Optimizing secondary schools' computer science education to foster a digitally skilled workforce for the Tanzania Development Vision 2050

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ABSTRACT

The Tanzania Development Vision 2050 calls for a digitally skilled workforce to create a prosperous, just, inclusive, and self-reliant economy, responding to the global shift from manual to digital economies. However, little is known about how well computer science education in secondary school is optimized to establish a solid digital foundation for the national workforce. Specifically, the study examined the trends of students sitting for computer science in the certificate of secondary examination, the secondary school leavers' experience of the computer science subject, and the influence of the computer science subject on the digitally-workforce for Tanzania Development Vision 2050. The study employed an explanatory cross-sectional design, a mixed-methods approach, and human capital theory. Data were gathered through questionnaires from 385 out of 417, 866 students who completed the Certificate of Secondary Education examination between 2017 and 2025, along with nine reports from the National Examination Council of Tanzania. The sample was chosen through stratified sampling techniques in which each year from 2017 to 2025 formed a stratum, and from each, a total of 45 respondents were randomly sampled. The analysis used descriptive, Spearman's rank correlation, Chi-square, and content analysis techniques. The findings show that out of 4,170, 866 students who completed the Certificate of Secondary Education between 2017 and 2025, only 29,945 (0.7%) studied computer science, suggesting that 99% of these students are digitally illiterate. Additionally, most students view computer science as highly relevant, and it is positively and strongly associated with and influencing a digitally skilled workforce for Tanzania's National Development Vision 2050. Despite the fact that they desired to study it, the subject was not offered in their schools. Based on these observations, the study concludes that there is an urgent need to teach computer science as a compulsory subject in all secondary schools to drive workforce digitalization for economic growth and sustainable development. Future research could focus on addressing the digital skills gap among students who finished secondary education without computer skills.

Keywords: Certificate of Secondary Education Examination, Computer Science Subject, Digital Skilled Workforce, Secondary Schools, Tanzania Development, Vision 2050

I. INTRODUCTION

The global labour market requires a digitally-skilled workforce to enhance the effective and efficient use of artificial intelligence, big data, cloud computing, and automation technology in production and service sectors of the economy (Schwab & Zahidi, 2020). Therefore, teaching information technology and computer skills is essential, as emphasized in the global Sustainable Development Goals 2030 (United Nations Conference on Trade and Development [UNCTAD], 2024).

Education systems in Europe, America, Latin America, Asia, and the Arab world have incorporated information technology and computer skills into their curricula to build a digital foundation from elementary levels (Miller et al., 2020, 2020; Guitert et al., 2021; OECD, 2020; Alaleeli & Alnajjar, 2019). In the African context, a workforce equipped with information and computer skills is essential to foster the 'Africa we want' through Agenda 2063, as detailed in the digital transformation strategy for Africa 2020-2030 (Union, 2020). Therefore, it is taught at the secondary level of education in countries such as Nigeria and Morocco (Amadhila, 2021).

Similarly, the sub-Saharan African countries such as Ghana and South Africa have given information and computer skills a dual position, as a vehicle for imparting education as well as a subject of study, due to the need to stimulate economic growth and sustainable development (Akongo et al., 2025). Similarly, the socio-economic transformation in the South African Development Cooperation (SADC) through SADC Vision 2050 requires a workforce with essential digital skills to meet its targets (Abrahams et al., 2022). This has led SADC countries, including Zambia and South Africa, to prioritize digital skills (Markowitz, 2019; Muduva et al., 2024; Mnisi et al., 2024).

Moreover, achieving the East African Development Vision 2050 requires the effective utilization and integration of information and communication skills in all sectors of the economy, such as agriculture, mining, tourism, and fisheries, as well as in the service sectors, such as health, education, transportation, trade, and communication (Tramberend et al., 2021). Therefore, information technology and computer skills are taught as a subject from the primary level of education, as observed in all East African countries, including Kenya, Uganda, Rwanda, and Sudan (Faustino et al., 2024).

These global and regional needs for digitalization have been reflected in the Tanzania Development Vision 2050, which aims to achieve a prosperous, just, inclusive, and self-reliant economy under the three main pillars: a strong, inclusive, and competitive economy; human capabilities and social development; and environmental integrity and climate change resilience. All these pillars imply a dire need for computer skills to catalyze the socio-economic transformation (Edjang-Nguema & Torrent-Sellens, 2025). Therefore, the government of Tanzania has declared that computer applications are one of the compulsory supportive subjects for Form I-IV students of ordinary secondary education (Ministry of Education, Science and Technology [MoEST], 2025:1).

1.1 Statement of the Problem

The Tanzanian government aims to achieve a prosperous, just, inclusive, and self-reliant economy by 2050 (MoEST, 2025). However, the shift from manual to digital in production and service sectors threatens this goal unless the government advances digitalization of its workforce to bridge the digital divide (OECD, 2020; OECD, 2024; Alenezi & Alfaleh, 2024). Consequently, the government developed the National Digital Economy Strategic Framework 2024-2034 and a computer application curriculum to promote digital workforce development for economic growth and sustainable development (Utonga et al., 2026). Despite these initiatives, little is known about the trends of students sitting for the computer science examination in certificate of secondary education, students' experiences with computer science during their secondary education, and the influence of the computer science subject on the digitally skilled workforce for Tanzania's Development Vision 2050. This highlights the need for this study.

1.2 Research questions

i) What are the trends of students sitting for computer science in the Certificate of Secondary Examination?
ii) What is the school leavers' experience of the computer science subject in their secondary education?
iii) What is the influence of the computer science subject on the digitally-workforce for Tanzania Development Vision 2050?

II. LITERATURE REVIEW

2.1 Theoretical Review

The theoretical underpinning of this study is human capital theory, proposed by Gary Becker and Theodore Shultz in the 1950s and early 1960s, which emphasizes the need to impart specific skills to the workforce as a human capital investment (Becker, 1975). The theory is relevant to this study because Tanzania's Development Vision 2050 requires a digitally-skilled workforce to transform production and service provision from manual to digital as a driving force to a prosperous, just, inclusive, and self-reliant economy. The theory regards employees as an invaluable organizational and national asset for achieving the national vision, hence the need to ensure the national asset keeps pace with global and regional digitalization processes through education and training (Oltulular, 2025; Awu et al., 2025; Wuttaphan, 2017). Moreover, the theory proposes that training and education for human resource development should be specific to meet institutional needs. Therefore, the specific needs in the case of the Tanzania Development Vision are digital skills, which are expected to be imparted through the teaching and learning of the computer science subject in secondary schools (Kessler & Lulfesmann, 2022).

2.2 Empirical Review

The global demand for digital skills to promote economic growth and sustainable development has made computer science education an integral part of various education systems worldwide (Angeli & Ioannou, 2015). Such skills are vital to keep up with technological advances across sectors of the economy (Elbagory, 2024). In England, computer science is taught as a required subject to improve digital skills for the digital economy (Fowler & Vegas, 2021). In the United States, the government legislated the formal teaching of computer science in kindergarten (Cohen-Vogel et al., 2022). Even in Latin American countries, computer science is valued as a tool for digital skills and is taught to all students starting from elementary education (OECD, 2020).

In the Middle East, computer science is a mandatory subject in secondary schools to meet the digital needs of the emerging generation (Alaleeli & Alnajjar, 2019). Paraguay's digital inclusion program has made computer science teaching compulsory in both public and private secondary schools (Troche et al., 2025). Asian countries such as India,

Indonesia, Singapore, South Korea, China, and Japan have incorporated computer science into secondary education, making it a required subject (Zheng, 2025).

In Africa—specifically Nigeria, Ghana, and Morocco—computer science is viewed as a pathway for digital skills, and it has been introduced as a compulsory subject in all secondary schools to foster a digital culture among youth (Davidson & Ezeh, 2023; Mnisi et al., 2024). In Sub-Saharan Africa, countries like South Africa and Zambia have declared computer science education as a way to boost digital literacy for economic growth, investing in infrastructure to provide these skills to all students (Kala, 2023).

Similarly, East African countries—such as Rwanda, Uganda, Kenya, and Sudan—require a digitally literate workforce to support regional and national economic progress and sustainable development; thus, computer science is a core part of their basic education curricula (Faustino et al., 2024). In Tanzania, the secondary education curriculum states that 'computer science" is a compulsory supportive subject in ordinary secondary education, implying it should be taught to all students (MoEST, 2025:1). This aligns positively with Tanzania's digital economy strategic framework 2024-2024 (Utonga et al., 2026).

The national digital economy strategy emphasizes the need for computer skills to meet the demands of secondary education students, as highlighted by various scholars (Timotheou et al., 2023). All reviewed literature underlines the importance of teaching computer science in secondary schools to develop a digitally skilled workforce that drives economic growth and sustainable development. However, in the Tanzanian context, despite these curricular and strategic frameworks advocating for digital skills, there is limited empirical evidence on the number of students completing secondary education with these skills, how school leavers perceive secondary computer education, or how computer education influences the development of a digitally skilled workforce in line with Tanzania's Development Vision 2050. This gap underscores the need for this study.

III. METHODOLOGY

3.1 Research Design

The study adopted a cross-sectional explanatory design Creswell & Creswell, 2022), which is relevant for studying the number of students who sat for computer science in the Certificate of Secondary Education Examination between 2017 and 2025, secondary school leavers' experience with computer science subject, and the influence of the subject on the digitally-skilled workforce for the Tanzania Development Vision 2050.

3.2 Study Area

The study was generally conducted in Tanzania, where students sit for the Certificate of Secondary Education Examination (CSEE), organized by the National Examination Council of Tanzania (NECTA).

3.3 Target Population

The study population comprised 4, 170, 866 students who completed the certificate of secondary education in nine years between 2017 and 2025. Such a number was obtained from the National Examination Council of Tanzania's performance analysis books.

3.4 Sampling Procedures and Sample Size

A stratified sampling technique was adopted in which school leavers for the nine years (2027-2025) were divided into nine strata, a stratum for each year. From each, 45 respondents were randomly picked to obtain a total sample of 405 out of 4,170, 866 total population. Similarly, nine reports of students who completed their secondary education were purposively sampled from the National Examination Council of Tanzania.

3.5 Data Collection Instruments and Procedures

Data were collected using structured questionnaires supplied to a total of 405 students who completed a certificate of secondary education between 2017 and 2025. The 385 filled questionnaires were received for analysis, which makes a response rate of 95%, which is reasonable. The questionnaire adopted five-point Likert scale items measuring the perceptions and experiences of students on the computer science subject in their former school when they were schooling, the relevance of the computer skills offered in secondary schools, and its effect on the digitally-skilled workforce for the Tanzania Development Vision 2050.

The instruments were self-developed by the researcher and reviewed by the experts in education, Information and Communication technology, as well as statistics, and then piloted to 40 respondents (10%), which resulted in dropping some questions with similar responses and modification of others for clarity due to the ambiguous responses observed in some respondents. Reliability was assessed, and a Cronbach's alpha of 7.7 was obtained. The documentary analysis was conducted for the reports of the Certificate of Secondary Education Examination (CSEE) accessed from

the www.necta.go.tz, the official website for the National Examination Council of Tanzania (NECTA). From each report, the number of students who sat for information and computer science examination was examined in comparison with the number of students who sat for the general subject examination, particularly Civics, in each year between 2017 and 2025.

3.6 Data Analysis

The quantitative data collected through questionnaires were analyzed using the Statistical Package for Social Sciences (SPSS) for generating descriptive statistics in frequency, percentage, mean, and standard deviation, as well as Spearman's rank correlation coefficient. The cross-tabulation table was drawn from quantitative data to enhance the chi-square for hypothesis testing. Moreover, the documentary data were analyzed descriptively, and the results were presented in frequency and percentage.

3.7 Ethical Consideration

Ethical consideration was considered throughout the study as participants were informed of the purpose of the study, consent was sought from them, and they were informed about their right to withdraw. The data and information obtained were purposely used for the study. Confidentiality was observed among the key informants, who were given numbers for the anonymity of their identities. The documentary data used were the open-access reports from the official website of the National Examination Council of Tanzania.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Demographic information of the respondents

The study examined the demographic information of the respondents in terms of age and sex. The results are presented in Table 1.

Table 1

Demographic Information of the Respondents

Demographic Information		**Frequency**	**Percent**
Age	15-20	187	49
	21-25	165	43
	26-30	20	5
	31-35	13	3
Sex	Male	178	46
	Female	207	54
Total		**385**	**100**

Source: Field Data

The results on the respondents' demographic characteristics presented in Table 1 indicate that the school leavers involved in the study were aged between 15 and 35 years. These are the youth who fall under the digital generation category, expected to utilize digital economic opportunities (Alaleeli & Alnajjar, 2019). Therefore, the involvement of these groups in the study was significant to gain their perception about the effects of information and computer science on the national development vision 2050.

Similarly, in terms of sex, the results indicate that the study involved both male and female participants because the Tanzanian education policy 2014, revised 2023 edition, is gender inclusive, and the national digital economy strategy 2024-2034 addresses the digital divide across gender; it was necessary to harness the perceptions of both male and female school leavers (MoEST, 2023). The rationale for involving different age groups and sexes in the study was the inclusive nature of the Tanzania Development Vision 2050, which entails the participation of both males and females and age diversity to achieve a prosperous, inclusive, and self-reliant economy (Utonga et al., 2026).

4.1.2 Trends of Students Sitting for the Certificate of Secondary Education Examination in Computer Science

The study examined the trends of students who sat for the certificate of secondary education examination in the computer science subject from 2017 to 2025. The results are presented in Table 2.

Table 2

Trends of students sitting for the Certificate of Secondary Education Examination in Computer Science (2017–2025)

Year	Total Candidates	ICS Total Candidates	ICS Candidates %	Passed ICS%
2017	317,673	2,420	0.76	87
2018	360,405	2,820	0.78	86
2019	424.939	2,786	0.65	72
2020	437,518	2,702	0.61	89
2021	484,783	2,700	0.55	94
2022	520,393	3,067	0.58	92
2023	529,427	3,527	0.66	90
2024	517,328	4,295	0.83	94
2025	578,400	5,628	0.97	96
Total	**4,170,866**	**29,945**	**0.7**	**89**

Source: NECTA Reports (NECTA, 2017; 2018; 2019; 2020;2021; 2022;2023; 2024;2025; 2026).

The results presented in Table 2 indicate that the trends of students sitting for computer science subjects in the certificate of secondary education examination in nine years, from 2017 to 2025, are, on average, very low, 29,945 out of 4,170,866, which is 0.7%. That means the majority of secondary school leavers (99%) did not study information and computer science subjects at all, or they dropped them along the way before their final years. This means 99% of secondary school leavers in Tanzania are digitally illiterate. However, those few who take it perform very well, which means the subject is well taught and understood by most of the students above 85%.

4.1.3 School Leavers' Experience of Computer Science Subject in their Secondary Education

The study explores the experience of school leavers with computer science subjects in their secondary schools. The results are presented in Figure 1.

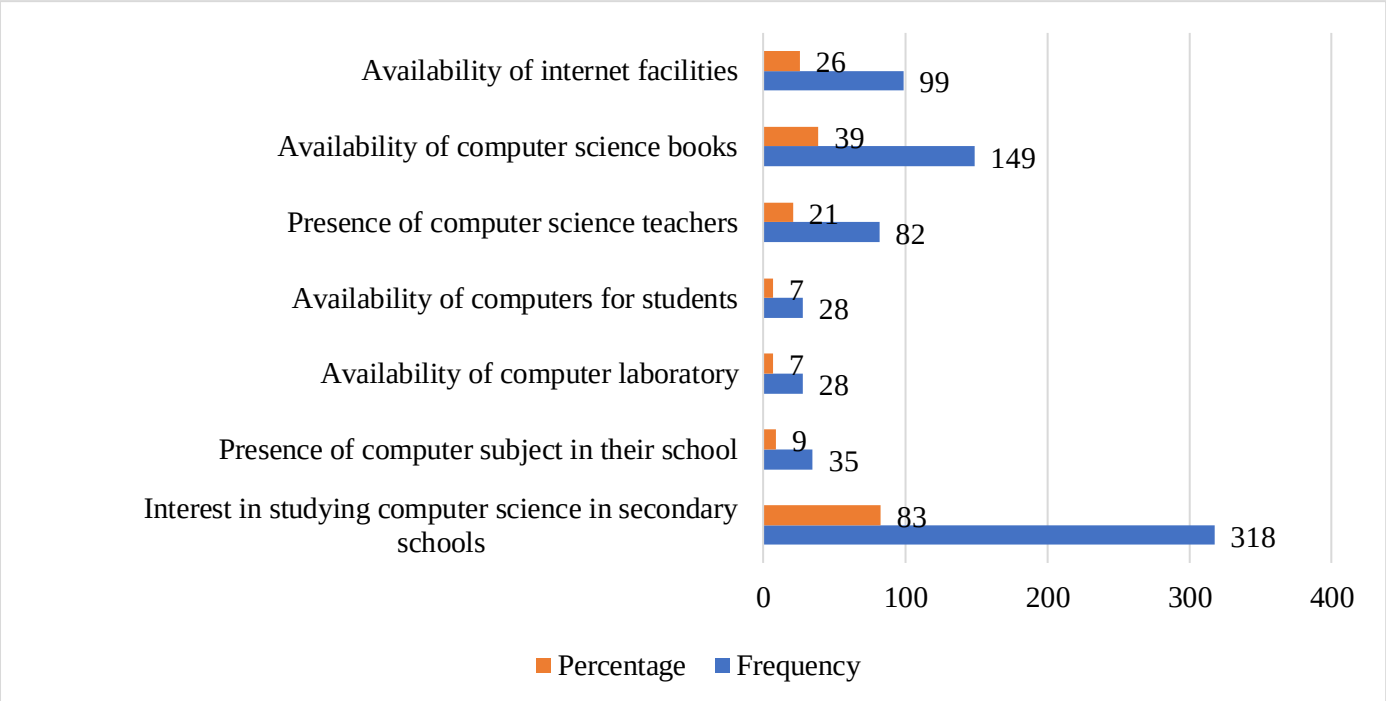

Figure 1

School Leavers' Experience of the Computer Science Subject

The results presented in Figure 1 indicate that most of the secondary school leavers, 318 out of 385 (83%), were interested in studying information and computer science subjects; however, the subjects were not taught in their schools. Similarly, most of the secondary schools faced a lack of essential resources to support the teaching and learning of

information and computer science subjects, which included a lack of computer laboratories, a lack of computers, a shortage of books, a shortage of teachers, and a lack of internet connectivity.

4.1.4 The Influence of Computer Science on the Digital Workforce and Tanzania Development Vision 2050

The study assessed the influence of the computer science subject on the digitally-workforce for Tanzania Development Vision 2050. The results are presented in descriptive statistics, Spearman's correlation coefficients, and chi-square.

4.1.4.1 Descriptive results

The descriptive results are presented in Table 3, in mean and standard deviation.

Table 3

Descriptive Analysis Results

Variables	N	Min	Max	Mean	Std. Deviation
Digital Workforce for Tanzania Development Vision 2050	385	1	5	4.29	1.127
Basic Computer Operations Skills	385	1	5	3.74	1.266
Word Processing Skills	385	1	5	3.88	1.254
Spreadsheet Skills	385	1	5	4.03	1.220
Database Management Skills	385	1	5	3.89	1.255
Presentation Skills	385	1	5	3.98	1.280
Desktop Publishing Skills	385	1	5	3.88	1.237
Internet Communication Skills	385	1	5	3.75	1.230
Internet Safety and Security Skills	385	1	5	3.91	1.261
Digital Marketing Skills	385	1	5	4.19	1.223
Artificial Intelligence Skills	385	1	5	4.11	1.236

Source: Field Data January to March, 2026.

The descriptive results show that respondents rated the relationship between the skills provided by the computer science subject and the digital-skilled workforce for Tanzania Development Vision 2050 positively, with the mean above the neutral point of 3.0, ranging from 3.74 to 4.19. This indicates that secondary school leavers see computer science as a vital tool for digital literacy, emphasizing the need for it to be offered to all students at that education level.

4.1.4.2 Correlation results

The Spearman's rank correlation results are presented in Table 4.

Table 4

Spearman's Rank Correlation Matrix (N=385).

	DWV	BCO	WPS	SSS	DBS	PRS	DPS	ICS	ISS	DMS	AIS
DWV	1.000										
BCO	.776**	1.000									
WPS	.496**	.731**	1.000								
SSS	.533**	.769**	.650**	1.000							
DBS	.849**	.776**	.606**	.709**	1.000						
PRS	.492**	.754**	.784**	.575**	.729**	1.000					
DPS	.472**	.756**	.517**	.607**	.769**	.610**	1.000				
ICS	.708**	.709**	.518**	.769**	.632**	.747**	.700**	1.000			
ISS	.799**	.776**	.682**	.771**	.674**	.737**	.782**	.783**	1.000		
DMS	.723**	.720**	.657**	.547**	.840**	.814**	.773**	.778**	.701**	1.000	
AIS	.735**	.729**	.754**	.710**	.763**	.808**	.811**	.856**	.880**	.894**	1.000

Key: DWW: digitally-skilled workforce for Tanzania Development Vision; BCO: Basic computer operations; WPS: Word processing skills; SSS: Spread sheet skills, DBS: Database management skills; PRS: Presentation skills, DPS: Desktop publishing skills, ICS: Internet communication skills, ISS: Internet safety and security skills, DMS: Digital marketing skills and AIS: Artificial intelligence skills.

The Spearman's rank correlation results indicate a positive and strong relationship between the digitally-skilled workforce for Tanzania Development Vision 2050 and the computer science subject in terms of its key skills (Basic computer operations, database management skills, internet communication skills, internet safety and security skills, digital marketing skills, and artificial intelligence skills). However, the study found a positive but moderate relationship between a digitally-skilled workforce for Tanzania Development Vision 2050 with word processing skills, spreadsheet skills, presentation skills, and desktop publishing skills. This suggests that the subject is essential to build a digital foundation for students in secondary schools before they join either the labour market or subsequent workforce training programmes.

4.1.4.3 Hypothesis testing results

The study determined the influence of the computer science subject on the digital workforce for Tanzania Development Vision 2050. It tested the two hypotheses that.

H_o= Computer science subject does not influence the digital workforce for Tanzania's development vision 2050.

H_a= Computer science subject influences the digital workforce for Tanzania's development vision 2050.

The frequency of secondary school leavers' responses was categorized based on agreement and disagreement. The result is presented in a cross-tabulation table 5.

Table 5

Response Category Table

RESPONSE CATEGORY	**BCoS**	**DPS**	**WPS**	**SSS**	**AIS**	**DMS**	**ISS**	**DMS**	**Total**
Agree	309	325	319	339	332	316	322	335	2597
Disagree	76	60	66	46	53	69	63	50	483
Total	385	385	385	385	385	385	385	385	3080

The results presented in Table 5 indicate that there were two response categories (Agree and Disagree), in which the number of agreements about the influence of the computer science subject on the digital workforce for Tanzania Development Vision was four times higher than the number of disagreements in all nine skills offered by the computer science subject.

Table 6

Expected frequencies f_e Table

RESPONSE CATEGORY	**BCoS**	**DPS**	**WPS**	**SSS**	**AIS**	**DMS**	**ISS**	**DMS**	**Total**
Agree	324.63	324.63	324.63	324.63	324.63	324.63	324.63	324.63	2597
Disagree	60.375	60.375	60.375	60.375	60.375	60.375	60.375	60.375	483
Total	385	385	385	385	385	385	385	385	3080

The results presented in Table 6 indicate the expected frequency in each of the skills offered by the computer science subject, and the total number of frequencies for both categories, agreement and disagreement.

Table 7
Calculated Chi-Square table

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
309	324.63	-15.63	244.2969	0.7525
325	324.63	0.37	0.1369	0.0042
319	324.63	-5.63	31.6969	0.0976
339	324.63	14.37	206.4969	0.0064
332	324.63	7.37	54.3169	0.1673
316	324.63	-8.63	74.4769	0.2294
322	324.63	-2.3	5.29	0.0163
335	324.63	10.37	107.5369	0.3313
76	60.375	15.625	244.141	4.0437
60	60.375	-0.375	0.141	0.0023
66	60.375	5.625	31.641	0.5241
46	60.375	-14.375	206.641	3.4226
53	60.375	-37.375	1396.891	23.1369
69	60.375	-8.625	74.391	1.2321
63	60.375	2.625	6.891	0.1141
50	60.375	-10.375	107.641	1.7829
Total			$\sum(f_o - f_e)^2 =$	$\sum \frac{(f_o - f_e)^2}{f_e}$

The results in Table 7 indicate that the calculated chi-square is 31.2444. The theoretical Chi-square at a given degree of freedom (df) and a given level of significance, preferably 5% level. Degree of freedom df =(nr-1) (nc-1) where nr is the number of rows, and nc is the number of columns. Df = (2-1) (8-1) =7 at 5%, this gives a theoretical Chi-square of 14.07. Since the calculated Chi-square is greater than the theoretical Chi-square, we reject the null hypotheses and simultaneously accept the alternative hypotheses that the computer science subject influences the digital workforce for Tanzania's development vision 2050.

4.2 Discussion

4.2.1 Trends of Students Sitting for the Certificate of Secondary Education Examination in Computer Science

The study found that the number of students who sat for the certificate of secondary education examination in the information and computer science subject between 2017 and 2025 is approximately 1%. If 99% of the students completing their certificate of secondary education lack essential digital skills, this means that such a population lacks essential digital foundation skills, hence little ability to embrace digital economy opportunities for economic growth and sustainable development. If secondary education is an entry to further education, it means that most of the students joining post-secondary training programmes lack basic digital skills (Shahanga & Kasambala, 2023). This situation implies that the quality of secondary education is questionable if it lacks essential skills (Shahanga, 2025; Shahanga et al, 2021a; Shahanga et al, 2021b). Such results are contrary to the national economy strategic framework 2024-2034, which emphasizes the digitalization of service and production sectors (Utonga et al., 2026). Similarly, the results deviate from the computer science subject curriculum, which requires the subject to be taught as a compulsory subject (MoEST, 2025). The results also differ from the national development vision, which highlights the need for digital skills for promoting economic growth. The deviation between the policy statements and the actual practice means a need for intervention strategies to achieve the policy needs. Globally, these results deviate from Schwab and Zahidi's (2020) report, which regards digital skills as the most employable skills in public and private sectors, and hence to be imparted to all learners at different levels of workforce development. Based on the human capital theory, the lack of digital skills to the 99% of secondary school leavers means inadequate investment in the workforce, which may negatively affect economic growth.

4.2.2 School Leavers' Experiences with Computer Science Subject in Secondary Education

The study found that most of the secondary school leavers did not study computer science even though they were interested in studying such a subject. The reason was a lack of essential resources to support the teaching and learning of such a subject, which included a lack of computer laboratories, a lack of computers, a shortage of books, a shortage of teachers, a lack of internet connectivity, and a lack of such a subject in their school. If such a subject is

highly demanded by students in schools and if most of the schools do not offer such a subject, it means that the negative experience of secondary school leavers about computer science is influenced by a combination of factors, including policy-based and school-based. The demand for computer science by most of the students concurs with previous studies in the Arab world, in which secondary school students were fond of computer studies due to the digital cultural age (Alaleeli & Alnajjar, 2019). However, the lack of computer science subjects in most of the Tanzanian schools deviates from previous studies in the USA, India, Cyprus, and the UK, where computer science is taught in all schools as a compulsory subject (Miller et al., 2020). However, the lack of essential resources to support the subject concurs with previous studies in Nigeria and Paraguay, where the lack of trained teachers, inadequate ICT devices, and lack of reliable internet connectivity affected the subject (Davidson & Ezeh, 2023; Boaumadan & Garcia, 2025). Based on the human capital theory, secondary school leavers lack specific skills for the digital economy due to unsupportive school systems.

4.2.3 The Influence of Computer Science on the Digital Workforce in Tanzania's Development Vision 2050

The study found a positive and strong influence of the computer science subject on the digitally-workforce for Tanzania Development Vision 2050. If the computer science subject influences the development of a digitally-skilled workforce for the national development vision 2050, the subject is an essential drive to the vision. Therefore, teaching and studying computer science in secondary schools should be mandatory to achieve economic growth and sustainable development, as suggested in the national development vision 2050. The results concur with the national development vision 2050 (URT, 2025), the computer application syllabus (MoEST, 2025), the Tanzania digital economy strategic framework 2024-2034 (URT, 2024), and the digital transformation strategy for Africa 2020-2030 (Union, 2020). Further, the positive and strong influence of computer science subject on the digitally skilled workforce concurs with previous studies in the Arab World, USA, Europe, Asia, Latin America, and Africa (Alaleeli & Alnajjar, 2019; Miller et al., 2020; Cohen et al., 2020; Boaumadan & Garcia, 2025). Since the labour market needs determine the employability of the graduates, secondary education should equip learners with digital skills, which are highly demanded by employers, and because such skills are offered by the computer science subject, it should be taught to all students (Shahanga & Akyoo, 2025). The teaching and learning of computer science in secondary school for developing a digitally-skilled workforce for the National Development Vision 2050 is supported by the human capital theory, which underscores the roles of training as investment in human capital for economic growth (Becker, 1975; Awu et al., 2025; Wuttaphan, 2017).

V. CONCLUSION & RECOMMENDATION

4.1 Conclusion

The study examined the teaching of computer science in secondary schools to create a digitally-skilled workforce for the Tanzania Development Vision 2050. It found that the trends of students sitting for the computer science subject in secondary schools are low, as statistically shown as 0.7%, despite the increase in students' enrollment following the fee-free basic education policy since 2016. This means 99% of them leave secondary education to enter the labor market or pursue further education without digital foundational skills. Based on this, the study concludes that secondary education prepares a manual workforce contrary to labor market needs. Furthermore, the study explored the experiences of secondary school leavers regarding the teaching and learning of computer science in their schools. The results indicated that most leavers want to study computer science, but their dreams are unmet because the subject was not offered in their schools. Additionally, the study assessed the influence of computer science subject on a digitally-skilled workforce aligned with the Tanzania Development Vision 2050. It found a strong and positive influence of computer science education and the digital workforce needed for the national vision. From this, the study concludes that the teaching of computer science in secondary schools should be enhanced to develop the skilled workforce required for a digital economy, which is central to Tanzania's development agenda. According to human capital theory, secondary education has not yet been fully utilized to develop a digitally-skilled workforce for the Tanzania Development Vision. This diverges from the theory, which emphasizes developing specific skills in the workforce as vital investments for economic growth and sustainable development.

4.2 Recommendation

Based on the results of this study, the following recommendations can be made. Firstly, since few students take computer science even in schools with such a subject, the subject should be made compulsory as other general subjects like mathematics, civics, and business studies. Secondly, the government, through the Tanzania Communication Regulatory Authority (TCRA) and Universal Communication Services Access Fund (UCSAF), should strengthen ICT infrastructure in schools to enhance the teaching and learning of computer science subjects. Thirdly, the school boards should establish collaboration strategies with public and private telecommunication companies to acquire digital tools and infrastructure for the same. Since most of the schools lack desktop and laptop computers, but teachers, parents, and

students possess smartphones, further study may assess the use of smartphones in teaching the computer science subject in secondary schools.

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