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The use of apparel cad technology in pedagogical training among technical universities in Ghana

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ABSTRACT
The study investigated the use of apparel CAD technology in pedagogical training among technical universities in Ghana. The study respectively drew 285 respondents from two public universities, i.e., Kumasi Technical University, Accra Technical University, and Sunyani Technical University in Ghana. The overall population of the study was 285 randomly sampled from the three public universities. The study employed questionnaires as a data collection tool. The data gathered were 285 responses representing 100%. The data was analysed using pie charts, and frequency tables. The study findings show that there is minimal training and inadequate usage of clothing computerised design technology (CCDT). This was brought about by the lecturers' poor instruction and learning resources, the students' limited industrial exposure, and the lack of a competent CAD studio, hardware, and software for clothing design. The instruction and implementation of clothing CAD technology that students received, according to graduates, instructors, and students themselves, did not prepare them or the students to meet the industrial labour need. Therefore, there is a gap between industrial labour demand and university products. It was concluded that teaching and learning materials should be made available, universities' human capital should be well-equipped and motivated, and curricula should be restructured through broad stakeholder consultation. The study finally recommends that the universities should fully invest in the required CAD technology to provide the necessary facilities and equipment and provide lecturers with the needed resources and motivation to restructure the program's fate in our academic space.

INTRODUCTION

All human activities today have impacted the dramatic changes resulting from implementing Information and Communication Technology (ICT). These changes have affected various markets, and the fashion and textile industry cannot be exempted (Apeagyei, 2018). With the increasingly fast changes in the apparel market, fashion and textiles have been introduced by digital world creativity advancements that have made the textile and apparel space thrive on the ticket of ICT. Computer-aided design (CAD) is at the peak of its explosive increase in the digital or information world (Konzen & Locker, 2000) because it has a lot of potential for improving delivery efficiency and quality. The concept of CAD signifies using a computer or digital tool technology to conduct or help in the design process (Istook, 2000). The solutions enable rapid design generation and adjustment without sacrificing originality and improved communication and interaction amongst product development systems. Computer technology is now

used in different textile and garment industries, from administration to retail and design to manufacturing (Yan & Florito, 2002).

AGOA seeks to advance industrialization, employment development, technology and talent transfer, exports, and foreign exchange earnings. Ghanaian investment has made technology possible for the clothing sector. Most nations are forced to alter their strategy due to the dynamics of the textile and apparel sectors and globalization. Investment in new technology is unavoidable to compete in the global market because the industrial sector's competitive edge should alter as it advances (Porter, 2015). To attain efficiency and quality, garment CAD technology is currently the most crucial and essential instrument. Technical universities, therefore, act as a saviour of the country as it has the upper hand in TVET programs compared to normal universities. Therefore, technical universities are mandated to transfer technical knowledge to their products as it is responsible for producing human capital ready to serve society as technology and fashion change with a high level of swiftness. Technical universities should have the materials and tools to make this dream or mandate a reality.

A study conducted by Asinyo (2014) on "the Development of Information and Communication Technology (ICT) Modular Framework for the Department of Industrial Art (DIA), KNUST" brought to bear the need to introduce ICT into the academic world to equip students to meet the fast-changing prowess of technology adequately. Dzikite et al. (2016) explored ICT in the training of fashion, apparel, and designing programmes. A study of a selected college of a Zimbabwean University of Science and Technology. Research revealed that in the apparel sector, CAD technology is used throughout the product manufacturing process, from design to production and administration to retailing of products in Ghana (ILO, 2015).

The clothing and textile industry has seen the impact of technology as part of global changes to remain competitive, the transition from the traditional method of designing, and adopt computer-aided designing technology. CAD reduces the requirement of manual sketching in design and collection development. Adwoa-Oppong et al. (2018) revealed that some level of CAD had been inculcated into fashion and textile education in some institutions in Ghana. CAD is the driving force of industrialization in the apparel and textile sector. After careful inculcation of ICT in the various educational and training sectors of the economy to help produce human capital, ready and well-equipped to meet the high demand for technology, therefore, there is the need to ascertain if these tertiary products have the opportunity to apply the knowledge acquired as expected. This is to help know whether the knowledge gained by these Fashion graduates is transferred to the world of industry. Therefore, this necessitates assessing the modules for apparel CAD technology training offered by selected universities in Ghana, thereby analyzing the applicability of CAD usage in the industry.

LITERATURE REVIEW

Apparel Industry in Ghana

Ghana's apparel industry has undergone a profound change since pre- and post-independence. After 1957, the independence-gaining year, the Ghanaian government pursued policies to put the country on the path to industrialization. One of the policies is Import Substituting Industrialization (ISI), which was spearheaded in the latter part of the 1960s and earlier in the 1970s by Dr. Kwame Nkrumah, President of Ghana (Hoefter, 2018). History takes as far back as ancient Egypt, where fashion started before spreading through evolution, revolution, and globalization to other parts of the world. Fashion was and is one of the ways status and economic prestige are measured. Entwistle (2015) opined that fashion is an aesthetic market, where economic rationality and taste are interwoven, and manufacturers and consumers make their choices. France, Italy, America, and many other countries were developed through their fashion and

textile industry. To reduce economic dependence, import substitution industrialization became the order of the day in sub-Saharan Africa. By the mid-1970s, almost sixteen (16) big and moderate-sized apparel organizations had been instituted in Ghana. The garment industry has also seen close to 138 manufacturing companies, mainly sole proprietors and retailers (Quartey, 2018).

The introduction of technologies as a substitute for the human or manual way of doing things started in the mid-1960s due to the emergence of new economies and the need for bulk production. Business, manufacturing, and daily tasks have transformed immensely due to the introduction of computers. Development in new technologies has led to cost-effective, convenient, and increased productivity in all spheres of life, from which the fashion industry cannot be exempted. As asserted by Bovone (2020), the development of Web 2.0 from 2000 onward and the global economic crisis after 2008 also account for the swift change in the fashion world. Import substitution industrialization is a set of economic policies employed by developing or emerging market nations that wish to increase their self-sufficiency and decrease their dependency on developed countries. It has been suggested that implementing these policies protects the nascent domestic market to help them participate in the competition with imported products and make the local economy self-sufficient. Also, import substitution industrialization was a strategy by the then government to move the economy from a human effort or manpower state to a modern industrialized state (Quartey, 2018).

The apparel industry is central to the development of the country's economy. Not only do they play a significant role in meeting people's basic needs, but they have also created many job opportunities. Skills and Knowledge have been passed on from generation to generation in the form of a master-apprenticeship style of knowledge transfer. The Apparel industry has gone through phases due to culture and globalization. Culture, the main wheel upon which the apparel industry thrives, has seen some sort of adoption and an entire diffusion which has led to the introduction of diverse clothing and fashion. Due to our culture, Ghanaians are typically distinct on the world scale or global market. The apparel industry in Ghana is going through a paradigm shift from the master-apprentice style of knowledge transfer to education and training or the formal type of education due to the pace at which technology is changing the dynamics of society, fashion is a core victim (Amoako-Gyampah, 2020).

Apparel Design Training in Ghana

Considering the fast pace of technological advancement globally, there has been a high demand in the labour market to supply skilled workers (Sallinger, 2006). As a result of a change in the market and the need for professionals to establish a dynamic market, the apparel industry has received urgent attention to tilt it to education. Training centres, universities, polytechnics and colleges have offered specific or specialized courses or training. Therefore, these courses are provided on different levels with different syllabi and diverse professionals and experts. The Ghana apparel training centre, which was launched on the 27th of November 2020, was established by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, together with partners such as Ethical Apparel Africa (EAA), Gerber, Groz Beckert, Freudenberg and Accra Technical Training College (ATTC) to training students to be professionals in the apparel field of knowledge and work (Brown, 2020). Ghana benefited from the Netherlands Programme for Institutional Strengthening Secondary and Educational Training Capacity (NPT-Project). Polytechnic education was made the integral conduit of the software with fashion design and textile studies as one of the priority areas of attention in 2003 (Oppong et al., 2013). The textile and apparel tutoring centre: This is a tutoring centre or laboratory instituted by the authorities in collaboration with UNIDO to improve the expertise of textile and clothing industries that dominate AGOA and export to different countries or destinations. National vocational training institutes supply primary practical and theoretical teaching in tailoring and sewing. Moreover, fashion design and textile software are run in

universities such as Kwame Nkrumah University of Science and Technology, the University of Cape Coast and the University of Education, Winneba (Amoako-Gyampah, 2020).

Apparel CAD Teaching and Learning

As a result of the introduction of diverse software such as CAD/CAM, there has therefore been a shortage of technologically trained people in this regard despite the dynamic changes in design and manufacturing since technology varies more swiftly than the societal system in which education is part (Emptage, 1991). Therefore, learning new concepts and skills is one sure way to succeed in designing and manufacturing. There is a direct relationship between education and a country's economic structure since it is the foundation for advancement (Eshiwani, 1993; DeGregori, 1989). Well-informed citizen forms the basis for a competing world market of a country faced with globalisation, the emergence of new economies, and technological innovation. A study conducted in Northern Ireland regarding skills requirement assessment for the apparel industry identified the gap in the key technical skills and comprehension among designers and apparel technologists due to technological change and the unavailability of staff training financing.

Advanced economies such as Europe, the United Kingdom, and the United States of America also face slack uptake of the apparel CAD Technology due to information gap, expertise acquisition, and training complementing with systems cost being the prime or key reason (Hardaker and Fozzard, 1995). Lack of resources, low level of technology, and inadequate training are the problems faced by Ghana, resulting from producing a changing labour market for dynamic output on the world market. Vocational, technical and higher learning in this country exhibit considerable shortfall because post-vocational and technical organizations have substantial limitations resulting from a lack of professional tutors, technologies, and information (Oppong et al., 2013). Taking on training and research operations to authorise citizens with the requisite knowledge and skills for the growth of society is the fundamental mission of universities and polytechnic institutes of higher learning and research. UNESCO (1998) asserts that universities are negatively impacted by low public funding and increased enrolment when there is no corresponding improvement in the availability of resources. Therefore, this hinders universities from being unable to provide certain resources in technology and knowledge, making them struggle to obtain daily financial liabilities or burdens and pursue academic perspicuity. Furthermore, the way schools have been organised and designed over the past century is completely at odds with how modern technology can be used efficiently.

According to Collins (1996), there is limited opportunity for students to use contemporary technologies to accomplish worthwhile activities when teaching is viewed as a teacher-to-student transfer of information. For instance, computer technology is more important to the design and production process in the apparel industry. Consequently, educators and professionals ought to assist learners in becoming acquainted with the technology they can come across in the workplace (World Bank, 2000).

Computer-Aided Design (CAD)

CAD is increasingly appearing in the clothing and fashion sector thanks to the competitive status of companies in the industry. Fashionable goods are seasonal, so they need to be delivered quickly. This can be accomplished by using economical and effective processes. Apparel CAD technology is evolving into an integrated associate degree environment that benefits the entire company as technologies come together. Clothing computer-aided design (CAD) technology is utilised not just for style and production purposes within the organisation, but also plays a crucial role in sourcing, mercantilism, and marketing. The development of computer-aided design has made it possible to enhance the physical and mental capacities of the designer (Owen, 1991).

CAD systems are primarily utilised in the apparel industry for several tasks, including sample preparation, pattern grading, garment design, and marker production. In the apparel industry, computerised sewing machines, spreaders, cutting systems, and motion systems are examples of CAM systems (Ondogon, 1994). Computer input, software, output, and communication devices are all part of the CAD system that helps the clothing production process (Stjepanovic, 1995). Computer hardware is now subject to more precise requirements due to the development of increasingly sophisticated and potent computers and software (Hutchinson and Sawyer, 1995). Beyond keyboards and mice, interactive input devices can also be found in graphs, video cameras, digital scanners, spectrometers, and digitizers. Plotters, colour hardcopy tools, colour film and video cameras, printers, automatic labelling and spreading machines, and automatic cutters are examples of output devices controlled by computers (Stjepanovic, 1995).

The use of CAD technology in the apparel industry has significantly improved efficiency, productivity, and competitiveness. CAD systems enable designers to create and modify patterns quickly, reducing the time and cost associated with sample making (Amoako-Gyampah, 2020). Additionally, CAD-CAM integration allows for seamless data transfer between design and production, minimizing errors and ensuring accurate garment construction (Oppong et al., 2013). The adoption of CAD technology has also facilitated mass customization, enabling manufacturers to produce personalized garments at scale (Brown, 2020).

Despite the numerous benefits of CAD technology, its implementation in the Ghanaian apparel industry has been limited. A study by Adwoa-Oppong et al. (2018) revealed that while some level of CAD had been introduced in fashion and textile education in Ghana, the training and usage of CAD technology in the industry remained inadequate. The researchers attributed this to factors such as poor instruction, insufficient learning resources, limited industrial exposure for students, and a lack of competent CAD studios, hardware, and software.

To fully harness the potential of CAD technology in the Ghanaian apparel industry, it is crucial to address these challenges. Investments in CAD infrastructure, including hardware, software, and training facilities, are necessary to equip designers and manufacturers with the necessary tools and skills (Amoako-Gyampah, 2020). Additionally, collaboration between educational institutions and industry stakeholders can help align curriculum with industry needs and ensure that graduates are well-prepared to utilize CAD technology in their careers (Oppong et al., 2013).

CAD in Pattern Making, Grading and Marker Making

The first areas of the clothing industry to use technology in manufacturing were pattern sorting and marker development when garment CAD technology emerged in the mid-1970s. Few people can afford this system because it is costly and difficult (Stjepanovic, 1995). Considerable advancements have been made in the commercialization and use of computers and automated systems for marker creation and sample classification since the 1980s. Garment CAD makes it possible to provide more designs more quickly, which effectively meets the high demand in the market. Component patterns are the fundamental building component of CAD system prototyping.

By employing a digitizer or scanner to turn the sample forms into coordinate records, basic blocks are input into the computer framework. According to Glock and Kunz (2005), CAD software allows for style modifications, pattern creation, and revision. The following are examples of CAD pattern systems: Richpeacetems, Tukatech, Lectra, Accumark, Gerber, and Optitex. The sample pieces can be plotted and drum plotted automatically to provide the most economical marker, or they can be sent straight to the Numerically Managed (NC) machine to make a paper marker straight away (Aldrich, 1992).

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CAD/CAM in Cutting

CAD/CAM cutting was started in the USA by Gerber. Computer systems for grading patterns and producing signs have developed rapidly. They have significantly reduced the time and labour costs in creating new designs, modifying existing designs and reducing the use of fabric (Byrne, 1995). CAD in the cutting room can be done mechanically or manually through a powerful algorithm to create the best fabric. Many CAD's software are Modaris through Lectra, the integrated CAD of the Gerber generation, and the smart GT of the Tukatech brand (Sareta et al., 2020).

In the apparel business, laser cutting machines are frequently utilised for fabric cutting. It chops material with a laser beam. The material is spread out on the pallet and moved to the cutting area by the optical maser cutting system. Subsequent pieces are cut whenever the cut components are eliminated after the cut piece has touched the other aspect of the reduction space. The software programme p-average mechanically divides patterns bigger than the cut space into frames suitable to the cut space, minimising structures that cross the fabric even in motion. The most productive process in the clothing industry, slicing, is being introduced into the cutting room more often to retrieve fabric from the shop, load it onto carts, and take out the material that has been cut (Byrne, 1995).

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CAD/CAM in Sewing

Due to its manufacturing-centric approach, the garment industry saw a delayed adoption of new technologies for sewing activities until the early 1980s. However, as microelectronics permeated every step of the clothing manufacturing process in the 1980s, several technological advances took place. A major gain is the ability to perform more complex jobs using microelectronic control unit machines. CAD/CAM is the process of connecting computer-aided design (CAD) systems to manufacturing machinery. The computerised CAM technology guarantees consistency, lowers labour costs, and removes operator mistakes. Further savings can be achieved by predefining device usage. The investment is highly worthwhile because lower human costs and increased machine efficiency might result in high capital equipment expenses (Sareta et al., 2020).

A wide variety of programmable electronic sewing machines are available. For example, special machines are used to sew pants, add belts and shirts, sew edges, buttons and buttonholes, collars, pockets, cuffs, and belts. A touch interface, an automatic thread trimmer, an automatic backstitch, and a pre-programmed seam library are possible features of more sophisticated machines (Byrne, 1995).

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Despite the numerous benefits of CAD/CAM and electronic sewing technologies, their implementation in the Ghanaian apparel industry has been limited. A study by Adwoa-Oppong et al. (2018) revealed that while some level of CAD had been introduced in fashion and textile education in Ghana, the training and usage of CAD technology in the industry remained inadequate. The researchers attributed this to factors such as poor instruction, insufficient learning resources, limited industrial exposure for students, and a lack of competent CAD studios, hardware, and software.

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METHODS

The study's representativeness and response rate were investigated by the researcher since they were relevant to a larger population, although the methodology was quantitative. 285 students in all, chosen at random from three public universities, made up the study's population using Morgan's (2006) suggested sample ratio. Sampled from Kumasi Technical University, Accra Technical University, and Sunyani Technical University were 220 undergraduate students, 50 graduates, and 15 lecturers, in that order. The sample size is more important in identifying meaningful exchanges, inconsistencies, and correlations because of the four interrelated research techniques (Bartlett et al., 2001). A further crucial assumption is bias, especially when determining the sample size and handling non-response (Ngulube, 2000). Several studies have reported that response rates to online surveys, especially those conducted through the web, are typically below 50%. For example, a response rate of 25.6% was noted by Doerfling et al. (2010). Alternatively, Ngulube (2005) argues that too large samples can lead to resource waste, but excessively small samples can also reduce the usefulness of the findings. It is possible to classify the percentage of responses received as fairly good when determining the study's response rate. Data were gathered for the study using questionnaires. There were 285 responses in the data or 100% of the total. Graduates, students, and professors made up the respondents. Consequently, the number of responses received served as the basis for the study's analyses.

RESULTS AND DISCUSSION

The Response Rate (n=290)

The two institutions' percentage returns were utilised for the study's analysis; the undergraduate students provided the most return (225), followed by the graduate students with 50, and the lecturers with the lowest (15). In this area, the replies primarily came from undergraduate students. One possible explanation is that technical universities have a larger proportion of undergraduate students. In Table 1, a frequency overview of the respondents' demographic background is provided.

Table 1. Frequency of the Response Rate (n=285)

	Frequency	Percentages
Undergraduate students	220	77.6
Postgraduate students	50	17.2
Lecturers	15	5.2
Total	**285**	**100**

The apparel CAD training modules offered in selected technical universities

The objective aimed to determine apparel CAD training modules offered by technical Universities in Ghana. In this regard, the following indicators were used to measure this objective, awareness of apparel CAD technology, availability of learning materials, and mode of teaching the apparel CAD technology.

Awareness of apparel CAD technology

When it came to the apparel CAD training modules that their university offered, the respondents were asked to rank their level of awareness. Based on Table 4, it can be observed that 69.1% of students knew about the existence of garment CAD technology, whereas 30.9% of student respondents had no

idea. It can be inferred from this that most of the participants know of clothing CAD technologies. Table 2 provides an overview of the findings.

Table 2. Awareness of apparel CAD

		Frequency	Percent
CAD Awareness	Yes	152	69.1
	No	68	30.9
	Total	**220**	**100.0**

Area of apparel CAD technology specialization

The respondents were questioned about how much experience they have with CAD technology for clothing. According to the survey, 60% of respondents were CAD specialists, 16% were interested in CAD/CAM for clothing cutting, 12% were interested in CAD/CAM for clothing manufacturing, 5% were interested in CAD/CAM for pattern, drafting, and grading, and 7% were unsure. This suggests that the participants exhibited a reasonable level of proficiency in utilising computers in the workplace and acknowledged the significance of acquiring computer literacy within their area of expertise (McAulay, 1993). When they enroll in universities, the majority of them already know how to use a computer and can search the internet for information relevant to their topic of study. According to the survey, the majority of first- and second-year students had used Adobe Photoshop, AutoCAD, and other programmes without realising that they were all CAD programmes.

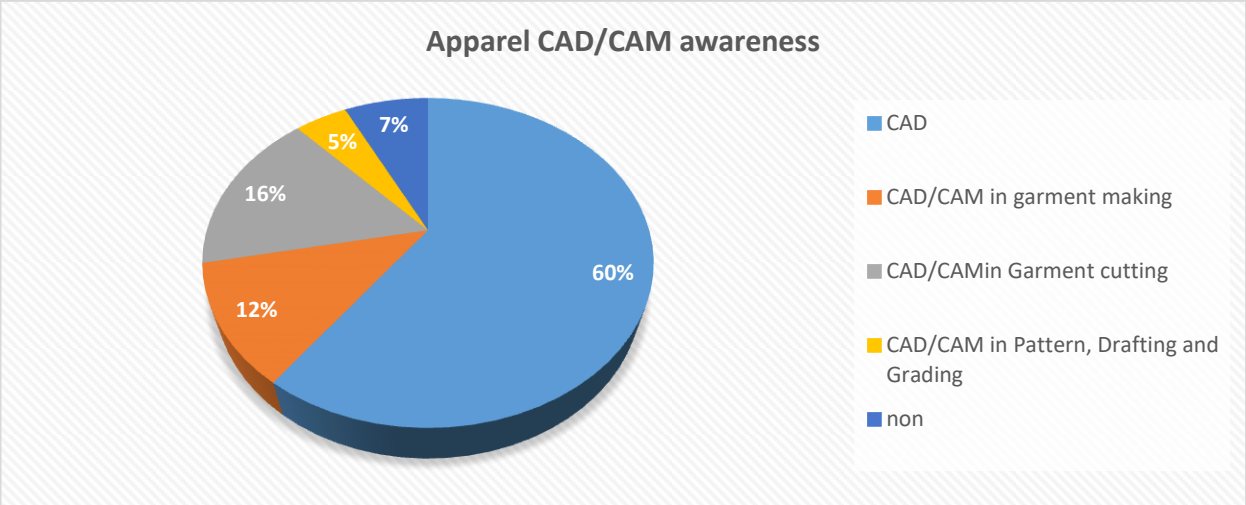

Figure 1. Distribution of apparel CAD/CAM aspect offered in the technical universities.

Apparel CAD materials availability

The respondents were further asked to indicate the availability of learning materials in their universities. The study discovered that 75.9% have the material in CAD and 2.3% have materials in CAD/CAM in pattern, drafting and grading, and 0.5% have the material in CAD/CAM in Garment-cutting. Again, 11.4% of the student respondents have materials in CAD/CAM in Garment-making, accounting for 10% of the student respondents have materials in both CAD in design and CAD/CAM garment-making. The study revealed that most students have access to CAD materials, thereby giving them a direction to graduate. A summary of the data is presented in Table 3.

Table 3: Available learning materials

	Frequency	Percent
CAD	167	75.9
CAD/CAM in pattern and grading	5	2.3
CAD/CAM in garment-cutting	1	.5
CAD/CAM in garment-making	25	11.4
CAD in Design and CAD/CAM Garment-making	22	10.0
Total	220	100.0

The state of teaching and learning materials for apparel CAD training

Finding out how teaching and learning resources for clothing CAD training were doing was the goal. The way that apparel CAD is taught, the accessibility of tools, resources, and software, the opinion of students regarding their training in the subject, and the opinion of instructors regarding their readiness for the workforce were all taken into consideration when measuring this.

Modes of teaching the apparel CAD

The respondents were asked to state the modes of teaching apparel CAD. 55.5% of students had theoretical and practical learning experiences under CAD. The study's findings show that all four apparel CAD sectors had inadequate practical job coverage, with CAD having the greatest percentage at 18.2%. The research depicted that pattern, drafting, grading, and garment-cutting are less taught in theory or practical, with a minimum percentage of 69.5 being none, accounting for between 153 and 155 of the student respondents.

The results vary from the Desiree (2003) study, which discovered that CAD, as with other design and construction skills, is practical, representing 80% of subject content, and theory represents 10-20%. Desiree (2003) stipulated that the best alternative way of acquiring knowledge in design or computer application is by practicing. This calls for the availability of computers in the design studios where students can access them easily. From the result, pattern, drafting, grading, and garment-cutting are at least taught in our universities as presented in Table 4.

Table 4. Modes of teaching the apparel CAD

Availability of apparel CAD studio

	CAD		Pattern, drafting and grading		Garment-cutting		Garment-making	
	Frequency	**Per. %**	**Frequency**	**Per.%**	**Frequency**	**Per.%**	**Frequency**	**Per.%**
Theory	27	12.3	33	15.0	30	13.6	48	21.8
Practical	40	18.2	25	11.4	22	10.0	30	13.6
Combined	122	55.5	9	4.1	13	5.9	56	25.5
Non	31	14.1	153	69.5	155	70.5	86	39.1
Total	220	100.0	220	100.0	220	100.0	220	100.00

The respondents were asked to indicate the availability of apparel CAD studio. The study shows that 51.8% indicated that their institution has a design studio for teaching and learning purposes. In comparison, 48.2% stated that their institutions do not have design studios for teaching and learning purposes. This demonstrated that while colleges had adopted CAD technology for clothing, they had not

yet obtained the facilities and tools required to facilitate teaching. Design studios with the necessary equipment were necessary, according to Ryder (2005), to provide suitable training in clothing computer-aided design. Design studios with the necessary equipment must be accessible because of the nature of CAD training for clothing. Students will be able to successfully interact with the software and hardware as a result, which will inevitably increase teaching and learning. A summary of the data is presented in Table 5.

Table 5. Availability of apparel CAD studio

Design studio Availability	**Frequency**	**Percent**
Yes	114	51.8
No	106	48.2
Total	220	100.0

Availability of equipment, facilities, and software

The study revealed that student respondents' rating on CAD the equipment, facilities, and available software CAD is excellent or encouraging; thus, 25% of student respondents are happy with such items. However, student respondents' evaluations of the other CAD technologies CAD/CAM for pattern, drafting, and grading, CAD/CAM for garment cutting, and CAD/CAM for garment making showed a significant level of discontent, with the lowest level of dissatisfaction being 65.9%. This unveiled that the universities lack equipment, facilities and software in the other CAD technology, which is very alarming in our attempt to train our students, Therefore, indicating that the universities fall short of the needed educational apparatus to equip these students in their pursuit of obtaining first-hand knowledge and practical skill in their said fields of study.

Table 6. Availability of equipment, facilities, and software

	CAD		CAD/CAM in Pattern, Drafting and Grading		CAD/ CAM in Garment-Cutting		CAD/CAM in Garment-Making	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Excellent	55	25.0	6	2.7	4	1.8	11	5
Very Good	37	16.8	10	4.5	10	4.5	12	5.5
Good	50	22.7	13	5.9	18	4.2	21	9.5
Fair	46	20.9	33	15.0	26	11.8	31	14.1
Jnsatisfactor/	32	14.5	158	71.8	162	73.6	145	65.9
Total	**220**	**100.0**	**220**	**100.0**	**220**	**100.0**	**220**	**100.0**

Student's responses status of apparel CAD training preparedness in textile and apparel

The study intended to ascertain the students' responses status of apparel CAD training preparedness in textile and apparel. The study revealed that 34.1% of the student respondents rated their training as good. 22.7% of the student respondents rated their training as being fair. 17.7% rated their

training been excellent. 15.0% of student respondents rated their training as unsatisfaction. From the result, student respondents stipulated graduates were satisfied with the level of knowledge or training they attained in connection with their preparedness in the textile and apparel industry. Therefore, students suggested that more practical skills should be provided to blend academic knowledge with industrial practice. Students also suggested that computer hardware and current CAD software should be made available in the universities to equip students since they think this has been the problem. According to the students, they lack practical skills in CAD software, which significantly affects them. The response is presented in Table 7.

Table 7. Student's responses on status of apparel CAD training preparedness in textile and apparel industry.

	Frequency	**Percent**
Excellent	39	17.7
Very Good	23	10.5
Good	75	34.1
Fair	50	22.7
Unsatisfactory	33	15.0
Total	220	100.0

Lectures' rating of students' preparation for the job market

The study revealed that tutors or lecturers are not satisfied with their input in their students' academic knowledge base in preparing them to meet the market demands of the textile and apparel industry. Table 10 indicated that a minimum of 33.3% of lecturers' respondents are not satisfied with the preparation of their students for the textile and apparel industry. This stipulated a minimum of 33.3% of the lecturers' respondents in all four major apparel CAD technologies under review. The other CAD software or technology is not seen as a high dissatisfaction from the lecturers' perspective in light of their knowledge transfer and the preparation of students towards meeting the needs of the textile and apparel industry. It was revealed that CAD had been the only CAD program with the fair input of lecturers in preparing students for their industrial field demands. Therefore, the result posits that a lot is required of the universities to provide the necessary facilities and equipment and provide lecturers with the needed resources and motivation to restructure the program's fate in our academic space as shown in Table 8.

Table 1. Lectures' rating of students' preparation for the job market.

	CAD		CAD/CAM in Pattern, Drafting and Grading		CAD/CAM in Garment-Cutting		CAD/CAM in Garment-Making	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Excellent	2	13.3	1	6.7	1	6.7	1	6.7
Good	3	20.0	3	20.0	3	20.0	3	20.0
Fair	5	33.3	5	33.3	4	26.7	6	40.0
Unsatisfactory	5	33.3	6	40.0	6	40.0	5	33.3
Total	15	100.0	15	100.0	15	100.0	15	100.0

Discussions

In this category, the majority of the evidence was acquired from undergraduate students. The larger number of undergraduate students at technical universities may be the cause. This implies that most of the people surveyed were aware of computer-aided design (CAD) technology for clothing. This suggests that the respondents understood the value of computer literacy in their field of expertise and were generally comfortable using computers in the workplace. Many university students, according to McAulay (1993), have mastered the fundamentals of computers and are able to surf the internet for information relevant to their subject of study. It was found from the study that the majority of first- and second-year students had used Adobe Photoshop, AutoCAD, and other programmes without realising they were all CAD programmes.

The findings differ from the Desiree (2003) study, which found that theory makes up 10–20% of the subject matter and that CAD, like other design and construction abilities, is primarily practical, accounting for 80% of the content. According to Desiree (2003), practicing is the finest alternative method of learning design or computer application. This necessitates having computers in the design studios that are freely accessible to students. As a result, our universities at least teach pattern, drawing, grading, and garment cutting.

Evidence gathered indicated that while universities have adopted computer-aided design (CAD) technology for clothing, they had not obtained the facilities and equipment required to facilitate training. Design studios with the necessary equipment were necessary, according to Ryder (2005), to provide suitable training in clothing computer-aided design. Design studios with the necessary equipment must be accessible because of the nature of CAD training for clothing. Students will be able to successfully interact with the software and hardware as a result, which will inevitably increase teaching and learning.
The study unveiled that the universities had inadequate equipment, facilities, and software in the other CAD technology, which is very alarming in our attempt to train our students, Therefore, indicating that the universities fall short of the needed educational apparatus to equip these students in their pursuit of obtaining first-hand knowledge and practical skill in their said fields of study.

According to the result, student respondents stipulate graduates were satisfied with the level of knowledge or training they attained in connection with their preparedness in the textile and apparel industry. Therefore, students suggested that more practical skills should be provided to blend academic knowledge with industrial practice. Students also suggested that computer hardware and current CAD software should be made available in the universities to equip students since they think this has been the problem. According to the students, they lack practical skills in CAD software, which significantly affects them.

This stipulated a minimum of lecturers in all the four major apparel CAD technologies under review. The other CAD software or technology is not seen as a high dissatisfaction from the lecturers' perspective in light of their knowledge transfer and the preparation of students towards meeting the needs of the textile and apparel industry. It was revealed that CAD had been the only CAD program with the fair input of lecturers in preparing students for their industrial field demands. Therefore, the result posits that a lot is required of the universities to provide the necessary facilities and equipment and provide lecturers with the needed resources and motivation to restructure the program's fate in our academic space (Adwoa-Oppong et al., 2018).

CONCLUSION

The study concludes that a high percentage of undergraduate students were aware of apparel CAD technology. As a result, they knew how to utilise computers rather well in the workplace and

understood how important it was to become computer literate in their field of expertise. The study further concludes that a high percentage of first and second-year students had done AutoCAD, Adobe Photoshop, and other software and were unaware that all of these are CAD software.

Additionally, it was determined that universities must make the necessary investments in additional computers in the design studios so that students have easy access to them. This is to enable them to engage fully with the pattern, drafting, grading, and garment-cutting that are at least taught in our universities. The study concluded that the universities had inadequate equipment, facilities, and software in the other CAD technology, which is very alarming in our attempt to train our students, Therefore, indicating that the universities fall short of the needed educational apparatus to equip these students in their pursuit of obtaining first-hand knowledge and practical skill in their said fields of study.

The study concluded that the graduates were not satisfied with the level of knowledge or training they attained in connection with their preparedness in the textile and apparel industry. Therefore, students suggested that more practical skills should be provided to blend academic knowledge with industrial practice. In respect of the lecturers, all four major apparel CAD technologies are under review. The other CAD software or technology is not seen as a high dissatisfaction from the lecturers' perspective in light of their knowledge transfer and the preparation of students towards meeting the needs of the textile and apparel industry. It was finally concluded that CAD had been the only CAD program with the fair input of lecturers in preparing students for their industrial field demands. Therefore, the result concludes that a lot is required of the universities to provide the necessary facilities and equipment and provide lecturers with the needed resources and motivation to restructure the program's fate in our academic space.

Recommendations

The study recommends further enhanced training on advanced software for undergraduate students in respect of apparel CAD technology. The university should invest in acquiring up-to-date software for apparel CAD training since they were using trial versions in their training. According to the survey, universities ought to spend more money installing more computers in the design studios so that students may conveniently use them. The study recommends that the universities should also invest in the required educational apparatus to equip these students in their pursuit of obtaining first-hand knowledge and practical skill in their said fields of study since they fall short.

The study recommends that the universities should enhance their curricula to inculcate more practical sessions to fit in the industry since a high percentage of the graduates were not satisfied with the level of knowledge or training, they attained in connection with their preparedness in the textile and apparel industry. The study finally recommends that the universities should fully invest in the required CAD technology to provide the necessary facilities and equipment and provide lecturers with the needed resources and motivation to restructure the program's fate in our academic space.

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