

## **Importance of CAD/CAM Training For Fashion Design Students in Kenya**

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**Abstract:** *Many tertiary colleges and institutions of higher learning in Kenya offer Computer Aided Design and Computer Aided Manufacture (CAD/CAM) in their training of fashion design courses. This is because the application of CAD/CAM technology is considered a major step in coping with dynamic changes apparent in the textile and fashion industry. The use of CAD/CAM technology in the fashion industry enhances speed and efficiency in garment production and designing through increased precision, productivity and organized information flow. This leads to shorter lead time in the product development process, thus reducing costs of garments. However, studies conducted in public universities and fashion industries in Kenya indicate there is minimal adoption of CAD/CAM technology in training of fashion students. This is attributed to limited appropriate CAD/CAM hardware and software as teaching resources due to the high costs of these technologies. This paper focuses on the importance of CAD/CAM technology used in fashion design training among tertiary colleges and institutions of higher learning in Kenya. This will help produce skill manpower, in adopting workable systems to help cope with the fashion industry demands. Data was obtained through document analysis, questionnaires, interview and observation. The study findings indicated that the training of CAD/CAM technology to the current students does not adequately meet the labour requirement in the apparel industry. The paper thus recommends that institutions need to update the system of teaching CAD/CAM in order to input the practical skills needed for the apparel industry.*

**Keywords:** *Computer Aided Design and Computer Aided Manufacture (CAD/CAM), Fashion Design, Higher Learning, Apparel Industry, Textile and Fashion, Lead Time*

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### **I. Introduction**

#### **1.1 Background**

Modern CAD/CAM (Computer Aided Design & Computer Aided Manufacture) software provides faster and more efficient working systems through increased precision, productivity and organized information flow [1]. Garment designing systems eliminate the tedious work involved in manual pattern drafting and grading, creation of layouts and relocation of written information. The computerization of different processes in the fashion industry is necessary to reduce the costs of a product and increase competitiveness. Computerized designing systems employ the use of software specifically designed for the development of industry specific objects, input/output of graphics, scanners and other remote devices [1]. CAD is becoming popular due to its simplicity and accuracy in drawing opines [2]. With CAD, the designs can be produced at a faster rate with more accuracy in drawings. Moreover, special drafting techniques can be employed and the design calculations are quick and superior [3].

The introduction of CAD/CAM technology in the textile and fashion industry in the early 1980s resulted to improved efficiency of the design process due to automation of routine design tasks, increased productivity and shortened lead time in the product development process. This has led to the production of cheaper and better garments [4]. However, successful use of CAD/CAM technology involves providing the right technology to suit the needs of the industry, to avoid inadequate or irrelevant training, or harmful attitudes among students towards these technologies [5]. Some researchers argue that CAD/CAM technology requires a different kind of expertise than is needed for manual design [6]. Thus, weaknesses of management skills in the use of technology seem to be a major barrier to a successful implementation of CAD/CAM. This includes the inability to estimate the learning needs of students in the current market. This is because considerable investments in training are required for effective CAD/CAM implementation [7].

Clearly in today's global market, manufacturers must rely on new technologies to capitalize on current market trends. Thus, many institutions in the country have turned to educate their students on CAD/CAM systems to help develop and produce complex parts quickly and efficiently needed in the external market. In Kenya, this is true of Maseno University, University of Nairobi and University of Eldoret.

## 1.2 Problem Statement

CAD/CAM is one of the technologies being used in the fashion industry for mass customization and production, making work easier through efficient and better quality of products. This need has created training opportunities for aspiring professionals in fashion design. To explore whether the training offered by various institutions to fashion design students is adequate, this study examines the importance of CAD/CAM knowledge to fashion design students in Kenya and whether it is conflicting with the training offered to graphic design students.

## 1.3 Specific Objectives

1. To determine CAD/CAM training courses offered to fashion design students in Kenya.
2. To determine the importance of CAD/CAM in fashion design industry.
3. To investigate the implications of graphic design software to the fashion industry
4. To establish the relationship between the CAD/CAM training and its application to fashion design by students.

## 1.4 Theoretical Framework

This study applies a theoretical framework derived from the systems theory. Systems theory was advanced in the 1940s by Ludwig Von Bertalanffy. The system approach theory integrates the system into parts; it simply checks on each part of the system and how it contributes to the whole function of the system to perform at optimum level. The relation between the systems will help to understand the whole function of the system. This can be applied such that the different packages being used in the course to educate can adequately equip and enrich the students with the skills in CAD/CAM for fashion design as well as graphic design.

This will help to integrate the way the various packages being taught and how they contribute to the whole system of fashion and design even through some of the software's are usually not for fashion and design students area of specialization. Figure 1 is a diagrammatic representation of the various factors that contribute to the understanding of CAD/CAM programs with their functions.

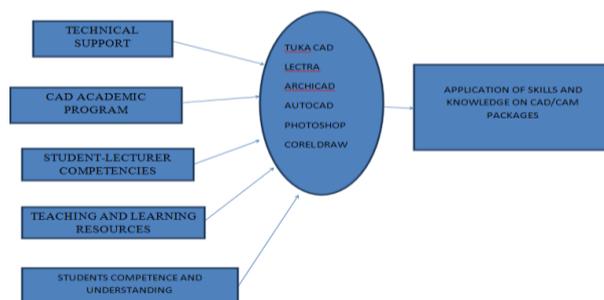


Figure 1: Factors that Contribute to the Understanding of CAD/CAM Programs with their Functions  
Source: Heylighten[8]

## 1.5 Review of Related Literature

### 1.5.1 Overview

In simple terms, when one is assisted with a computer in manipulation of graphics and mathematical representation of designs within the computer using a particular software and hardware, this is referred to as Computer Aided Design (CAD). Kazlacheva[9] states that CAD systems help in designing, constructing and modelling of garments faster and with high accuracy. The fashion design industry is very specific with its various drawing tools and tools for modification in CAD systems. CAD involves the intersection of three sets, geometric modelling, computer graphics and design tools, based on their constituents [10]. Groover and Zimmers[11] observe that computer aided designing involves any type of designing activity which makes use of the computer system to develop, analyze or modify any engineering designs.

Gould [12] observes that the latest fashion computer technology is used not only to design fabrics and textile products, but also create prototypes using a digital design laboratory featuring digital textile printing, 3D body scanning and garment knitting; fashion design studios with draping, CAD for 2D and 3D design. All these require expertise which a student can venture into with relevant training.

Popular CAD Software available for Fashion Design include *VSticher*, a 3D garment design and application software from Browzwear distributed in the Asia-pacific region by Pragma solutions, in India [13]. Lectra, Fashion PLM, TUKA CAD and many more push back the limits of product lifecycle management by covering all the necessary steps for creation of collection and bringing together role-based applications for product-design, pattern making and physical and 3D virtual prototyping with tools for the planning and

management of collection. Optitex specializes in the development of innovative, easy-to-operate 3D CAD/CAD solutions for cut fabrics. It creates a virtual world when testing manufacturing designs [14]. Gerber Accumark technology and Lectra are two of the most widely used CAD systems for fashion apparel, while Adobe Photoshop and Adobe Illustrator programs serve as excellent digital interpreters of the drawing skills of a designer [15]. Maya software application is widely used for 3D modelling, animation and effects. This is suitable for film and television production, video games development, web design and print production [16]. Assyst software is in widespread use in all aspects of the fashion industry worldwide including children's wear, men's wear, ladies wear, couture, lingerie and outerwear. Assyst software is used for creating designs in 2D and 3D forms, body measurement, pattern cutting, style development, grading, ratings and costing, marker making and cut order planning.

### **1.5.2 Benefits of Using CAD/CAM**

Computer Aided Design is a joining of human and machine, working together to optimize design and manufacture of products [17]. Computers allow designers to graphically test ideas in real time without having to create real prototypes. This reduces engineering costs for an Original Equipment Manufacturer (OEM); is where a company whose products are used as components in another company's product, in this case the use of CAD/CAM hardware technology greatly in the Fashion and design industry by the designers is the use of products and services from other companies with the aim of improving products in the industry and also results in products getting to market faster. Non-technical team members from management to marketing can work with engineers to view, discuss, change and document a design in progress before building a prototype. This is an effective attribute of innovative designing that aids in identifying design flaws and reinforces group "brain storming", resulting in fewer misinterpretations and better product flow [18].

CAD/CAM analytical tools permit design improvements through an inexpensive and time-saving process. New integrated software tools that are commercially available, have been developed to allow design engineers to perform finite element analysis directly, during the early stages of design, thereby ensuring that the best design intent is achieved [19]. This in turn reduces final prototype numbers, lowers design costs, and decreases time to market [20]. Today's systems are much more user friendly and can utilize current trend in Windows operating system computing. With Operating Systems such as Windows 7, 8, and 10, Mac and Android systems, CAD/CAM softwares operate efficiently with expansion of the graphic memory allocation within these systems since its introduction to the Market.

### **1.5.3 CAD/CAM Training in Learning Institutions in Kenya**

Some of the CAM/CAM technologies that fashion design students are expected to be knowledgeable in include 3D anthropometry systems, Lectra, Gerber and Tuka CAD. However, due to lack of facilities, students are only expected to conduct research on the latest CAD/CAM software for fashion and design. Thus students often rely on the internet to conduct their research therefore lacking in practical exposure to the software. This in turn enables the students to be only skilled in documentation and not the actual production of the technology.

This is in contrast with students pursuing other courses such as Education Technology, Engineering or Architecture. TVET report of 2011 states clearly that CAD/CAM used in higher education is mainly used for students in the fields of Engineering and Architecture. These students are exposed to the CAD/CAM software such as ARCHICAD, AUTOCAD and CAXA software that help in the designing processes as these are the most renowned CAD/CAM softwares used in the Education industry. This makes the students to gain practical and theory experiences.

## **II. Materials And Methods**

### **2.1 Study Area and Sample Selection**

This study used a descriptive survey research design. The study was designed to depict the participants in an accurate way which is simply about describing people who take part in the study. The University of Eldoret is located approximately ten kilometres from Eldoret town and this is where the study was carried out. The university has several courses it offers but the study limited itself to the courses that have modules or parts that have CAD/CAM in their curriculum of study. This is referred to as purposive sampling since the sample was selected specifically due to the course structure that they do hence purposively done.

### **2.2 Data Collection and Analysis**

The required data was collected during the second semester period in the University of Eldoret during the first two weeks after the school reopens that is during January. A structured questionnaire was issued to obtain data from the respondents who gave their responses to questions in the study. The questionnaire was structured in a way that it had both open ended and closed question where the respondent only had to give a mark on the designated box to show response. Chi-Square analysis was done in order to establish the influence

that CAD/CAM training has on the skills and perceptions of fashion and design students towards embracing technology in fashion and design industry.

### III. Results And Discussion

#### 3.1 Respondent's Awareness of CAD/CAM Existence

The study revealed that 87.5% of the respondents were aware of the existence of Computer Aided Design/Manufacture (CAD/CAM) packages while 12.5% were not familiar with these packages. Further, 37.5% of the respondents that were familiar with CAD/ CAM packages, said they were familiar with ArchiCAD, AutoCAD and CAXA packages. This was influenced by the fact that these are commonly used packages by students taking Education Technology, Architecture, Interior design of Graphics courses. Also, 31.25% of the students reported that Graphic design packages like Photoshop, Corel Draw and Adobe Illustrator as the Main CAD/CAM packages are the ones they commonly used.

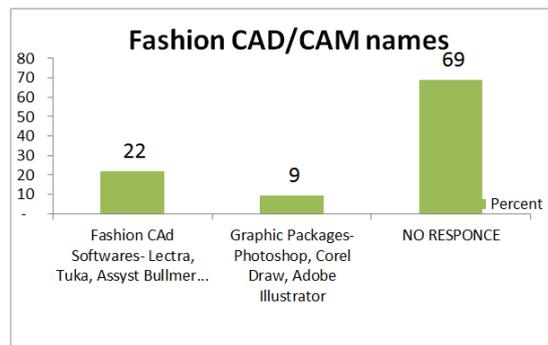


Figure 2: Known CAD/CAM applications known to response

This can be attributed to the influence and interest of Graphic Design making students to look for these softwares and get to know how they work even before they are taught in class. There are also several clubs in the University that offer similar packages thus making more students to be aware of the Graphic Design packages. 25% of the students recorded to have actually known Fashion CAD packages such as Lectra, Tuka CAD and AssystBullmer. These are packages that the Fashion Design Students are actually taught in class but with minimal experience and practise, only few of them were able to remember them as compared to other Graphic packages that they interact with very often. Figure 2 shows the graphical representation of the findings on this matter.

#### 3.2 Importance of CAD/CAM in the Fashion and Design Industry

CAD/CAM has been proven to be used in the international institutions such as University of Hong Kong, University of Johannesburg and Insituto De Moda in Italy. This actually means that the softwares are actually important in the Fashion Design Industry, since top fashion schools internationally are embracing technology in their studies, these eases the procedures of mass production and accuracy which are very critical in fashion design.

CAD/CAM is used in various institutions and technology is advancing thus making it viable in the industry. Eighty-eight percent (88%) of the students agreed that CAD/CADM was important thus there is need for them to understand how to use these softwares (Figure 3). Thirteen percent (13%) of the respondents reported that CAD/CAM had no importance to the fashion industry.

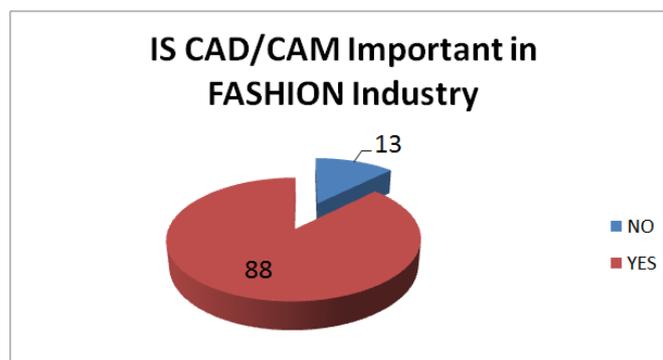


Figure 3: Respondents' Opinion on the Importance of CAD/CAM to Fashion and Design Companies

Many students had interacted with CAD/CAM in other places other than the university premises. Places of interaction with CAD/CAM software included industrial field attachment industries e.g. Bedi in Nakuru and places that the students have actually visited during their educational trips at the Export and Processing Zones in Ruaraka, Nairobi. This shows that CAD/CAM is actually being used in the fashion industry. This should motivate universities to invest in this technology so as to effectively train their students so that they can compete effectively in the job market.

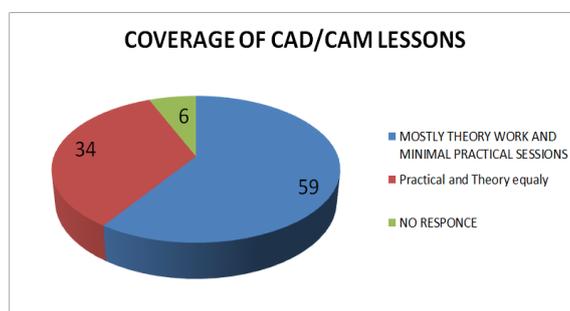
### **3.3 Relationship between the Packages Taught and Application of the Knowledge Acquired by the Students**

#### **3.3.1 Effects of Practical Skills on the Ease of Use of CAD/CAM**

As with all skills, practice makes perfect. From the study, 25% of the respondents agreed that exposure to CAD/CAM packages enhances one's capability and capacity in designing as well as interaction with clients. This is evident with features such as Quick Response (QR) which helps designers to respond fast to clients' needs thus enhancing productivity. However, 9% of the students responded that CAD/CAM had no influence on their practical skills while that it had actually had an effect, top schools international such as Intituto De Moda in Italy, National Polytechnic in Korea do use CAD/CAM in the study and thus students are highly accurate since human error is lowered due to use of computers. This therefore shows that the students need hands-on exposure to understand the effects that CAD/CAM has on their area of specialization.

#### **3.3.2 Theory and Practical Coverage of CAD/CAM Content**

Further, 59% of the students reported that most CAD/CAM courses were mostly taught theoretically than practically.



**Figure 4: Pie Chart on Computer Aided Design/Manufacturer Lessons Coverage**

Therefore the students were not well equipped with the skills needed for the industry and job market, lowering their acceptance of the change in technology when in the job market. Most of the students observed that they are actually taught more of theory than practical lessons. This actually lowers the interaction between the students and the packages. This in turn affected the frequency at which they can recall on how to practise what they have learned in class.

#### **3.4 Influence of CAD/CAM Packages Taught to Apparel Fashion & Design Students Professionally**

Chi-square analysis showed that the CAD/CAM curriculum taught to fashion design students had no influence on the CAD/CAM they used during their internships and therefore later in their prospective jobs ( $p > 0.05$ ). This could be attributed to the fact that very few students actually had experience with the relevant CAD/CAM packages and for the few who had the experience most of them probably had the experience during their field attachment and not in the class course.

Most of the students noted that CAD/CAM is actually important to the Fashion and Design industry. This may be due to experience and observation made during academic trips and internship as well as industrial field attachment where students saw the various programs in use.

## **IV. Conclusion And Recommendation**

### **4.1 Conclusions**

1. Lack of practical experiences in CAD/CAM during the lesson does not fortify the theory learnt.
2. Availability of CAD/CAM packages facilities ease the communication between clients and designers.
3. Practice & Exposure to CAD/CAM packages in the work environment increases competence of the designers' skills and efficiency.
4. Students need to be exposed to both the practical and theory content in order for them to be competitive in the fashion industry.

#### **4.2 Recommendations**

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

1. Institutions offering fashion design programmes should equip their laboratories with computer hardware and relevant software facilities to equip the students with CAD/CAM practical skills in order to make them competent.
2. Hiring of at least one lecturer and technician that are competent in the field of CAD/CAM in fashion and design
3. Have two field attachment sessions during the programme for students to get more exposure during their industrial attachment.

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