Consequences on Manual Drawing Ability from Computer Aided Design and Computer Aided Manufacturing

Adla Rajesh¹, V. Mahesh², Jay Prakash Srivastava³, P Abhilash⁴ and Suni Kunar Jakkula⁵

¹Assistant professor, Department of Mechanical Engineering, Sumathi Reddy Institute of Technology for Women, Warangal, India
²,³,⁴ Department of Mechanical Engineering, SR Engineering College, Warangal, India
⁵Department of Chemistry, SR Engineering College, Warangal, India.

E-mail: rajesh325.adla@gmail.com

Abstract: Evolution of Drafting/Drawing started in the French by Gaspard monge in the year 13th Century. Till 1980’s Manual drawings played a predominant role. Mini Drafter came into existence when people found that the things must be drawn in an effective manner. The basic instruments like Protractors, French Curves, T-squares are generally used in the drawing. Later on there is an advancement of drawing the same things in the computer Monitor system which they used a software called Computer Aided Design. As the manual drawing used protractors and compasses, the Modern way of Drafting is using the commands and the codes as the tools. The innovation of CAD made the people to draft the things in an accurate and precise manner. The theme of the paper is to show the aid and advantages of Computer Aided Design and modern techniques used in the field of engineering which also includes the way of protecting manual drafting skills.

1. Introduction
The technical drawing which is initiated initially is used to represent the objects and the machine symbols clearly and precisely[1]. It is generally used to represent two or three dimensional of an object on a sheet paper. The representation is fundamentally a two dimension. It is a form of language known from person to person with identifying the symbols or signs [2]. It is also a graphical representation where by the ideas and the information is shared among the people. It is therefore it is a diametrical representation whereby the ideas and the information are conveyed from the Design Engineer to the product Developer [3]. So an incredible importance is must be given for constructing the sketches and the drawings. AutoCAD is an application of Computer-aided Design and Drafting software. AutoCAD was first introduced in the year 1982. AutoCAD is developed by Autodesk. There is a rapid development in the use of AutoCAD by the students, faculty and the engineers. It works on the index of geometric systems which includes points,
lines, arcs, etc. Inbuilt commands are present in the software where by the user works on that through these commands such as drawing, editing and labeling. CAD Programs used to run on mainframe and minicomputers where CAD operator work on separate systems before AutoCAD came into existence [4]. For the last ten years Auto CAD also found in mobile and a web application which is named AutoCAD 360. It played a crucial role in industry by the product managers and the architects, graphic design engineers and the product managers. As per the records in the year 1994, it was supported by 750 training centers [5]. Computer Aided Design (CAD) Technology has evolved a rapid transformation in teaching of Engineering Graphics which has got revolutionary change on the learners and educators in accepting the Engineering Graphics in technical Institutions. It has become a mandatory course then of teaching CAD course in many technical Institutions and Universities. The research article consists of research on the training of Computer Aided Engineering Drafting (CAED). The main challenges that are discussed in the paper are the present and the future improvement of online/offline classes and the teaching techniques/methodologies of the course. A number of solutions are developed in designing the content and complexity of the course and also to improve the teaching methodologies [6]. The improvement approach in the engineering design has a multi-disciplinary development of the Engineering field. People’s utilization concept responded more and more from the boom development of the scientific exposure. The manufacturer has his own way of manufacturing the goods where by the customer even had to accept for that. Besides looking at the quality and the functionality of the product, customer even looking at the look which we can say the outer shape of the product. A degree of innovation is expected by the customer from the manufacturer all the time which would bring a challenging task to the industrial technology [7]. There is a great rapid growing demand of CAD in the industrial design. So lots of scholars are more focused towards the industrial design in the past ten years. The wider range of software and hardware is developed and exponential of ever-changing technologies are captivating the industrial design talents as well [8]. Computer Aided Design (CAD) is the main household tree which is playing a vital role in information based engineering. Computer Aided Design is also playing a crucial role in both engineering drawing and technical drawing which makes it more user friendly, consistent and clarity while using it in corporate or educational sector [9]. A CAD is having more sweep and boom based on its nature and shape. It is a user friendly and great supportive to the people related in doing designing textile, research and apply on industry of textile filed. Linear, angular, ordinate, and radial and arc length are the basic types of dimensions that could be basically identified [10]. Configurations are mainly depending on the type of nature, shape of the object. It is probable in computing the dimensions of CAD by its actual form from its surroundings. The configuration/layout describes to recognize the fundamental standards of directions arrangements and orientations along with the reality and shape [11][12].

2. Experimental Study

2.1 Problems Connected with Manual Drafting and Computer Aided Drafting

Computer Aided drafting and Manual Drafting has both advantages and also certain advantages too.

2.1.1. Manual Drafting/Manual Drawing

The manual drafting is a standard method of drafting for the design engineers and also for the engineering students. It is a common drafting course for many years which really require good drafting skills. It is really a challenging task for the manual drafting as the draft person must maintain accuracy and precession of the components. Manual drawing must have a keen look while drawing which the drawing must also be from the blurriness [13]. Clarity must be maintained which must be even from the instrument.
errors of T-scale and mini drafter which also used a standard and related pencils while drawing. For example the clear information of what is an epicyclic gear train can be explained through CAD rather than Manual drawing.[14][15]. The drafting person should also meet the required person to complete the estimated project in the prescribed time for which he should have minimum patience. It also takes a lot of time and he should have a deep concentration doing without any errors and must be answerable for any delay.

2.1.2. Computer Aided Drafting
Designing and modeling is all done manually before the invention of AutoCAD. Manual Drafting to some extent is a time consuming task which also showed a lot of unexpected errors. The processing of modeling and designing got more precise, more accurate, digitalized and so simplified. The draftsmen or students are completely depending on the software. If so is the case the ability of drawing will be going on vanish gradually.

2.2. Problem Solution
In Conventional teaching where the faculty is using normal chalk and blackboard which is a little bit enforcement only for the basic knowledge which must be also presented through power points and applying some new methodologies for the fulfillment of complete knowledge. The students and the learners can do the complete CAD practice in CAD laboratory. So as a concluding part students gain the maximum knowledge practicing both the conventional drawing and the CAD part. So a student can be confident once he has a thorough knowledge of both the modern as well as traditional knowledge. Initially the problem solution, with its applications and finally the concepts are to be educated theoretically and thereby the students should first practice the things in the drawing sheet and then in the CAD software which will be a formal way of learning. The theoretical part and the practical part both combine takes a lot of time ultimately the manual skills of drafting will be in the student’s hands.

| S.NO | Entity       | Computer Aided Drafting(CAD)                                      | Manual Drafting                                      |
|------|--------------|------------------------------------------------------------------|------------------------------------------------------|
| 1    | Line weights | Available from 0.001cm to 50cm                                   | Depending upon the pencil used by the individual     |
| 2    | Storage Space| It occupies less space as it is digital form can be named as portable document file | It depends upon the skills developed by the individual |
| 3    | Transportation| The transportation can be done very easily via emails            | The transportation is possible with little bit risk and time consuming process |
| 4    | prototype    | It is possible                                                   | It is impossible                                     |
| 5 | The process of editing | It is possible | It is impossible |
|---|------------------------|---------------|-----------------|
| 6 | Scaling factor         | The process can be done by single command | Drafting must be done |
| 7 | The process of converting 2D to 3D | It is possible | It is impossible |
| 8 | Virtual Manufacturing  | It is possible | It is impossible |
| 9 | Animating process      | It is possible | It is impossible |

3. Results and Discussion

The Drafting skills will be developed by using the manual drafting. It shows very clear that CAD is a time saving process however it must be implemented only after the candidate gets a clear idea of manual drafting skills. For the accuracy, precision and the line weight, CAD is more preferable than that of manual drafting. CAD has very wide range of applications which is mentioned in the above table. Students will be getting clear hands on experience while dealing with manual drafting and more accurate, precision while dealing with the Complex engineering drawings respectively.

4. References:

[1] Refold CN 1998 Teaching and Learning Computer Aided Engineering Drawing, *Int. J. of Eng. Ed.* 14, 276-81
[2] Shouqian Sun, Qi Huang, Lingyun Sun and Chai Chunlei 2005 Research on Computer-Aided Industrial Design Technologies for Product innovation *The Journal of Designing in China* 1, 78-79
[3] Rajesh Kumar Goutam and Sanjay Kumar Dwivedi 2005 Search Engines Comparison on the Basis of Session Duration and Click Hits *Int. J. of Comp. Sci.* 8179-183
[4] WANG Hai-bo 2005 Computer Aided Industrial Design *Journal of Anhui University of Tech.* 23-26
[5] Bilalis N 2000 Computer aided design cad. Technical University of Crete *InnoRegio Dissemination of innovation and knowledge management techniques EC funded Project Report Greece* 1-27
[6] Rajashekar Patil and S. Mohan Kumar 2012 Computer Aided Engineering and Machine Drawing: A modern method. *Int. J. of Mod. Eng. Res.* 2427-430.
[7] Jun YAO 2013 Discuss the development of computer aided industrial design technology. *Int. J. of Comp. Sci.* 101
[8] Burton M 2005 Design For Rapid Manufacture: Developing an Appropriate Knowledge Transfer Tool For Industrial Designers, Doctoral Thesis Loughborough University London
[9] Chen K and Owen C L A study of computer-supported formal design *Design Studies* 19, 331–359
[14] Rajasri I, Guptha AVSSKS and Rao YVD 2013 A Comparative Study of a Few Tests for Isomorphism in Planetary gear trains. Int. J. of Eng. and Tech. Innov., 3 95-103
[15] Rajasri I, Guptha AVSSKS and Rao YVD 2014 Effect of Symmetry on Structures of Epicyclic Gear Trains, Int. J. of Eng. and Tech. Innov.4 77-85