. IPTMS presents a viable alternative to proposals suggesting extended industrial training periods to enhance non-technical skills. Its effectiveness hinges on structured competency-based training programs tailored to adult learning principles, rapid skill enhancement for engineering students, and the ability to assess both trainers' and students' competencies. Additionally, IPTMS facilitates student recruitment and placement, minimizes skills mismatches, and incorporates robust reporting documentation such as log books, report books, and presentation slides following the Eight-Disciplines (8D) methodology. Furthermore, it includes mechanisms for student rewards and recognition. This paper undertakes a systematic literature review of existing research on IPTMS for graduate engineers, drawing primarily from electronic databases like Scopus and Web of Science. The analysis identifies gaps in current IPTMS implementations within engineering industries, offering conclusions and recommendations for comprehensive IPTMS design enhancements.

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INTRODUCTION

Both the EAC (2012) and MOHE (2012) emphasized the significance of industrial training, proposing a minimum duration of 6 months. However, prolonging this training might burden engineering students amidst their demanding coursework. A more viable approach entails refining the structure of industrial training to integrate essential skills within a manageable timeframe. Implementing a robust Industrial Training Management System (IPTMS) is vital to mutually benefit both employers and students. Without it, there's a risk of exploitation by employers seeking inexpensive labor. An effective IPTMS should incorporate structured modules, competent trainers, efficient assessment methods, and recognition of adult learning principles. Improving the current framework primarily rests on employers, as they determine interns' performance levels. Collaboration between industries and universities is crucial to bridging the gap between theoretical knowledge and practical experience, ensuring students receive comprehensive training.

LITERATURE REVIEW

This research article explores into the role of industries and employers in internship programs. The training providers for interns are still the employers, despite the fact that universities initiate the internship program. As a result, the goal of hiring interns should be to meet both university and industry requirements. This is advantageous to both students and employers. All constructs from the pre-industrial training phase, the industrial training phase, and the post-industrial training phase must be examined in this perspective (Johan and Turan, 2016).

Pre-Industrial Training Phase

In the industry, the human resource (HR) department serves as a portal for students to be placed in industrial training programs. It's essential that companies disclose HR email address, their website, the nature of their product, and a list of internship students' job descriptions. This will provide students with a broad overview of the company and assist them in making the best option possible when it comes to applying to the proper working environment for their academic background (Ooi, 2017). One of the most popular questions asked by interviewers of graduate engineers is on their industrial training experience (Inceoglu et al., 2019). So, avoiding skill mismatch is highly important and it is HR's job to assign students to the proper departments and tasks. Because the majority of students are unaware of current career changes that are relevant to their academic institution's course due to technological advancement (Mohd Kamaruzaman et al., 2019). Furthermore, IPTMS should priorities the wellbeing of students by offering personal protective equipment (PPE), personal accident insurance (PAI), medical leave, and a monthly allowance. This demonstrates that companies are concerned about the safety and well-being of interns (Allais, 2012).

Industrial Training Phase

Usually, experienced staff in companies will be nominated as trainers but they need to ensure they are competent enough to train the interns. Assigning trainers is important process because only experienced trainers or those designated as subject matter experts are capable of properly transferring skills as they are good in applying training function, which is based on the competences required to support students in specialized employment; and other non-technical skills (Padmini, 2012).

Next, structured IPTMS consist of four important construct which are classroom training, on-job-training, continues guidance and assessment. The contents of the Table 1 were tabulated based on preliminary study conducted in 3 main industries those practicing structured industrial training

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approach. However, all of them have different way of conducting classroom training (Kamsah, 2004), on-jobtraining (Musid et al., 2019) and continues guidance (J. Larson, W. Barnard, J. Chandler, M. O'Donnell, W. Savenye, 2020). Except assessment method remain same which enforce presentation, report book writing and log book writing because its requested by universities (Osma and Sayginer, 2010). Employers are really interested in assessing interns' performance when they're under their supervision because trainees will be a valuable asset to their organization in the near future (Padmini, 2012). Therefore, it's advisable to use industrial based assessment form and document which familiar to employers and its gave early exposure to the students about industrial based report preparation techniques such as 8D, P5 and A3 (Osma and Sayginer, 2010).

Post-Industrial Training Phase

A post-industrial training is not end of the program. In actual the career begins after industrial training. The industriesstudents relationship should continue after the industrial training till job placement in the same industry after graduation.

Internship students must be given a job offer or job assurance based on their performance during the industrial training period. Such that, IPTMS will only achieve its goal if graduate engineers are hired within 1 to 6 months of course completion (Fenta et al., 2019). Employers should provide an intern with a certificate and/or testimonial as a sign of appreciation, and supporting credentials should detail the intern's ethics and performance during their time in the industry ("NCSC Annual Review," 2019).

RESEARCH METHODOLOGY

The structure of an industrial training management system at the employer level is the topic of this research. Since the terms "industrial training" and "internship" are interchangeable, the articles picked for the literature review must be error-free and cover both terms simultaneously. As a result, the VOS viewer software version 1.6.17 was chosen in this study to reduce error and increase accuracy. The software can convert article names, keywords, and abstracts from Web-of-Science (WoS) and Scopus into ris, csv, and txt format, and then into bibliometric maps, network visualization, overlay visualization, and density visualization. (Eck and Waltman, 2016). The initial data was gathered using the keywords structured, internship, industrial, and training from WoS and Scopus. The information was gathered as of September 30, 2021, and was limited to the engineering field. At the first stage, 1020 Scopus and 486 WoS documents were extracted, with only 309 and 235 articles being shortlisted, respectively.

Scopus and Web-of-Science were chosen for the literature study because both websites contain a large number of data collections that are sufficient to conduct a comprehensive literature review (Mascarenhas et al., 2018).

Figure 1: front view

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Figure 2: Login interface

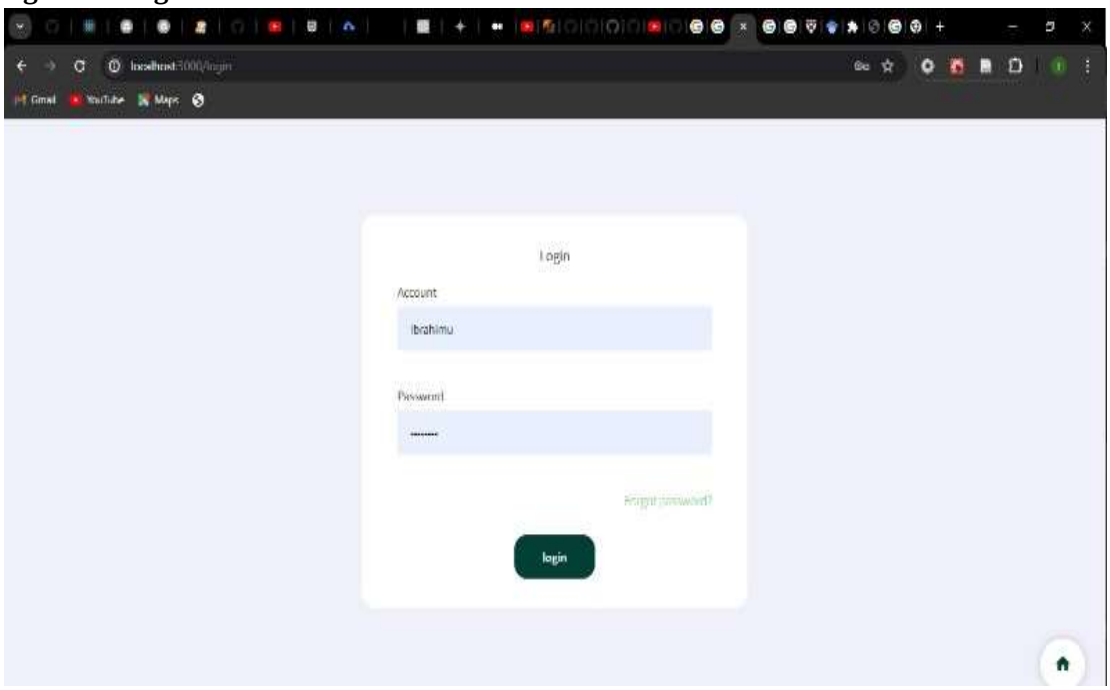
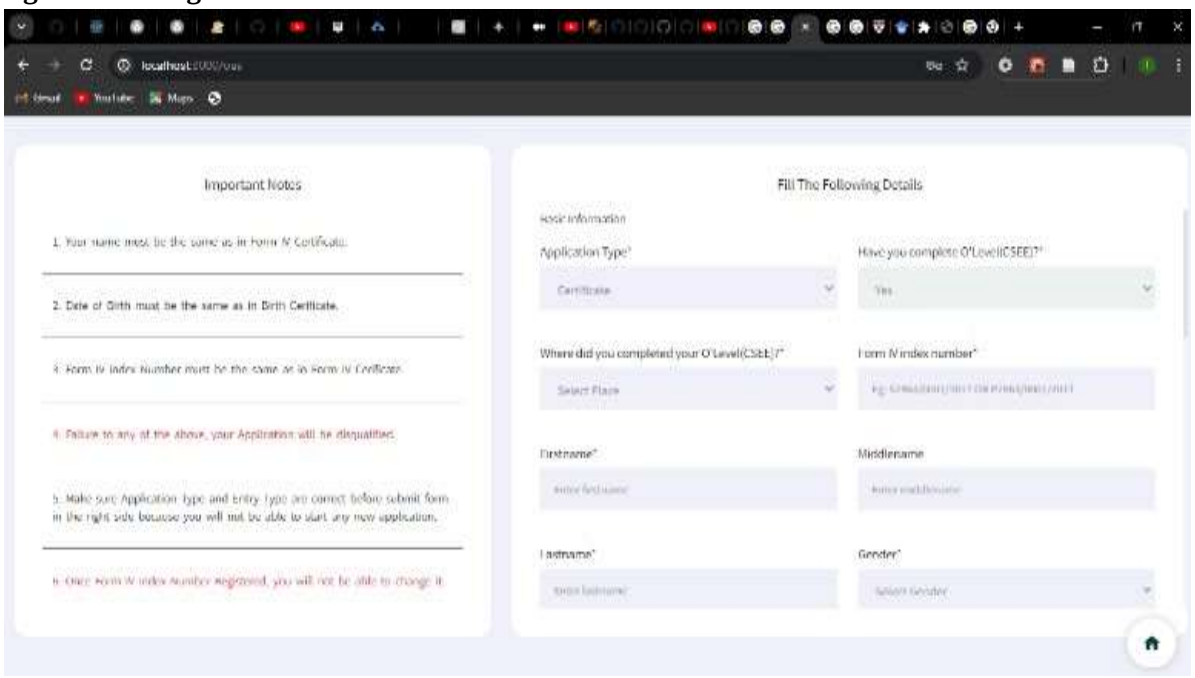


Figure 3: Filling and evaluation form



RESULTS AND FINDINGS

The network visualizations in figures 1 and 2 show the population and reoccurrence of keywords used at least 5 times in research articles found in Web of Science and Scopus, respectively. Since these studies focus on industrial management systems that emphasize significant constructs must be included in the internship procedure but are often taken for granted.

Industrial training focuses on skill development, technical presentation, evaluation and personal development in general. Noticeable that employers take responsibility to design industrial training module to improve the non-technical skills and assign a competent trainer in their organization to train the internship students.

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Due to the perception that industries will provide the best for trainees, questions about trainer competency and specifics on training modules are rarely raised (Phang et al., 2013). On the other hand, academic institution providing assessment form to be filled by the employers; by right the assessment form should come from industries since employers hunting for work-ready-engineers. Moreover, students frequently write, present, and receive engineering training, but writing and presentation guidance is typically provided by the academic institution, with little participation from the employer (Norback et al., 2010). The reason for this is because log book writing, report book writing, and presentation are not in the same format as industrial reporting, which employers are unfamiliar with. To address this, universities could adopt document formats that are similar to industrial technical writing formats, such as the Eight-Disciplines (8D) report, Plan-Do-Correct-Act (PDCA), Define-Measure Analyze Improve-Control (DMAIC), A3 and 5P which encourage employer participation (Osma and Sayginer, 2010).

CONCLUSION

The market includes industries such as small and medium enterprises (SMEs), multinational corporations (MNCs), original equipment manufacturers (OEMs), and contract manufacturers (CM). Some are well-established, such as companies that run structured internship program, have training departments, trainers, and even training facilities. It appears that not all students had the opportunity to complete an internship at a well-known industry. Industrial training, on the other hand, has the same purpose and outcome for all students. By adopting a Framework of structured Industrial Training Management System (IPTMS), all industries will be encouraged to strive toward the same goal of an industrial training program while also meeting their vision and mission. Furthermore, IPTMS will encourage all sorts of industries and employers to follow comparable methods without compromising the purpose of employers to recruit interns for their organizations. Introducing new frameworks or techniques to industries that are unfamiliar might be challenging (Johan and Turan, 2016). But, IPTMS adopts the majority of good manufacturing practices (GMP) from industries, which is more related to industrial culture such as industrial training procedure; training matrix; trainer-trainee competency assessment; log book and report book follow industrial formats. This will promote industry and employer participation in industrial training program. At the same time, the outcomes of this framework will respond to Malaysia's demand for "holistic graduates," as articulated in the Malaysian Education Development Plan (Sirat and Da Wan, 2018).

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