Theoretical Article

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Alternative educational pathways for Higher Certificate in Information Technology graduates at a South African University of Technology

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Abstract: This theoretical paper explores alternative educational pathways for Higher Certificate in Information Technology graduates, addressing the gap between the Higher Certificate in Information Technology qualification and advanced career opportunities. These graduates, who did not meet the minimum requirements for Diploma programmes, often struggle with career advancement due to curriculum mismatches. This limits their ability to pursue advanced qualifications, which are frequently necessary for career growth in the Information Technology industry. The pressing challenge is to identify and develop viable educational pathways that provide these graduates with opportunities for further academic progression or career advancement, addressing gaps in skills, qualifications, and industry requirements. The paper uses the lens of constructivist theory to explore how alternative educational pathways can be designed to support these graduates by promoting active, experiential learning and enabling them to construct knowledge in practical, real-world contexts. We argue that traditional educational pathways are insufficient in addressing the growing needs of students and employers in the Information Technology field. To effectively bridge the gap between certificate-level education and advanced qualifications or employment, the research contends that alternative pathways, such as bridging programmes, work-based learning, and digital education platforms, must be more accessible, better structured, and institutionally supported. This study recommends policy revisions to improve articulation pathways, introduce bridging programmes, and strengthen industry collaboration, promoting lifelong learning through flexible, industry-aligned education for continuous upskilling and enhanced employability in IT.

Keywords: Higher certificate, information technology, constructivist learning theory.

1. Introduction

A key consideration is whether academia adequately prepares students with the necessary skills for the Information Technology (IT) industry (Sahin & Celikkan, 2020). The Higher Certificate (HC) in IT, offered by universities of technology in South Africa, provides a foundational entry point into the IT field, equipping students with basic technical skills and knowledge (Maki, 2023). This certification is viewed as a first step into the workforce, particularly by students who might not have fulfilled the prerequisites for degree programmes (Jackson, 2021). According to Baah (2024), the IT sector is one of the fastest-growing industries, yet South Africa faces a severe skills gap, with an estimated 41% of companies reporting difficulty in finding skilled IT professionals. This gap is exacerbated by the barriers faced by Higher Certificate in IT graduates, who often lack direct access to diploma or degree programmes. Furthermore, the articulation policies in South Africa have been identified as a significant barrier for students with a Higher Certificate in IT, preventing seamless progression to diploma or degree programmes. A study by Bolton, Matsau, and Blom (2020) found that nearly 30%

of students with vocational qualifications, such as a Higher Certificate in IT, are unable to continue their studies due to these restrictive policies.

This situation causes career stagnation and increases the skills gap in the industry. Additionally, the rapid evolution of technological advancements necessitates continuous learning and specialised competencies, which are frequently inadequately addressed within the foundational curriculum of the Higher Certificate (Johnston, 2024). This discrepancy creates a gap between the qualifications attained and the competencies employers seek, consequently limiting the prospects for professional advancement among graduates.

Numerous investigations have scrutinised the challenges encountered by graduates possessing lower-level qualifications, particularly in sectors such as IT that demand continual skill enhancement. Billionniere and Rahman (2020) investigate formal and informal educational avenues for acquiring skills in Emerging Technologies (EmTech), highlighting the need for higher education to evolve by acknowledging varied learning experiences. Their research contends that conventional skill sets are inadequate for the exigencies of the 21st-century workforce, especially with the proliferation of emerging technologies. To thrive in the future, students are required to cultivate critical thinking, adaptability, problem-solving, and technological adeptness. The research emphasises the urgency for educational frameworks and curricula to advance, ensuring that students are armed with the superior knowledge, competencies, and proficiencies requisite for the future workforce.

Other South African scholars, such as Serame and Afuye (2024), and Majola, Jordaan, and Powell (2024), are increasingly focusing on bridging the gap between vocational qualifications, such as Higher Certificates in IT, and further education or employment opportunities. They emphasise the need for more flexible educational pathways, stronger industry-academic partnerships, and greater attention to socio-economic factors that hinder access to education. Research also highlights the importance of aligning curricula with industry demands and promoting lifelong learning to keep pace with technological advancements in the IT sector.

In consideration of this, it becomes evident that educational institutions must not only deliver foundational education but also devise flexible, innovative programmes that promote lifelong learning. Imagine a student who completes a Higher Certificate in IT with the ambition to pursue a diploma or degree, only to find that rigid academic structures limit their progression. Without alternative pathways, their potential remains untapped, and the industry loses a valuable workforce. The pressing question we must ask ourselves is: what happens to Higher Certificate in IT graduates who wish to advance their studies but face limited pathways? Are they left without opportunities to grow in an ever-evolving digital economy? The truth is that the evolving nature of the digital economy requires continuous learning. If these graduates are unable to advance, the industry may lose skilled professionals who could contribute significantly. By aligning curricula with the ever-changing demands of the technology-driven landscape, educational institutions can more effectively equip graduates for sustained success, thereby ensuring their competitiveness within an increasingly dynamic job market.

Correspondingly, Pitan and Muller (2023), in their investigation, emphasised that the unparalleled expansion of Higher Learning Institutions (HLIs), coupled with the growing emphasis on graduate employability within university rankings, has rendered employability a fundamental objective of contemporary HLIs. As institutions worldwide compete for students and tuition revenue, those that extend beyond traditional academic or discipline-specific skills and knowledge and offer innovative experiential programmes stand out. By focusing on developing students' ability to envision and engage with future work through hands-on practice within their disciplines, these institutions can distinguish themselves in an increasingly competitive educational landscape.

While the above studies have contributed to the field by emphasising the importance of skill development and its impact on student employability, they have not proposed flexible approaches to ensure sustainable learning beyond qualifications or certificates. In contrast, this study is unique in that it offers a distinctive perspective, advocating for the introduction of new methods that enable students to continue learning and advancing beyond foundational certificates, thereby fostering lifelong learning.

1.1 Problem statement

Although the demand for skilled professionals in the Information Technology (IT) sector is steadily increasing, graduates holding a Higher Certificate in IT encounter considerable obstacles when attempting to further their education or secure employment at the Central University of Technology, South Africa. The traditional progression routes, such as transitioning to diploma or degree programmes, often remain out of reach for these individuals due to various barriers, including academic prerequisites, financial constraints, or institutional limitations (Serame & Afuye, 2024; Majola et al., 2024; Chakravorty, Daga, Sharma, Chakravorty, Fischer & Mehta, 2021). For instance, students who have completed a Higher Certificate in IT often lack essential prerequisites in software development, as their training primarily focuses on networking skills. This academic limitation hinders their ability to seamlessly transition into advanced IT programmes that require a broader skill set. Additionally, many of these students come from economically disadvantaged backgrounds, which imposes significant financial constraints. As a result, they are unable to afford private universities that may offer more flexible pathways and better opportunities for academic and professional advancement. This financial barrier further exacerbates educational inequality, limiting their access to higher qualifications and career growth in the IT sector.

Moreover, the Higher Certificate is often undervalued in the job market, leading to limited employment prospects and leaving many graduates ill-equipped to meet the industry's evolving demands. This issue is not solely confined to South Africa; an investigation carried out by Brennan (2021) in the United Kingdom (UK) critically examined how the interplay between decentralisation and market dynamics can obstruct the establishment of equitable and effective learning pathways that genuinely serve all students, particularly those pursuing alternative routes within higher education. The researcher observed substantial inconsistencies in the implementation of flexible learning pathways across various institutions. While certain universities have adopted a range of flexible options, such as online education, part-time study, and modular courses, others have fallen behind due to limitations in resources or insufficient institutional prioritisation. Consequently, this has culminated in disparate access to flexible learning opportunities for students throughout the UK.

This disparity between the qualifications conferred by Higher Certificate (HC) programmes and the expectations of higher education institutions and employers underlines an urgent necessity for alternative educational and career pathways. Rectifying this disparity is essential for advancing the professional development of Higher Certificate graduates and for better aligning their qualifications with industry standards (Serame & Afuye, 2024; Majola et al., 2024; Billionaiere & Rahman, 2020). Therefore, it is imperative to investigate and cultivate innovative strategies that can effectively bridge this gap, ultimately resulting in enhanced educational outcomes and more feasible career prospects for this marginalised demographic.

2. Underpinning Theory: Constructivist Learning Theory

This paper is situated within the framework of Constructivist Learning Theory. The theory was developed primarily by Swiss psychologist Jean Piaget in 1894 and further expanded by Soviet psychologist Lev Vygotsky around 1896 (Mohammed & Kınyo, 2020). Piaget proposed that learning is an active process whereby individuals construct new knowledge based on their experiences and prior knowledge (Mattar, 2018). His theory emphasised cognitive development through stages and

highlighted the importance of discovery, learning, and exploration. A few years later, Vygotsky contributed to the theory by emphasising the social and cultural aspects of learning (Angraini, Kania & Gürbüz, 2024). His concept of the Zone of Proximal Development (ZPD) and the importance of interaction and collaboration in learning added depth to constructivist ideas. Vygotsky believed that knowledge is co-constructed through social interactions.

Combining the ideas of Piaget (1894) and Vygotsky (1896), as depicted in Figure 1, the theory now posits that learners actively construct their knowledge and understanding through experiences and interactions with their environment (Angraini, Kania & Gürbüz, 2024). Rather than passively receiving information, students engage in a process of making sense of new information by integrating it with their existing knowledge and experiences (Gunarathna et al., 2024).

Figure 1: Constructivist Learning Theory (Angraini, Kania & Gürbüz, 2024)

This theory is relevant because it supports the design of alternative educational pathways that are personalised, flexible, interactive, and contextually relevant for Higher Certificate in IT graduates. It encourages learning that is active, reflective, and adaptable to the fast-evolving IT industry, helping students bridge the gap between foundational qualifications and advanced career or academic opportunities. To achieve the research aim, the study adopted four key principles of Constructivist Learning Theory, as shown in Figure 2.
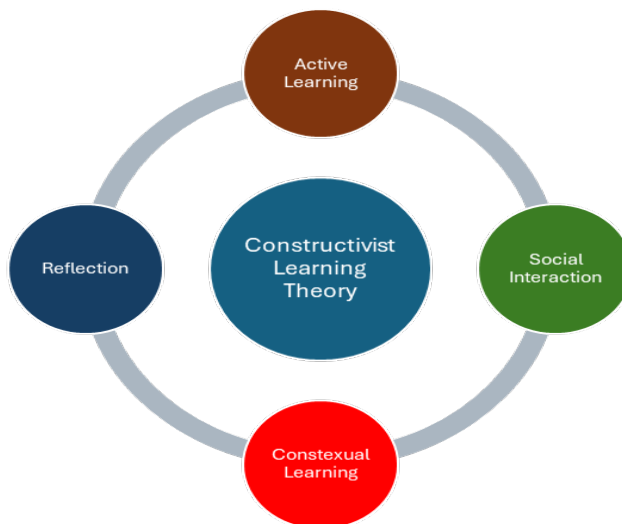

Figure 2: Constructive Learning Theory Key Principles (Mattar, 2018)

Various elements underpin constructive learning. One of these is active learning. In active learning, students are encouraged to take an active role in their learning processes, engaging with materials, collaborating with peers, and participating in hands-on activities that allow them to explore and experiment (Maki, 2023; Thorpe et al., 2024). To provide context for our study, alternative educational pathways should focus on hands-on, practical experiences that enable HCIT graduates to build real-world IT skills.

Another element is social interaction, where learning is viewed as a social activity, and interaction with peers, instructors, and the community is crucial. Therefore, HCIT graduates should engage in peer learning, mentorship programmes, and industry networks to provide a richer learning experience. Additionally, collaborative learning environments foster a deeper understanding and help HCIT students develop critical thinking and problem-solving skills (Langworthy, Maria, & Jake, 2022). Coupled with the above, constructive learning theory also involves contextual learning, which argues that knowledge is constructed within specific contexts. In the context of this research, alternative pathways should align with the current South African IT job market, ensuring that HCIT graduates develop skills that meet industry demands. Constructivism emphasises the importance of situating learning in real-world contexts, making education relevant to students' lives and future careers (Billionniere & Rahman, 2020). Finally, there is critical reflection, where students are encouraged to think critically about their learning experiences, enabling them to make connections, evaluate their understanding, and adjust their learning strategies (Angraini, Kania, & Gürbüz, 2024). Alternative pathways should encourage self-paced, flexible learning models, such as online learning platforms (e.g., Coursera, Udemy, or Cisco courses) that allow students to progress at their own speed.

The Constructivist Learning Theory presented in this paper offers a strong foundation for shaping alternative educational pathways for Higher Certificate in Information Technology graduates in South Africa. It is pertinent to situate this study within this framework, as it highlights the importance of active, contextual, and social learning, making it well-suited to develop engaging and relevant learning experiences that prepare graduates with the necessary skills and knowledge for the IT field. By emphasising personal agency and self-reflection, the theory also empowers students to take charge of their educational progress, addressing the specific challenges faced by this group.

3. State of IT Education and Higher Certificate Programmes

The admission prerequisites for the Information Technology Higher Certificate programme at a particular University of Technology necessitate a minimum attainment of 27 on the CUT scoring scale, alongside requisite language proficiency in English at the National Qualifications Framework (NQF) level 4. Applicants who do not satisfy the minimum score threshold and instead attain scores between 22 and 26 on the CUT scoring scale are compelled to engage in an additional component of the admissions process. This component entails the completion of an admission selection process, which involves not only an appraisal of academic potential but also the successful undertaking of an admission selection examination. This examination serves to evaluate the applicant's preparedness for the demands of the IT programme, thereby ensuring that those who marginally fall short of the cutoff can substantiate their potential for success.

The structure of the Higher Certificate programme is designed to be completed within the span of one academic year. During this timeframe, students are mandated to undertake 12 modules, meticulously distributed across two semesters to facilitate an equitable distribution of academic workload. These modules are carefully crafted to encompass critical domains within Information Technology, thereby providing students with foundational insights into both theoretical frameworks and practical implementations. However, the curriculum predominantly emphasises foundational elements of networking, whereas the IT Department situated at the Welkom campus offers a Diploma with a specialisation in software development.

This situation creates a substantial obstacle for graduates of the Higher Certificate programme for two primary reasons: 1) they frequently lack sufficient academic points requisite for direct admission into the conventional diploma programme, and 2) their Higher Certificate credentials do not fulfil the standards necessary for consideration within the mainstream diploma track. This predicament results in a bottleneck for students who aspire to progress within the domain of software development but find themselves constrained by their current academic qualifications. Consequently, these graduates encounter restricted opportunities to transition seamlessly into elevated qualifications, thereby limiting their options to further their education or enhance their career prospects within the field of Information Technology. This gap in the pathway from certificate to diploma-level education presents a critical issue, as it restricts access to more specialised fields. It is this challenge, among many others, that propelled us to undertake this research as a way to contribute to shaping the field. Some of the challenges are discussed in detail in the following section.

4. Challenges of IT Graduates: A Global Perspective and Implications for CUT

Throughout the IT industry, constant change arises from ongoing technological innovation and evolving market demands (ElSharkawy et al., 2022). Sahin and Celikkan (2020) argue that rapid advances in IT render certain curriculum topics redundant before the completion of a standard two- or four-year degree programme. This is particularly true for students enrolled in the HC in IT programme at Central University of Technology (CUT). Despite the one-year duration of the certificate programme, students face technological advancements from the industry that surpass their current knowledge and skills. A crucial consideration raised by Sahin and Celikkan (2020) in their research is whether higher education institutions can equip students with the essential competencies they require. Figure 3 below illustrates the three stakeholders in the IT sector and their respective expectations. It is anticipated that students will engage in more practical activities within their courses, learn more relevant industry-related subjects, and gain experience that will facilitate their job search in the future.
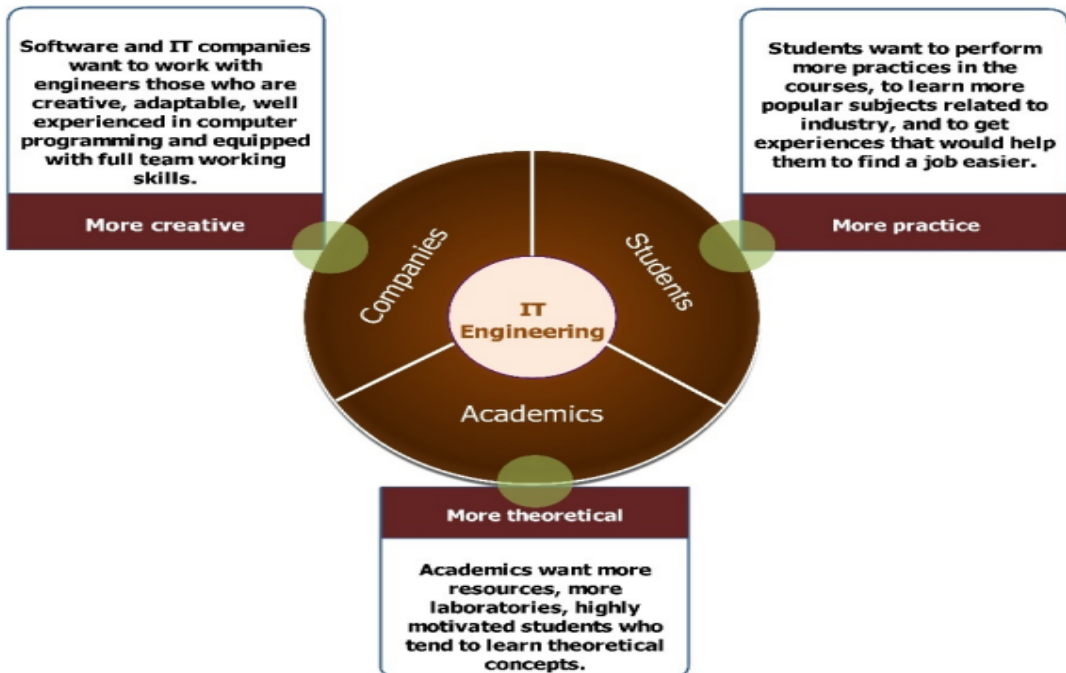

Figure 3: The expectations of three stakeholders of the IT sector (Sahin & Celikkan, 2020)

In their results, Sahin and Celikkan (2020) identified that the inclusion of technical electives in curricula is essential for improving students' field knowledge; therefore, a large number of well-

structured technical electives should be available. The authors also discovered that, despite the comprehensive instruction in Computer Networks within academic institutions, it is not regarded as a required skill by employers. Conversely, Object-Oriented Programming and Programming Languages continue to be in high demand within the employment sector, as indicated in Table 1.1. They also found that, in higher education, academic advisors play a pivotal role in shaping students' academic trajectories. A critical function of their role is to guide students in course selection that aligns with their academic interests and career aspirations.

Table 1: The educational knowledge gap between employer skill expectations and what is taught by the academics based on the mean values (Sahin & Celikkan, 2020)

	Topic	Academics Mean	Employer Mean	Δ Mean	Academics Teaching Rank	Employer Skill Expectation Rank
1.	Customer relationships	0.89	3.42	2.53	66	22
2.	Leadership	1.60	3.42	1.82	54	23
3.	Accounting	0.96	2.74	1.78	64	41
4.	Interview-Negotiation, Contract management	0.57	2.29	1.72	69	49
5.	Ethical issues	2.61	4.26	1.65	29	5
6.	Analytic thinking	2.81	4.40	1.59	27	1
7.	Maintenance	2.10	3.55	1.46	41	20
8.	Business models	1.60	3.00	1.40	52	33
9.	Quality	2.58	3.95	1.36	30	10
10.	Entrepreneurship	1.63	2.95	1.32	50	34

IT certification programmes present a number of challenges and implications for students at CUT, such as 1) curriculum relevance, 2) skills gap, and 3) relevance for the job market. These issues will affect the IT industry because if students at CUT are unable to access or succeed in IT certification programmes, there will be a limited pool of qualified candidates with industry-recognised credentials. This results in a skills gap within the IT sector, as employers struggle to find candidates with the specific technical skills needed to fill roles in software development, cybersecurity, data analytics, and more. To adapt to a dynamic IT environment, students should have an IT curriculum that is flexible enough to accommodate changing technologies and taught by instructors who remain abreast of technological advances (Mardis et al., 2018). Sahin and Celikkan (2020) also noted that information technology-related curricula in higher education institutions should reflect the dynamic nature of society and technology. This dynamic approach can ensure that IT graduates at CUT are equipped to address societal needs and that their education remains relevant. Despite the challenges, technology plays a crucial role, particularly with the emergence of online learning platforms. Technology can assist with online learning to address the growing needs of society, which is discussed next.

5. The role of Technology and Online Learning for Higher Certificate students

In recent years, technological advancements have significantly altered the educational paradigm, offering novel instruments and platforms that have revolutionised conventional pedagogical approaches. These advancements provide numerous benefits, including enhanced educational accessibility, individualised learning opportunities, and improved interaction between students and teachers. The expanding availability of education has resulted in a rapid growth of online higher education, with both course diversity and student enrolment increasing, as online education is viewed as an innovative way to improve university accessibility (Lee, 2017). Tailored learning opportunities include preparation for further learning and the development of essential skills such

as English, Mathematics, and Digital skills (Nicholson, 2024). Improved interaction between students and instructors allows students to engage with instructors by asking questions or discussing course activities. Through the extensive use of group work in virtual classes, students can interact, which enhances learning (Cavinato et al., 2021). This type of engagement can be particularly beneficial for higher education students, providing them with the flexibility to learn at their own pace.

The latest technological advancements enable the effective implementation of online learning, resulting in a variety of new learning models in education today (Hermanto & Srimulyani, 2021). Learning online has become increasingly popular across all levels of education (Elshami et al., 2021; Park & Kim, 2020), even though Martin and Borup (2022) reported that engagement rates are lower online than in person. An earlier investigation involving one of the researchers highlighted that student engagement remains equally important when transitioning from conventional classroom settings to online learning platforms. However, the authors noted that the digital environment requires changes in how students interact with educational content and receive support from others. They indicate that this shift makes it challenging for researchers to directly apply the extensive knowledge gained from research on student engagement in traditional classroom settings to the domain of virtual learning environments. Making the learning process more enjoyable can increase students' interest in participating in online learning (Pribeanu et al., 2021). Teachers in online learning should prepare teaching materials that are easy to understand and motivate their students while meeting their needs in terms of adequate online learning facilities (Amelia et al., 2020). Baber (2022) reported that a lack of social interaction in the classroom can hamper effective online learning, which is why instructors should ensure their classes are interactive. Okada and Sheehy (2020) also confirmed that students should enjoy learning if they are to learn effectively.

Due to its flexibility and accessibility, online learning is becoming more popular in higher education (Park & Kim, 2020). After COVID-19, educational services are being forced to adapt to online learning methods (Hermanto & Srimulyani, 2021). The shift to online learning has raised new expectations for instructors, including the need to integrate content knowledge with engaging teaching strategies that utilise technology's capabilities (Archambault et al., 2022). In online courses, student engagement can be more uncertain and more challenging to analyse than in face-to-face classrooms (Cole et al., 2021).

6. Policy and Institutional Support

Currently, the Central University of Technology, Welkom policy does not allow HC graduates to progress to the mainstream diploma due to a curriculum mismatch. The Information Technology Department on the Welkom campus offers a diploma in Software Development, while the HC content focuses on Networking. There is no connection between a Diploma in Software Development and an HC in Networking. We argue that the absence of clear articulation agreements between programmes can create a "dead-end" for graduates, limiting their opportunities for academic progression. Moreover, we need policies that support vertical articulation—allowing credits from the HC to count towards a diploma to facilitate smoother transitions and promote lifelong learning.

Developing effective policies ensures that specific objectives are achieved, priorities are established, and resources are allocated where they are most needed (Arndt et al., 2015). Good policies ensure that risks are managed and sustainable practices are followed. Regardless of policy efforts, South Africa's higher education facilities remain very restrictive when it comes to articulation (Baah, 2024).

To improve institutional support policy, a comprehensive approach is needed to address gaps in the existing system, enhance coordination among stakeholders, and ensure policies are adaptable to changing circumstances. Key strategies can include firstly conducting a thorough policy review (Toronto & Remington, 2020) by assessing current policies and using evidence-based analysis to measure the effectiveness of existing policies and improve them based on the results of these studies. Secondly, we must strengthen policy implementation mechanisms (Capano & Howlett, 2021) by

allocating adequate resources for implementing policies, including sufficient funding, staff, and infrastructure. Thirdly, we should promote the coherence and coordination of policies (Shawoo et al., 2023) through collaborative strategic planning, resource allocation, and consistent channels of communication. Faculty, administration, and students were involved in the policy development to foster its adoption in Zimbabwean universities (Garwe, 2023). Lastly, incorporating flexibility and adaptability into policy frameworks (Suprayitno et al., 2024) is essential to effectively respond to technological innovations, socioeconomic transformations, and institutional imperatives; thus, policies necessitate periodic review and amendment. In the study conducted by El Galad et al. (2024), flexibility measures were tailored to meet the needs and experiences of students and lecturers through their active participation.

As institutions evolve, policies for institutional support need to be continuously evaluated, stakeholder engagement is essential, and they must adapt to new challenges and opportunities, including the use of electronic learning (e-learning) for skills development. E-learning involves the use of electronic media and the internet to conduct learning. The adoption of e-learning can also assist HC students in furthering their studies at our sister campus in Bloemfontein, which offers a diploma in Networking that is more relevant than a diploma in Software Development. Pham and Ho (2020) suggested that policymakers and university leaders should consider both distance learning and classroom modes of delivery. They further contend that this will facilitate the preparation of higher learning institutions, facilitators, and students for a seamless transition toward the digitalised era. Distance learning can assist HC students from Welkom in pursuing a diploma in Networking. The development or review of the current policy can help meet the needs of HC students at the Welkom campus.

7. Alternative educational pathways for Higher Certificate in IT

This section outlines alternative educational pathways for graduates of the Higher Certificate in Information Technology. Section 8.1 presents alternative pathways at the Central University of Technology (CUT), while Section 8.2 details available opportunities for Entry-Level IT positions.

7.1 Alternative pathways for higher certificate students at CUT

The students who performed better in their HC level are offered an opportunity to further their studies with a Networking diploma, based on a selection criterion of the top 10 performers from each campus. The HC programme benefits initially non-qualifying students, allowing them to study for the diploma alongside 40 new grade 12 students, creating a quota of 60 at the Bloemfontein campus as set by the Department of Higher Education and Training. These disadvantages restrict access for other students who do not meet the criteria to essential qualifications, creating uncertainty about their professional future and increasing competition for scarce resources.

The department's intention in creating the HC was to provide students with the opportunity to qualify for entry-level IT positions. However, these students are not seeking entry-level positions; they wish to continue their studies. Corporations and students typically adopt a short-term perspective (focusing on training for initial employment), whereas information technology faculties maintain a long-term perspective (Maki, 2023). IT faculties emphasise the importance of acquiring knowledge and skills that will be useful in the long term, such as problem-solving and critical thinking skills (Mafenya, 2022). They also focus on developing technical skills, such as networking and computer repair, which will remain relevant regardless of the job market.

In light of the challenges and the current structure, enrolment, and prospects of the programme, we submit that students who complete the HC in IT with a focus on networking can pursue several career paths or further their education by enrolling in short courses such as Cisco Certified Network Associate (CCNA), Certified Information Systems Security Professional (CISSP), and Cloud Computing Certifications (AWS, Azure, Google Cloud), to mention a few. This would help to fill the

information gap that exists and reduce frustration among graduates who are unable to secure employment or further their education.

7.2 Available opportunities for entry-level IT

One of the key elements in addressing the challenges noted above is the provision of information to graduates in entry-level IT roles (Ngo-Ye & Choi, 2021). With the attainment of a Higher Certificate, individuals become eligible for various professional roles, including IT support technician, help desk technician, network support assistant, and junior network administrator. A support technician, often referred to as an IT support technician or help desk technician, is essential for ensuring the smooth operation of an organisation's computer systems and networks. Their expertise helps identify and resolve technical issues, contributing to increased productivity and a more efficient working environment. Another entry-level role that students can pursue is that of Network Technician or Administrator (Lowe, 2021). Upon acquiring relevant experience and further certifications, students can progress to positions such as network technician or network administrator. As network technicians, students can set up network hardware and perform cabling and physical network setups. However, the success of these roles also highlights the need for graduates to possess entrepreneurial skills, enabling them to become job creators rather than merely consumers. For example, integrating a course or module on digital marketing, focusing on how IT professionals can use online platforms to promote tech products or services, or implementing project-based learning, where students collaborate with actual businesses or startups to develop software, websites, or IT systems, would be beneficial. This experience will expose students to real-world challenges and help them understand the practical application of IT solutions in business contexts. This means that part of the training provided to IT students should equip them with pathway skills such as creativity, innovation, and exploration of the job market.

Another opportunity that students should utilise in South Africa, given the limited job market, is taking up networking internships. In research conducted by Urquía-Grande and Perez Estebanez (2020), their findings reported that students view internships as valuable and feel they fit well into the company's culture. However, they believe these experiences help them develop practical skills more than the cognitive skills gained from their degree programmes. We acknowledge that the remuneration for networking internships is low, but it can be a stepping stone to greater heights within the field, which often emphasises experience and familiarity with organisational culture.

In addition, students should consider starting a small IT Support Business rather than solely pursuing employment. South Africa has witnessed a surge in the establishment of new enterprises as an alternative for fostering economic prosperity and stability in both developed and developing countries around the globe (Alferaih, 2022). Small and medium-sized companies are increasingly seeking IT solutions, making the launch of an IT support business a rewarding undertaking. Other emerging areas of entrepreneurship in South Africa include cloud networking. Cloud computing represents a model that enables convenient, on-demand access to a shared pool of configurable computing resources. These resources encompass networks, servers, storage, applications, and services, thereby facilitating widespread accessibility and flexibility in resource utilisation (Reddy et al., 2020). These pathways offer various options for further education, certification, and career advancement, allowing students to tailor their journey according to their interests and career goals.

While we appreciate the available options for graduates, we are also aware that those with a Higher Certificate in Information Technology (HCIT) from a South African context still face significant challenges in navigating the terrain (Chakravorty et al., 2021; Pitan & Muller, 2023). As Laubscher (2021) highlights, HCIT graduates often encounter difficulties with the more advanced technical and theoretical components of diploma programmes, primarily due to the narrow focus of the Higher Certificate curriculum. This is particularly evident in fields requiring a deeper understanding of programming, data management, and systems design. Although advancement is feasible,

particularly in diploma programmes such as Networking, many students experience delays in completing their studies because of the need for additional bridging courses to address these knowledge gaps. According to Fitzallen et al. (2015), there is an increasing impetus to enhance the accessibility of higher education for individuals from diverse backgrounds; however, vocational qualifications frequently do not adequately facilitate their transition.

Moreover, universities frequently maintain rigid entry requirements for diploma or degree programmes, which further complicates the transition for HCIT graduates (Pitan & Muller, 2023). Those with lower academic points often find it difficult to meet the thresholds for admission, making the process of academic mobility even more challenging. This rigidity limits access for many students, especially those from disadvantaged backgrounds, who may already face structural barriers within the education system. It is imperative for institutions to revisit their entry criteria, alongside offering more flexible and supportive mechanisms, such as comprehensive bridging programmes and targeted academic support, to effectively address these challenges. The adaptable admission criteria at Open University Malaysia facilitate the inclusion of individuals possessing limited formal qualifications by allowing them to leverage their prior educational experiences and professional backgrounds (Awang et al., 2014). The authors also indicated that the framework is designed to enhance educational accessibility for those who do not satisfy conventional entry requirements. Diverse pathways were selected by individuals exhibiting varying characteristics, most notably differing academic histories; analogous and satisfactory rates of success serve as evidence that gaps in the academic development processes of students were effectively bridged (Duarte et al., 2016). Research indicates that individuals admitted via flexible entry mechanisms demonstrate performance levels comparable to those admitted through conventional requirements, thereby implying that prior experiential knowledge can serve to mitigate academic gaps (Duarte et al., 2016). Higher education and VET partners worked together in discipline groups to identify gaps in mathematics knowledge and devise pathway solutions for their articulating students. Despite the challenges of the identified pathways, the HC graduates can choose which one is suitable for them to pursue as a career. The identified pathways offer many possibilities for the graduates to learn further in support of lifelong learning.

8. Conclusions and Recommendations

Although HCIT graduates have access to a variety of pathways, the efficacy of each one varies according to the student's academic performance or career goals, business partnerships, and institutional support. Internships, industry certifications, and articulation agreements appear to be the most successful in promoting professional entry or further education. However, the wider impact of these routes is hampered by issues including the skills gap, a lack of opportunity to acknowledge prior learning, and the strict academic hierarchies of many colleges. The smooth transfer of HCIT graduates into further education or the workforce requires more concerted initiatives, such as improved bridging programmes and increased industry engagement. This paper explored alternative educational pathways for HC holders in IT at the South African University of Technology. The investigation concentrated on addressing the disparity between the HCIT credential and advanced professional opportunities. Graduates possessing an HC in IT are equipped to pursue a diverse array of career avenues and further educational pursuits.

In conclusion, the discussions highlight the intricate interrelationship among institutional policy frameworks, career progression within the IT sector, and entrepreneurial ventures. Institutions are required to conduct regular evaluations of policies to ensure sustained relevance and adherence to evolving standards. Concurrently, graduates in information technology are presented with a multitude of pathways for continued education and professional growth. The IT support sector, characterised by a surging demand for specialised competencies, presents considerable prospects for new enterprises. Foundational positions, such as those held by support and network technicians, are

pivotal for fostering the necessary expertise within this dynamic domain for HC graduates from CUT.

It is recommended that the diploma in Networking be introduced at the Welkom campus to increase the intake from 10 to 20 and allow the campus to grow, as the diploma is currently only offered at the Bloemfontein campus. The criteria should be clearly refined to achieve a balanced population dynamic, consisting of a certain percentage of females and males. This will ensure that the population is well represented. Psychometric tests can be introduced to determine compatibility in the field so that, at a later stage, students are not disadvantaged based on their academic performance.

9. **Declarations**

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