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COMPETENCE DEVELOPMENT AND THE DRIVE TOWARDS LABOUR MARKET DEMAND FOR TERTIARY EDUCATION GRADUATES: IMPACT OF THE STUDENTS' INDUSTRIAL WORK EXPERIENCE SCHEME (SIWES)

The Student Industrial Work Experience Scheme (SIWES) enhances students' competencies by bridging the gap between practice and theory to improve employability. Despite this, there is limited empirical evidence concerning the programme's effectiveness in supporting capability development among participating students in Nigeria. This study, therefore, investigates whether SIWES enhances the development of the most sought-after employability competencies among participating students. One hundred and thirty-four students were sampled, and data was analyzed using a structural equation model. The study confirmed that SIWES enhances four out of the five competencies examined. The study concluded that SIWES offers significant benefits to students by fostering the development of competencies such as analytical, adaptability, ICT proficiency, problem-solving abilities, and people management skills, all of which are crucial for future employment. The study recommended that higher education providers strengthen and establish frameworks for effective SIWES programme to develop students' competency and prepare them for future jobs.

Keywords: SIWES, competence development, health information management, structural equation model, higher education institution.

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1. INTRODUCTION

The acquisition and application of 21st-century skills, competencies, and capabilities have become significant factors in the global job market. Competency development involves educational training to improve knowledge, skills, and personal attributes to enhance workplace productivity and performance (UNIDO, 2017; World Economic Forum, 2017). The nature of modern production and industrial needs now require practical skills and intuitive knowledge to handle modern equipment and technologies effectively (Adegbite, Adeosun, 2021). The World Economic Forum (World Economic Forum, 2017) has identified the skills and competencies in demand for employability in 21st-century organisations. This has sparked a debate on the role of higher education providers in preparing a future workforce that is employable and equipped with the necessary skills and competence to meet the needs of individuals, organisations, and the economy. The acquisition and development of cognitive and socio-emotional skills among young graduates before entering the labour market will be crucial due to the unpredictable shifts in labour demands brought about by global market trends, especially the fourth industrial revolution.

Across the globe, it is widely recognized that training and development are pivotal for enhancing human capacity and driving socio-economic growth. The ability to secure and retain jobs is closely linked to the quality of educational training, which should align with the demands of the labour market. A mismatch between industry needs and workers' skills can lead to decreased employability, often due to insufficient training or education in technical and problem-solving skills (UNIDO, 2017). Hence, tertiary institutions must ensure that students are equipped with the technical and analytical skills necessary to add value to themselves and collaborate effectively with multinational teams and organisations. To address the evolving skill requirements, curriculum design should be flexible to bridge the gap between academic learning and industry needs, as skill mismatch experienced in the industrial sector results from global technological advancements. The Fourth Industrial Revolution (4IR) has spurred a growing demand for critical skills, particularly in the Information and Communications Technology sector, as Artificial Intelligence gradually replaces human labour.

In Nigeria, graduate unemployment has been a major challenge for the economy. Recent evidence indicates that the nation's socio-economic status has suffered due to a significant increase in unemployment. For example, according to the National Bureau of Statistics (NBS), the unemployment rate surged to an average of 13.5% in 2006 and escalated to 27.10% in the second quarter of 2020. Additionally, youth unemployment constituted 53.40% of the affected population (NBS, 2020). Scholars have identified various causes of unemployment in Nigeria, including the government's failure to create job opportunities through policies, investors' lack of a clear workforce development plan, economic recession, greater employment of expatriates, and the inadequacy of employable skills that align with industry needs (Dada, Ojetunde, 2020). There are also concerns about the quality of training graduates receive from Nigerian tertiary institutions. Business owners in both government and non-governmental enterprises have doubts about the competency of graduates from Nigerian institutions, believing that their qualifications do not necessarily guarantee employability. It has become evident that an applicant's demonstrated competence plays a crucial role in organisations' hiring decisions, even though the number of job openings cannot accommodate the influx of graduates from various tertiary education institutions in the country (Dada, Ojetunde, 2020). Many

organisations tend to favour applicants with foreign qualifications due to deficiencies in technical competency development among graduates of local tertiary institutions (Adegbite, Adeosun, 2023; Dada, Ojetunde, 2020).

In 1973, the government established the Students' Industrial Work Experience Scheme (SIWES) under the Industrial Training Fund (ITF) to provide students in tertiary institutions with practical industrial skills and experience. SIWES aims to prepare students for future employment by exposing them to modern technology and equipment unavailable in their institutions. Additionally, it serves as a way for students to apply their theoretical knowledge to practice. Reports have indicated that SIWES positively impacts students' academic performance (Anyeana, Ochuba, 2019). Despite this development, the future of the Nigerian labour market remains uncertain, as there are doubts about whether the scheme has achieved its objectives. There is a growing concern about the impact of the Student Industrial Work Experience Scheme (SIWES) on the development of skills and the employability of graduates.

The significance of the industrial work experience programme in equipping tertiary education graduates with vital skills and enhancing their employability in Nigeria's competitive job market has recently garnered considerable attention from both academic institutions and employers. However, uncertainty persists regarding whether the training these programmes provide leads to guaranteed employment. There are ongoing discussions about how the Student Industrial Work Experience Scheme (SIWES) fosters the development of crucial skills among students, particularly the 21st-century competencies that modern organizations demand. This research aims to investigate the specific ways in which industrial work experiences contribute to the enhancement of key employability competencies among tertiary education students in Nigeria. Specifically, it evaluates the impact of practical experiences gained through internships and industrial placements on the skills most valued by employers, including people management, complex problem-solving, information and communication technology (ICT), adaptability, and critical thinking, all of which are essential for students' overall career readiness upon graduation. This paper is structured into several key sections. The literature review delves into previous studies on student industrial work experience and related concepts. The third section offers background information and outlines the methodology employed in the research. Subsequently, the analysis and findings are presented, accompanied by discussions and their implications. The paper concludes with a summary of the key points, recommendations for future research, and a discussion of any limitations encountered.

2. CURRENT STUDIES

2.1. Student Industrial Work Experience Scheme (SIWES)

In 1973, Nigeria's Industrial Training Fund (ITF) introduced the Student Industrial Work Experience Scheme (SIWES), which equips students with practical skills essential for their future post-graduation careers. The program seeks to narrow the gap between theoretical knowledge obtained in tertiary institutions and the practical demands of industries. SIWES facilitates collaboration between academic institutions and industries, enabling undergraduate students in science, engineering, technology, and other professional courses to gain hands-on experience. According to Usman (2021), SIWES enhances students' practical skills alongside their theoretical understanding by exposing them to real-world work environments. The program provides students with invaluable experience in utilizing tools, machinery, and equipment not readily available within

educational settings (Oswald-Egg, Renold, 2021). As Abraham-Ibe (2015) stated, the Student Industrial Work Experience Scheme (SIWES) allows students to develop essential skills such as teamwork, problem-solving, communication, and time management while pursuing university academic studies.

2.2. Competency Development in Tertiary Education

Competency encompasses observable attributes such as knowledge and skills and underlying characteristics like attitudes, traits, and motives, all of which contribute to exceptional job performance (Pang et al., 2018). This concept extends beyond technical abilities and expertise for a specific role to include personal qualities and behaviours that enhance effectiveness in the workplace. Employers increasingly seek individuals who can take initiative, address challenges, and offer innovative solutions (Ahmed et al., 2022). Competency development in higher education is essential for preparing students to succeed in their careers (Varma & Malik, 2023). Tertiary institutions play a key role in fostering competency through coursework, practical training, and collaborative projects (Kenayathulla et al., 2019). This approach ensures that graduates are well-prepared for the challenges of the global marketplace. Tertiary institutions use various methods to develop students' competencies, such as academic coursework, internships, collaborative projects, and competency-based assessments (Fuchs, 2022). These experiences help students apply theoretical knowledge in real-world contexts and assess their readiness for the workforce.

3. HYPOTHESES DEVELOPMENT

3.1. SIWES, Analytical, and Critical Thinking Competence

An essential attribute of an educated individual is the capacity to solve personal and societal challenges using analytical and critical thinking skills. Cultivating analytical and critical thinking abilities is vital for undergraduate students, by enhancing their likelihood of securing employment after graduation. One effective approach for students to enhance these skills is through participation in the Student Industrial Work Experience Scheme, which is tailored to provide exposure to various problem-solving scenarios (Daerego, Victor, 2023). The escalating unemployment and underemployment among youths and graduates in Nigeria highlights the lack of essential analytical and critical skills needed to sustain the Nigerian economy in the twenty-first century (Alao et al., 2022). The current curricula of vocational and technology education programme in Nigerian tertiary institutions do not appear to align with the country's contemporary demands for workplace employment. Additionally, students graduating from higher institutions often do so without acquiring the necessary work-related skills and working experiences to adequately prepare them for the labor market (Fuchs, 2022). The SIWES introduces undergraduate students to opportunities for learning, improving, and sustaining their analytical and critical thinking skills, which can enhance their employability after completing their studies. Studies have shown that students improved their critical thinking and problem-solving skills after completing their industrial training (Rodzalan et al., 2020). This program helps students develop analytical and professional skills necessary for future job placements. Based on the above, the current study hypothesized that:

H1: Student Industrial Work Experience Scheme positively impacts students' analytical and critical thinking.

3.2. SIWES and Adaptability Competence

The importance of the Students Industrial Work Experience Scheme (SIWES) has been a major concern for education and economic planners in Nigeria, particularly regarding its impact on graduate employment and overall societal development. There are ongoing debates regarding its influence on students' academic performance and preparedness for the labour market, including their ability to adapt to changes and meet workplace demands. Daerego and Victor (2023) noted that the academic training provided by higher institutions in Nigeria is mainly theoretical and lacks practical elements. Consequently, graduates often lack the skills and competencies required in the job market. The significance of SIWES in preparing graduates for employment opportunities cannot be overstated. In essence, it plays a crucial role in closing the skill gaps between the job skills required and the current capabilities of the workforce in the labour market (Daerego, Victor, 2023). SIWES is designed to equip students with adaptability skills by exposing them to the flexibility needed to handle change, manage multiple demands, and adapt to new situations. Whether the above objective is achievable is one of the propositions that the current study put forward to investigate, thus hypothesized that:

H2: Student Industrial Work Experience Scheme positively impacts students' adaptability competence.

3.3. SIWES and ICT Competence

Information and communications technology (ICT) advancement has sparked a significant shift in academic curricula. Educational institutions are now prioritizing the integration of digital tools. In discussions about the future of work, students are constantly urged to adapt to the innovations of ICT, leading to changes in job requirements that demand specific digital skills and competencies (Usman, 2021). Implementing the SIWES programme in Nigerian higher institutions is a valuable innovation that can provide students with a competitive edge in ICT competence. This is increasingly crucial in today's technology-driven business landscape, as many organizations heavily rely on technology for their operations. The importance of ICT-based knowledge for students, particularly in developing ICT competence, cannot be overstated (Bashir et al., 2022). Based on the above, this study aimed to investigate the significance of SIWES on the development of ICT-related knowledge among tertiary education students in Nigeria, thus hypothesizing that:

H3: Student Industrial Work Experience Scheme positively impacts students' ICT competence.

3.4. SIWES and Complex Problem-Solving Competence

Problem-solving is an essential part of our daily activities, such as deciding what to wear, using new electronic devices, planning travel routes, organizing work schedules for efficiency, and communicating with people who speak different languages, among others (Wu, Molnar, 2022). The SIWES programme could serve as a good learning platform to offer students the opportunity to acquire this vital practical skill called complex problem-solving skills. Studies have pointed out a challenge of internships in Nigeria as the mismatch between training and labour market demands, emphasizing that educators must handle students' emotions, cognitive development, and values for effective learning (Maiunguwa, 2022). Eichmann et al. (2019) emphasized the importance of problem-solving skills for active social participation, which can be gained through programme like the SIWES. The current study, among others, was designed to investigate the connection

between the Students Industrial Work Experience Scheme (SIWES) and problem-solving skills among tertiary education students in Nigeria, building on previous research highlighting the importance of problem-solving skills for the employability of new entrants into the labour market. It is therefore hypothesized that:

H4: Student Industrial Work Experience Scheme positively impacts students' problem-solving competence.

3.5. SIWES and People Management Competence

Student employability in the labor market is closely linked to subjective assessment of their preparedness for securing employment (Omonijo et al., 2019). Employers place great importance on skills and knowledge, as they can significantly impact the production of goods and services and corporate goals. People management skills are among the sought-after competencies required by 21st-century organisations (World Economic Forum, 2017). Therefore, SIWES is expected to cultivate students' people management competence through leadership, communication, and teamwork skills, given their experience working alongside others. A comparative study by Omonijo et al. (2019) also examined student industrial work experience in the United States, Turkey, Germany, and Nigeria. The study revealed that although SIWES is vital for students to acquire essential competencies like people management skills, its failure to assess the scheme's impact on achieving specific competency attainment remains a significant limitation. It is on the premise of the above that this study hypothesized that:

H5: Student Industrial Work Experience Scheme positively impacts students' people management competence.

4. METHODS

4.1. Study Population and Sample

The study employed a non-experimental research design, focusing on second-year health and information management program students. The study population included participants in the SIWES programme, from which 134 second-year students were selected from the School of Health Information Management at Obafemi Awolowo University Teaching Hospital in southern Nigeria. Following the sample size determination technique proposed by Barclay et al. (1995), the study used the construct with the highest number of indicators, the SIWES construct with ten indicators, to determine the minimum sample size. Based on this technique, 100 cases are expected to be the minimum sample size for this study; thus, 134 respondents were deemed appropriate. SmartPLS software was utilized to perform structural equation modeling using a non-parametric approach to test the hypotheses.

4.2. Measurement of construct

This study used scales from previous research (Al-Alawneh, 2014; Suarta et al., 2017) to evaluate student industrial work experience (SIWES) and competencies. Data was collected through a structured questionnaire. The competency development scale comprised 28 items rated on a five-point Likert scale (1= Very low to 5=Very high), while the SIWES scale has 10 items rated on a five-point Likert scale, where 1 represents Never, and 5 represents Very often. The content validity index for these scales was 0.74 and 0.78, and the ordinal alpha reliability coefficient was 0.88 and 0.84, respectively.

Table 1. Demographics

Age		
	Frequency	Percentage (%)
Below 16 yrs	12	8.9
16-20 yrs	81	60.5
21-25 yrs	20	14.9
26-30 yrs	21	15.7
Total	134	100.0
Gender		
Female	97	72.4
Male	37	27.6
Total	134	100.0

Source: Author's work.

5. RESULTS

The study utilized SmartPLS software to assess the reliability and validity of the instrument and determined that it accurately measures its intended variables. Both Cronbach's Alpha and Composite Reliability for assessing the consistency of all constructs were found to be above 0.70.

5.1. Measurement (Outer Model)

The study used the partial least square method, a popular approach in global research (Hair et al., 2016; Koch, 2013). It involves two stages: the measurement model (outer model) and the structural model. All study variables were reflectively measured, and the outer model was evaluated for reliability and validity. The measurement model comprises endogenous and exogenous variables. Competency development (endogenous variable) encompasses five sub-constructs, namely analytical and critical thinking (Comp_ACT), adaptability (Comp_AD), information communication and technology (Comp_ICT), people management (Comp_PM), and problem-solving (Comp_PS). The student industrial work experience (SIWES) represents the exogenous variable.

5.2. Indicator Reliability and Consistency

The outer loading values from all constructs are used to determine the reliability of an indicator. An external loading of 0.50 is preferred (Hair et al., 2022), while values below 0.50 are considered unreliable and should be removed from the items. In this study, all constructs had outer loadings above 0.50. However, the loadings for SIWES8 were less than 0.50, so this indicator was considered unreliable and deleted to establish item reliability. Another important aspect of the assessment model is composite reliability, which evaluates the internal consistency of the constructs. Hair et al. (2017b) state that a model is reliable if the composite reliability is greater than 0.70. All items have a composite reliability coefficient greater than 0.70 (see Table 2), fulfilling the recommended threshold. In addition, each construct has a value ranging from 0.838 to 0.912. These values align with Hair et al.'s recommendation, indicating that the model is reliable for testing the hypotheses.

5.3. Validity (Discriminant and Convergent)

Convergent validity assesses how well a construct aligns with other measurements in a study. The recommended AVE value is 0.40 by Hair et al. (2017b) and 0.50 or higher by Chin (2010). In this study, all AVE are above 0.50 and, therefore, meet the cut-off with the recommended value. This study employed two different methods to assess the discriminant validity of the models. The Fornell-Lacker criterion was utilized to calculate the square root of the average variance extracted (AVE) for each variable. In this study, the Hetero Trait – Mono Trait (HTMT) correlation ratio is used to assess discriminant validity. A construct is discriminately valid if the HTMT value is below 0.90 (Henseler et al., 2016). Findings indicate that all HTMT values in this model are below 0.90, confirming that the model has discriminant validity.

Table 2. Reliability and Validity of Measurement

Construct	Items	Indicator Reliability	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Analytical & Critical Thinking	Comp_ACT 1	0.857	0.866	0.907	0.71
	Comp_ACT 2	0.805			
	Comp_ACT 3	0.761			
	Comp_ACT 4	0.819			
	Comp_ACT 5	0.768			
	Comp_ACT 6	0.761			
Adaptability	Comp_AD 1	0.808	0.886	0.912	0.634
	Comp_AD 2	0.847			
	Comp_AD 3	0.845			
	Comp_AD 4	0.869			
Problem-Solving	Comp_CPS 1	0.743	0.851	0.884	0.565
	Comp_CPS 2	0.823			
	Comp_CPS 3	0.735			
	Comp_CPS 4	0.759			
	Comp_CPS 5	0.746			
	Comp_CPS 6	0.775			
ICT	Comp_ICT 1	0.883	0.878	0.908	0.622
	Comp_ICT 2	0.893			
	Comp_ICT 3	0.744			
	Comp_ICT 4	0.651			
	Comp_ICT 5	0.61			
	Comp_ICT 6	0.681			
People Management	Comp_PM 1	0.831	0.862	0.894	0.584
	Comp_PM 2	0.779			
	Comp_PM 3	0.819			
	Comp_PM 4	0.82			
	Comp_PM 5	0.748			
	Comp_PM 6	0.728			

Table 2 (cont.). Reliability and Validity of Measurement

Construct	Items	Indicator Reliability	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
SIWES	SIWES 1	0.616	0.792	0.838	0.546
	SIWES 10	0.579			
	SIWES 2	0.505			
	SIWES 3	0.596			
	SIWES 4	0.542			
	SIWES 5	0.577			
	SIWES 6	0.588			
	SIWES 7	0.636			
	SIWES 8	0.442			
	SIWES 9	0.748			

Source: Author's work.

5.4. Structural (Inner Model)

Hair et al (2016) suggests using a structural inner model to test causal relationships between exogenous and endogenous variables is appropriate. In this study, the bootstrapping technique was used to examine the significance of the structural path. This study tested five hypotheses using the structural model, and the significance of the path coefficients was measured through accelerated bootstrapping confidence interval (Henseler et al., 2016). A total of 134 respondents and 5000 bootstrapping samples were utilized to test the hypotheses' level of significance. The findings include the parameters and statistics indicating the direct associations between the constructs (see Figure 1 and Table 3).

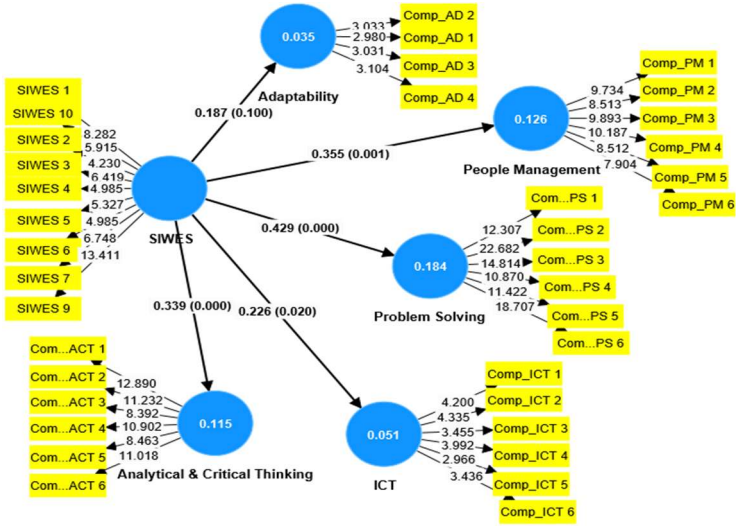

Figure 1. Graphical Representation of Hypothesis Testing

Source: Author's work.

Figure 1 shows the path coefficient and p-values ascertaining the relationship between the constructs. The analysis presented in Table 3 reveals no statistically significant positive direct relationship between student industrial work experience (SIWES) and the adaptability competency of Information and Health Management students. Specifically, the direct effect of SIWES on the adaptability competence of the students was measured at 0.187 (p= 0.100). Furthermore, given that the t-value (1.644) in the relationship was less than 1.96, hypothesis one (H1) was rejected.

Table 3: Path Coefficient and Relationships

Hypothesis	Relationship	Original Sample (0)	Sample Mean (M)	Standard Deviation	T-Statistic	P-value	Decision
H1	SIWES -> Adaptability	0.187	0.214	0.114	1.644	0.100	Reject
H2	SIWES -> Analytical & Critical Thinking	0.339	0.373	0.091	3.71	0.000	Accept
H3	SIWES -> ICT	0.226	0.278	0.097	2.333	0.020	Accept
H4	SIWES -> People Management	0.355	0.385	0.107	3.324	0.001	Accept
H5	SIWES -> Problem Solving	0.429	0.457	0.066	6.545	0.000	Accept

Source: Author's work

The data presented in the results indicates an 18% decrease in the adaptability competence of the students as the SIWES unit increases. Additionally, Table 3 reveals a significant positive impact between SIWES and the following competencies: a) analytical and critical thinking (β= 0.33, t=3.71, P= 0.000), b), ICT (β= 0.22, t=2.33, P= 0.020), c) people management (β= 0.35, t=3.32, P= 0.001), and d) problem-solving (β= 0.42, t=6.54, P= 0.000). As a result, hypotheses H2 – H5 were accepted based on this data. The SIWES program could serve as a platform to develop people management, ICT, problem-solving, analytical, and critical thinking competencies of the tertiary education students in Nigeria.

6. DISCUSSION

The existing literature lacks substantial evidence regarding the effectiveness of the student Industrial Work Experience Scheme (SIWES) programme and its impact on developing the most sought-after competencies required by the 21st-century modern organization among participating students in Nigeria. This study aimed to demonstrate how SIWES could enhance the competencies of higher education graduates using health information management students as a sample. Previous research on competency development and graduate employability suggests that exposing students to practical situations and on-the-job knowledge outside the classroom can prepare graduates for the

workforce (Alao et al., 2022; Daerego, Victor, 2023). The results from the structural model indicated that four out of the five competencies (critical thinking, adaptability, ICT, people management, and problem-solving competencies) hypothesized in this study exhibited a direct-positive relationship with the student industrial work experience scheme (SIWES). However, adaptability competence did not show a direct and positive relationship with the student industrial work experience scheme. The skills and attributes examined in this study are crucial for producing well-prepared graduates for future employment. The findings of this study support the views of Bashir et al. (2022), Wu and Molnar (2022), and Omonijo et al. (2019), who claim that SIWES plays a crucial role in enhancing academic performance and developing competencies. The results of this study further support the findings of Anyeana and Ochuba (2019), indicating that students demonstrate improved technical knowledge acquisition during experimental education (SIWES) after gaining real-life work experience.

7. PRACTICAL IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

There is a dearth of research on the practical aspects of the Student Industrial Work Experience Scheme (SIWES). The outcomes of this study offer great potential for higher education institutions, students, and employers. The findings indicate that the SIWES programme can enhance student competencies, highlighting higher education institutions' crucial role in SIWES. This underscores the necessity for stronger collaboration between industry, higher education institutions, and students. When higher education institutions clearly understand the industry's sought-after skills and competencies, they can design their curricula and SIWES programme accordingly, providing students with more authentic workplace experience in preparation for future jobs. The current study sampled health information management students. Further research could be conducted to sample students across universities in Nigeria in the future to validate the findings from this study.

8. CONCLUSION

This study investigated whether the Students Industrial Work Experience Scheme (SIWES) could predict students' employability competencies. The study assessed five competencies: adaptability, analytical and critical thinking, ICT, people management, and problem-solving. It utilized a sample of health information management students and employed a partial least squares structural equation model approach to analyze the relationship between SIWES and these competencies. The results revealed a strong positive correlation between four of the five employability competencies and SIWES. The study underscores the significant role of SIWES in developing students' competencies, highlighting its substantial benefits for participating students. This study suggests that higher education providers enhance the SIWES programme to develop student competencies for employability.

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