

Trainee-Related Determinants of Incorporation of Computer-Aided Production Techniques in Training of Mechanical Engineering Technicians in TVET Institutions within Uasin Gishu County, Kenya

 Kiplimo Kipkoech Moses, Dimo Okinyi Herbert and
 Muyaka Mwira Jafred

School of Education, University of Eldoret, P.O. Box 1125 – 30100, Eldoret, Kenya

Abstract

Although Technical and Vocational Education and Training (TVET) system in Kenya aims to produce technically competent mechanical engineering technicians, many institutions in counties struggle to integrate computer-aided production techniques in training. These challenges reduce the employability of TVET graduates, making Kenya less competitive in sectors reliant on digital manufacturing. Given that Uasin Gishu County is an emerging industrial hub, the future technicians trained there require advanced skills. Consequently, this study sought to identify the specific trainee-related determinants influencing the incorporation of computer-aided production (CAP) techniques in mechanical technician training, analyzing factors such as trainee exposure and training, perception and attitude, desire to learn, learning preferences, personal ambitions, and self-determination. This study was anchored on William Theodore's human capital theory and adopted a descriptive research design. The research was conducted across accredited mechanical engineering programs in TVET institutions within Uasin Gishu County. The target population consisted of 128 trainees from seven institutions, with participants selected through random sampling. Data collection utilized a structured questionnaire that underwent pilot testing to establish validity through expert review and to ensure reliability. Data was analyzed using descriptive statistics and presented in tables and charts. Findings showed that trainee-related factors significantly influenced the adoption of computer-aided techniques. Majority of trainees reported receiving relevant training (n=35 agreed; n=34 strongly agreed) and learning guided by modern technology (n=50 agreed; n=30 strongly agreed). A majority perceived these techniques as essential for their careers (n=42 agreed; n=57 strongly agreed) and expressed strong motivation to learn (n=43 agreed; n=60 strongly agreed). Many linked their ambitions to mastering these skills (n=48 agreed; n=37 strongly agreed) and demonstrated self-determination (n=53 agreed; n=52 strongly agreed). However, respondents cited key

constraints including inadequate staff (n=40 agreed; n=44 strongly agreed), obsolete equipment (n=46 agreed; n=56 strongly agreed), and exam-oriented curricula (n=26 agreed; n=69 strongly agreed). The study concludes that trainee-related factors are strong enablers of digital adoption, but institutional and structural challenges remain the critical bottlenecks in achieving comprehensive digital competence among mechanical technician trainees in Kenya. The study recommends revising the TVET curriculum to include compulsory computer-aided production modules, upgrading institutional digital infrastructure, enhancing trainers' continuous professional development, and strengthening industry partnerships for internships and mentorship to improve trainees' practical exposure and employability.

Keywords: TVETs, trainee-related factors, computer-aided production techniques, mechanical engineering technicians

Journal ISSN: 2960-2602

Journal DOI: <https://doi.org/10.69897/joret.v3i3>

Correspondence: moseskipkoech646@gmail.com

Copyright © 2025 Kiplimo et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY).

Funding: The author received no financial support for the research, authorship and/or publication of this article.

Data Availability Statement: The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

Competing interests: The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Introduction

Technical and Vocational Education and Training (TVET) has become a cornerstone of workforce development worldwide, equipping learners with practical skills needed for the 21st-century labor market (Pharamela & Singh-Pillay, 2025). Globally, the rise of automation, digital manufacturing and computer-aided design has made the integration of computer-aided techniques essential in technical training (OECD, 2020; UNESCO, 2022). Advanced economies such as Germany, China, and South Korea have shown that when trainees are exposed to digital tools early in their training,

they become more innovative, adaptable, and employable (Chun et al. 2021; UNESCO-UNEVOC, 2020).

Across Africa, the African Union's Agenda 2063 underscores the importance of digitalization and industrial modernization as pathways to inclusive growth (African Union, 2020). Yet, many African TVET systems still struggle with gaps in infrastructure, digital resources, and learner preparedness (World Bank, 2019; AfDB, 2021). For example, research in Nigeria and South Africa shows that trainees' limited digital literacy, weak exposure to ICT in earlier education, and

low confidence with emerging technologies slow down the adoption of computer-aided methods in training (Nuhu, 2023; Mhlanga, 2021). These challenges highlight the need to look beyond institutional capacity and trainer competence, and instead consider the role of trainees themselves in shaping successful integration.

In Kenya, TVET is mandated by the TVET Act (2013) and Vision 2030 to deliver a workforce that is skilled, adaptable, and aligned to industry expectations. The manufacturing sector, as a pillar of the Big Four Agenda, depends heavily on technicians with up-to-date competencies in computer-aided processes such as CAD, CAM, and CNC machining (Republic of Kenya, 2007; Republic of Kenya, 2013; Wahungu et al., 2023). However, several studies show that many TVET graduates still lack adequate digital skills, forcing industries to offer expensive in-house training (Barke, 2021; Kiarie, 2024). This mismatch between training outputs and industry requirements continues to undermine the competitiveness of Kenya's workforce.

While much research in Kenya and beyond has focused on trainer-related and institutional determinants such as pedagogical methods, infrastructure, and curriculum alignment (UNESCO-UNEVOC, 2020) less attention has been paid to trainee-related determinants. Yet, learners' digital readiness, prior exposure to technology, socio-economic background, self-determination, motivation, and attitudes strongly influence how effectively they can adopt and apply computer-aided techniques (Davis, 1989; Venkatesh et al., 2003; Kigen et al., 2021). Neglecting this dimension risks designing interventions that invest in infrastructure and trainer capacity, while overlooking the readiness of the learners who are the ultimate beneficiaries.

There is therefore a clear gap in empirical evidence on how trainee-related factors affect the incorporation of computer-aided techniques in mechanical technician training in Kenya's TVET institutions. Addressing this gap is critical for ensuring that learners are not only exposed to modern tools but are also prepared, motivated, and capable of using them effectively.

Theoretical Framework

This study was anchored on William Theodore's human capital theory in its dispensation. This theory was first developed in 1961 and later advanced and documented in 1974 by Stanley Becker (Becker, 1974). The theory suggests that the entire process of educating and training is solely aimed at incorporating useful knowledge and know-how that can uplift one's future earnings (Gary, 1993). The theory further postulates that untrained learners(input) who ought to be subjected to pertinent and needful set of knowledge, skills, values and attitudes (process) that will cause a successful transformation of the learners so that they can complete their studies as truly competent potential workforce (output) so as to serve the contemporary market demands. Human capital theory perceives a graduate as a machine that need to have been well-programmed and fabricated to serve its intended purpose without strain. Human capital is basically the composition of productive competencies that an employee impartially applies in effort of helping the employer to achieve the industry's goals. In this study, therefore, technician mechanical engineering students are expected to be properly engaged by the trainers in aid of the institutional facilities and government input so that they are ejected into the market as competent workers that can be of good productivity to the companies. This theoretical underpinning, was been

ideal in finding out the trainees determinants of effective incorporation of computer-aided techniques in training of the mechanical engineering students.

Methodology

This study was conducted in Technical and Vocational Education and Training (TVET) institutions within Uasin Gishu County, Kenya. The county serves as an educational and industrial hub in the North Rift region and hosts several institutions offering Diploma programs in Mechanical Engineering, making it suitable for investigating trainee-related determinants of incorporating computer-aided production techniques in training. The institutions included were The Eldoret National Polytechnic, Rift Valley Technical Training Institute, Eldoret Technical Training Institute, Turbo Technical and Vocational College, Kipkabus Technical and Vocational College, Ziwa Technical Training Institute, and Koshin Technical and Vocational College. The study adopted a post-positivist research paradigm, which recognizes that reality can be approximated through empirical evidence and probabilistic reasoning. A descriptive survey research design guided the study, as it enables systematic data collection and statistical analysis to examine relationships between variables. The target population comprised 480 trainees from the seven TVET institutions offering Diploma programs in Mechanical Engineering in Uasin Gishu County. A sample size of 144 respondents was determined using Mugenda and Mugenda (2003) 30% sampling rule. Random sampling was employed to select participants from all seven institutions. Data were collected using structured questionnaires containing closed-ended Likert-scale items. Instrument validity was confirmed through expert review, peer

evaluation and pilot testing in non-sampled institutions. Reliability was assessed using Cronbach's alpha, with coefficients of 0.7 and above deemed acceptable. Collected data were checked for completeness, coded, and analyzed using SPSS Version 29. Descriptive statistics, including means, frequencies, and percentages, were used to summarize the data and presented in tables.

Results and Discussion

Demographic Characteristics of Trainees

Table 1 outlines the demographic data for 128 Mechanical Engineering trainees, including gender, age, and prior experience. These factors influence the trainees' adaptability to technologies like computer-aided production. Based on the demographic data presented in Table 2, the cohort is predominantly male (69.53%, $n=89$), with female trainees constituting 30.47% ($n=39$). This pattern aligns with national data showing lower female participation in technical and engineering fields (UNESCO-UNEVOC, 2022). The majority of trainees (55.46%, $n=71$) fall within the 21-25 age bracket, indicating a young adult student population. Academically, nearly half of the trainees (46.09%, $n=59$) had a Kenya Certificate of Secondary Education (KCSE) score of C (Plain), while only 15.63% ($n=20$) attained a C+ or higher. Furthermore, most trainees had not attended any post-high school career course (84.37%, $n=108$) nor had prior fieldwork experience in mechanical engineering (77.34%, $n=99$).

Table 1: Demographic Characteristics of Trainees (n = 128)

Variable	Category	Frequency	Percentage (%)
Gender	Male	89	69.53
	Female	39	30.47
Age Bracket (Years)	16–20	32	25.00
	21–25	71	55.46
	26–30	22	17.19
	31–35	2	1.56
	36 and above	1	0.79
KCSE Score	C+ and above	20	15.63
	C (Plain)	59	46.09
	C- (Minus)	17	13.28
	D+ (Plus)	25	19.53
	D (Plain) and below	7	5.47
Post-High School Career Course	Yes	20	15.63
	No	108	84.37
Prior Field Work in Mechanical Engineering	Yes	29	22.66
	No	99	77.34

Training & Exposure

To assess the role of prior training as a factor influencing the adoption of computer-aided techniques, trainees were surveyed on their relevant

experience. This was examined through a series of statements rated by the trainees on a five-point scale; from Strongly Disagree (SD) to Strongly Agree (SA). The results are summarized in Table 2.

Table 2: Training and exposure of trainees

Statement	SD	D	N	A	SA
I have received training in computer-aided techniques as part of my educational program	13	33	13	35	34
I have done several practicals on computer-aided techniques	8	15	43	33	29
Our learning has majorly been guided by the use of computer and current technology in mechanical production.	5	13	30	50	30

According to the findings, a majority of respondents agreed (n=35) and strongly agreed (n=34) that they had received training in computer-aided techniques as part of their educational program. However, a significant portion of the cohort disagreed (n=33) or strongly disagreed (n=13) with this statement, indicating a notable divide in formal training exposure. When asked about practical application, the largest number of trainees (n=43) remained neutral on

whether they had done several practicals on computer-aided techniques. Nonetheless, a combined (n=62) respondents agreed or strongly agreed with the statement, compared to (n=23) who disagreed or strongly disagreed. Furthermore, the technological guidance of the curriculum was widely acknowledged. A strong majority agreed (n=50) and strongly agreed (n=30) that their learning was majorly guided by the use of computers and current technology

in mechanical production, demonstrating a positive perception of the program's modern relevance despite the varied levels of hands-on practical experience. The results suggest that while progress is being made in introducing computer-aided techniques to mechanical engineering trainees, the experience is not yet consistent or comprehensive. There is clear evidence of exposure, especially in instructional approaches, but significant gaps remain in terms of uniform access to practical training. These results align with wider concerns raised by UNESCO-UNEVOC (2020) and Maringe & Ojo (2022), which emphasize the need for training institutions to integrate both hardware and software-based learning for

modern technical education. In fields like mechanical engineering, where industry expectations are evolving rapidly, exposure to digital tools and practical application is critical. The World Bank (2023) further supports this by pointing out that digital readiness is increasingly being used as a benchmark for employability in technical fields.

Perception and Attitudes

The research further investigated whether trainee perceptions and attitudes served as determinants influencing the adoption of computer-aided techniques. The findings from the corresponding survey items are detailed in Table 3.

Table 3: Perception and attitudes

Statement	SD	D	N	A	SA
Computer aided techniques are very relevant at my area of occupation and therefore I have to acquire the skills in the computer-aided techniques.	2	15	12	42	57
Having competence in computer-aided techniques will be of great help to my career.	8	2	23	42	53
Introduction of computer-aided techniques is a threat to jobs so it should be avoided.	21	14	23	39	31
The future of mechanical industry will be shaped by computer-aided techniques	3	7	27	54	37
I am very comfortable with incorporation of computer-aided techniques in mechanical industry.	2	11	22	51	42
I have a positive attitude towards invention and innovation of computer-aided advancements in mechanical industry.	2	3	17	41	65

Based on the findings, a significant majority of respondents agreed (n=42) and strongly agreed (n=57) that computer-aided techniques are very relevant to their area of occupation and that they must acquire the associated skills. Similarly, a large number of trainees agreed (n=42) and strongly agreed (n=53) that competence in these techniques would be of great help to their career. Regarding the impact of this technology, opinions were divided on the statement that the introduction of computer-aided

techniques is a threat to jobs and should be avoided. While 39 respondents agreed and 31 strongly agreed, a combined 35 respondents disagreed or strongly disagreed with this notion. Furthermore, a strong consensus emerged that the future of the mechanical industry will be shaped by computer-aided techniques, with most respondents agreeing (n=54) or strongly agreeing (n=37). In terms of personal comfort and attitude, most trainees reported being comfortable with the incorporation of these techniques, with a

majority agreeing (n=51) and strongly agreeing (n=42). Majority also indicated a positive attitude towards inventions and innovations in this field, with many agreeing (n=41) and a strong majority strongly agreeing (n=65). These results strongly support the idea that perception and attitude are powerful trainee-related determinants of whether computer-aided techniques are incorporated into training. Where learners see value, relevance, and career benefits, they are more likely to embrace new tools and approaches. As UNESCO-UNEVOC (2020) and World Bank

(2023) point out, technological change in vocational training systems often depends as much on mindset and readiness as it does on infrastructure or policy.

Desire to Learn

The study further examined whether the trainees' desire to learn influenced the incorporation of computer-aided production techniques. To assess this, trainees responded to a series of related questions, and the findings are summarized in Table 4.

Table 4: Desire to learn

Statement	SD	D	N	A	SA
I am highly motivated to acquire skills in computer-aided techniques.	3	12	10	43	60
Because my future career success will be dependent on my knowledge of computer-aided techniques, I desire to acquire computer-aided techniques in my training to the best	3	2	25	54	44
I have accorded much of my time to learn various computer applications in mechanical engineering.	10	18	24	37	39
I have several videos and simulations in mechanical production which guide me in learning computer-aided techniques	16	10	31	39	32

Based on the findings, a strong majority of respondents reported being highly motivated to acquire skills in computer-aided techniques, with many agreeing (n=43) and a majority strongly agreeing (n=60). This desire to learn is closely linked to career aspirations, as most trainees agreed (n=54) and strongly agreed (n=44) that their future career success depends on this knowledge, prompting a desire to acquire it to the best of their ability. However, when asked about the practical application of this motivation, the results were more varied. While a combined (n=76) respondents agreed or strongly agreed that they have devoted much of their time to learning various computer applications, a notable 28 respondents expressed disagreement. A similar pattern emerged regarding the use of learning materials; although (n=71)

respondents agreed or strongly agreed that they have several videos and simulations to guide their learning, a significant (n=26) respondents disagreed or strongly disagreed with this statement. These results demonstrate that desire to learn is a powerful driver in the incorporation of computer-aided techniques in mechanical engineering training. When trainees are motivated, recognize the value of what they are learning, and invest their time and energy, the chances of successful adoption rise significantly. However, the findings also remind us that motivation must be supported through access to learning tools, a structured curriculum, and encouragement from instructors. As noted by Maringe and Ojo (2022), learner motivation, when paired with institutional support, creates a strong foundation for

the integration of digital tools in technical education.

Learning preference

To determine whether learning preference influenced the incorporation

of computer-aided production techniques, trainees responded to a series of related questions, and the results are summarized in Table 5.

Table 5: Learning preference

Statement	SD	D	N	A	SA
I love theoretical part of mechanical engineering.	12	5	21	53	37
I find learning through use of hands-on skills in real manual work more interesting than other strategies.	8	5	18	37	60
I prefer learning computer aided techniques to others as this is the most crucial area of my training.	5	8	24	44	47

Based on the findings, a strong majority of respondents expressed a love for the theoretical aspects of mechanical engineering, with (n=53) agreeing and (n=37) strongly agreeing. However, an even greater number of trainees showed a preference for hands-on learning, with 60 strongly agreeing and (n=37) agreeing that they find learning through real manual work more interesting than other methods. Furthermore, when asked about their preference for computer-aided techniques specifically, a large majority of the trainees indicated that they favor this area of learning. A total of (n=44) respondents agreed and (n=47) strongly agreed that they prefer learning computer-aided techniques over others, viewing it as the most crucial part of their training. This indicates that while trainees

appreciate both theoretical knowledge and hands-on manual work, there is an overwhelming preference for computer-aided techniques, which are perceived as essential to their education. When trainees are ready to embrace digital tools and simulations alongside hands-on and theoretical methods, institutions have a stronger foundation on which to build blended and technology-driven learning environments (Chun et al. 2021; UNESCO, 2018).

Personal Ambitions

To assess whether personal ambitions influenced the incorporation of computer-aided production techniques, trainees were asked a series of related questions, and the findings are summarized in Table 6.

Table 6: Personal ambitions

Statement	SD	D	N	A	SA
I have to gain computer-aided techniques because my future survival in mechanical industry is pegged on my proficiency in computer-aided production techniques skills	5	13	25	48	37
I aspire becoming a trainer in computer techniques so I have to make all efforts to acquire the computer-aided techniques.	3	13	21	44	47
I have plans to start my own firm in mechanical industry which will rely on computer-aided techniques so I have no option but to learn the skills.	3	8	26	50	41

Based on the findings, the personal ambitions of the trainees revealed a strong drive to acquire computer-aided techniques. A significant majority of respondents (n=48 agreed, n=37 strongly agreed) affirmed that their future survival in the mechanical industry depends on their proficiency in these skills. Furthermore, a strong ambition to become a trainer was evident, with many respondents (n=44 agreed, n=47 strongly agreed) aspiring to teach computer techniques. Entrepreneurial ambitions also served as a key motivator, as many trainees (n=50 agreed, n=41 strongly agreed) reported plans to start their own firm reliant on computer-aided techniques. These results indicate that trainees view digital competence as central to professional success in a technology-driven sector. This ambition-driven motivation aligns with global

research highlighting the link between digital literacy and technical employability (UNESCO-UNEVOC, 2020; World Bank, 2023). It also reflects a growing entrepreneurial mindset among trainees who aspire to apply digital tools in innovative ways within the mechanical industry. Therefore, personal ambition emerges as a major trainee-related determinant of computer-aided technique adoption, as it promotes active learning, self-motivation, and a forward-looking approach to skill development in TVET institutions.

Self-determination

Self-determination was examined as one of the trainee-related factors influencing the adoption of computer-aided techniques, and the results are presented in Table 7.

Table 7: Self-determination

Statement	SD	D	N	A	SA
I am bold and have taken bold steps to acquaint myself with computer-aided techniques even in absence of my trainers.	3	8	12	53	52
Although I have encountered challenges in understanding computer-aided production techniques, I am still motivated to reflect on the challenging areas again and again.	2	12	8	59	47
I am personally committed to ensure that I am effective in embracing computer-aided techniques before I finish my course.	6	17	12	39	54

Based on the findings, the data on self-determination reveals strong proactive attitudes among trainees. For the statement regarding taking initiative to learn independently, a large majority of respondents (n=53 agreed, n=52 strongly agreed) reported taking bold steps to acquaint themselves with computer-aided techniques without their trainers. When facing challenges, most trainees (n=59 agreed, n=47 strongly agreed) maintained motivation to persistently review difficult concepts. Furthermore, a strong sense of personal commitment was evident, with many respondents (n=39 agreed, n=54

strongly agreed) expressing determination to master computer-aided techniques before completing their course. This indicates that the personal ambitions of the trainees are a powerful driving force behind their motivation to learn computer-aided techniques. Trainees who take initiative, persist through obstacles, and hold themselves accountable create momentum that can push digital adoption forward. From a training and policy perspective, this insight highlights the importance of nurturing learner autonomy, offering flexible learning opportunities, and recognizing

self-motivated efforts as part of broader integration strategies (UNESCO-UNEVOC, 2020).

Prevailing Constraints

To assess whether prevailing constraints influenced the incorporation of computer-aided techniques, trainees responded to several related questions, and the findings are summarized in Table 8. Based on the findings, trainees

identified significant institutional constraints affecting their acquisition of computer-aided techniques. A large majority (n=40 agreed, n=44 strongly agreed) reported that insufficient staffing has hindered their skills development. This staffing challenge echoes broader regional concerns about teacher capacity in technical education across Africa (Chun et al., 2021; UNESCO-UNEVOC, 2020).

Table 8: Prevailing Constraints

Statement	SD	D	N	A	SA
Our institution has less staff to train us in computer-aided techniques and this has affected us in terms of acquiring the skills	4	20	20	40	44
There is still obsolete equipment in our mechanical workshop and therefore we cannot manage to learn computer-aided techniques in our institution.	3	13	10	46	56
I have not been enlightened on the value of computer-aided techniques in production so I have no idea on how to acquire skills in computer-aided techniques	5	11	19	33	60
Our training is purely exam-oriented and therefore we have very limited time to be exposed to acquisition of computer-aided techniques.	10	8	15	26	69

The most pronounced constraint was obsolete equipment, with most respondents (n=46 agreed, n=56 strongly agreed) indicating this prevents effective learning. Trainees are therefore often taught using outdated machinery that does not reflect the realities of the current job market. As Maringe and Ojo (2022) observe, without modern infrastructure, the shift to digitally enabled training remains theoretical and disconnected from industry needs. Additionally, many trainees (n=33 agreed, n=60 strongly agreed) reported lacking understanding of the value of these techniques, leaving them unsure how to acquire the skills. The strongest agreement emerged regarding curriculum limitations, with most respondents (n=26 agreed, n=69 strongly agreed) stating that exam-oriented training severely limits their exposure time to computer-aided techniques. This

points to a curriculum design issue, where learning is driven more by the need to pass exams than by the need to acquire useful, job-ready skills. When time and learning structures are tightly bound to theoretical testing, there is little room for learners to explore new technologies or build competence in applied areas (Oketch et al., 2021; World Bank, 2023).

Conclusion

The findings of this study demonstrate that trainee-related determinants play a central role in shaping the incorporation of computer-aided techniques in mechanical technician training. Across dimensions such as training and exposure, perception and attitude, desire to learn, learning preferences, personal ambitions, and self-determination, trainees consistently exhibited strong recognition of the relevance of digital tools, high levels

of motivation, and readiness to engage with emerging technologies. The results further revealed that learners generally view competence in computer-aided techniques as crucial for career growth, entrepreneurial aspirations, and future survival in the mechanical industry. Their preferences leaned heavily toward practical, hands-on experiences enriched with digital integration, with many trainees also taking proactive steps to supplement institutional gaps through independent study and use of digital resources.

At the same time, the study highlighted notable disparities and barriers that temper this enthusiasm. Although many trainees reported positive exposure to computer-aided techniques, access was inconsistent and often constrained by systemic factors such as inadequate staffing, outdated equipment, lack of structured orientation, and exam-oriented training practices. These institutional limitations created uneven experiences, with some trainees benefiting more than others from opportunities for practical engagement. Overall, the study concludes that while trainees' attitudes, motivation, and determination are strongly aligned with the demands of a modern, digitally driven mechanical industry, the persistence of structural and contextual constraints continues to affect how effectively these aspirations are translated into comprehensive digital competence during training.

Recommendations

Based on the findings of this study, the following are the recommendations of the study:

- i. The Ministry of Education and TVET regulatory bodies should review and reform the national TVET curriculum by holding stakeholder workshops, bench-marking with global practices,

and embedding computer-aided techniques as compulsory modules, so that all graduates acquire relevant digital competencies.

- ii. TVET institutions should upgrade and maintain their digital infrastructure and workshop equipment within the next academic cycle by allocating resources, partnering with industry for equipment support, and conducting annual audits, to create an environment that supports trainees' digital skill development.
- iii. TVET trainers should undertake continuous professional development every academic year by enrolling in refresher courses, engaging in industry attachments, and joining peer-learning forums, with institutions tracking compliance, to ensure trainers deliver instruction aligned with current technologies.
- iv. Industry stakeholders should establish structured internship and mentorship programs immediately through signed agreements with TVET institutions, joint workshops, and provision of guest instructors, in order to expose trainees to real-world applications of computer-aided techniques and enhance employability.

References

- AfDB. (2021). *African economic outlook 2021: From debt resolution to growth*. African Development Bank.
- African Union. (2020). *Agenda 2063: The Africa we want*. African Union Commission.
- Barke, S. (2021). *Assessment of advanced digital skills gap in Kenya using the design reality gap research framework* (Doctoral dissertation, University of Nairobi). <https://erepository.uonbi.ac.ke/handle/11295/155820>
- Becker, G. S. (1974). A theory of social interactions. *Journal of political economy*, 82(6), 1063-1093.
- Chun, H. K., Comyn, P., & Moreno da Fonseca, P. (2021). Skills development in the time of COVID-19: taking stock of the initial

- responses in technical and vocational education and training. Geneva: International Labour Office. <https://www.voced.edu.au/challenge?destination=%2Fcontent%2Fngv%3A89412>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://www.jstor.org/stable/249008>
- Kiarie, N. (2024). Enhancing Digital Resilience: A Cybersecurity Readiness Assessment of Kenyan TVET Institutions. *Journal of the Kenya National Commission for UNESCO*, 5(1).
- Kigen, P., Kiprotich, J., & Rono, D. (2021). Digital readiness and adoption of e-learning in TVET institutions in Kenya. *Journal of Education and Practice*, 12(18), 89–98.
- Maringe, F., & Ojo, E. (2022). Digital transformation in African higher and vocational education: Opportunities and challenges. *International Review of Education*, 68(2), 145–163.
- Mhlanga, D. (2021). Artificial intelligence in education: A Pan-African perspective. *Journal of Higher Education Policy and Management*, 43(5), 601–618.
- Nuhu, L. I. (2023). *Survey of Availability, Accessibility and Readiness to Use Digital Technologies for Teaching Mathematics in Secondary Schools In Minna Metropolis, Niger State* (Doctoral dissertation). <http://irepo.futminna.edu.ng:8080/jspui/handle/123456789/19904>
- Oketch, M., McCowan, T., & Schendel, R. (2021). The impact of tertiary education on development: A rigorous literature review. *British Council/DFID*. <https://discovery.ucl.ac.uk/id/eprint/10068500/>
- Pharamela, S., & Singh-Pillay, A. (2025). Technical and Vocational Education and Training College Lecturers and 21st-Century Skills: Awareness and Implications for Teaching Practices. *Journal of Technical Education and Training*, 17(2), 182-196. <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/19657>
- Republic of Kenya. (2007). *Kenya Vision 2030: The popular version*. Government Printer.
- UNESCO-UNEVOC. (2020). *Digital skills development in TVET: Challenges and opportunities*. UNESCO-UNEVOC International Centre. <https://eric.ed.gov/?id=ED619368>
- Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. <https://www.jstor.org/stable/30036540>
- Wahungu, D. K., Wawire, V., & Kirimi, F. (2023). Strategies for aligning institutional engineering technical vocational education and training practices with industry skills requirements in Kenya. *Reviewed Journal International of Education Practice*, 4(1), 96-116. <https://ir-library.ku.ac.ke/server/api/core/bitstream/6943c742-4a32-407f-9e4e-a07f69662a46/content>