An Evaluation of Newer Computer Aided Design and Drafting (CADD) Software

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Abstract

Architecture is about presenting a design in a form that can be interpreted by others in order for them to understand the idea, concepts, or intentions of the architect. In the past five decades, softwares for the design and drafting of architectural drawings have emerged and evolved. Newer versions of these softwares such as AutoCAD®, ArchiCAD® and SketchUp® are available. However, most designers seem to be using older versions because these users say "there is nothing of significance in the newer ones." The paper examines how some architects are adjusting to these new trends, looks at how the striking areas of these newer versions will be of great use to the architect as well as other designers, through a comparative analysis of some of the components absent in older version that have been included in the newer ones, with respect to their applications. This work also attempts to break the "old school" jinx by recommending how architects/designers acquire knowledge on the advantages of these new components which aid their presentation and thereby enhance the comprehension of the client as well as other professionals.

Key words: *architecture, concepts, drafting, presentation, software.*

2. INTRODUCTION

When a designer draws, the process can be so aggravating if one of the drawing tools (t-square, set-square, pencil, eraser, curves, etc.) gets missing, even if it's just for some few seconds. This reason prompted the use of a drafting machine that has most of these tools incorporated in it. However, the stress involved in drawing despite being minimised was still rather a bit cumbersome since it still involved one's dexterity in manipulating the machine. With the incursion of the computers as an aid to difficult tasks during the fifties, it became just a matter of time before they caught up with the design sector. It was heard of computers that had processing speeds that could undergo some superb calculations in little or no time as adjudged by mortal beings. Thus programmers started creating programmes that would be used by designers to help them in achieving their dreams. The problems they encountered during this earlier period included poor picture resolutions by the monitors, small memory or data space in the computer (that makes the programme run slow, thus no advantage as regards to time) as well as lack of financial support, since it was not a too popular phenomenon then. However, with the advancement in

technology and increase in speed of the computers (we now have computers running 100,000 times faster than those created in the 1970's), it was easier to run these programmes that are usually "heavy" and require fast processing speed. We now saw the emergence of software like: Micro station®, Cad key®, 3D home architect®, AutoCAD®, ArchiCAD® and so many others. The versions are being upgraded and newer inputs added into them. AutoCAD® software and their evolution to their present state are shown below. (Fig. 1):

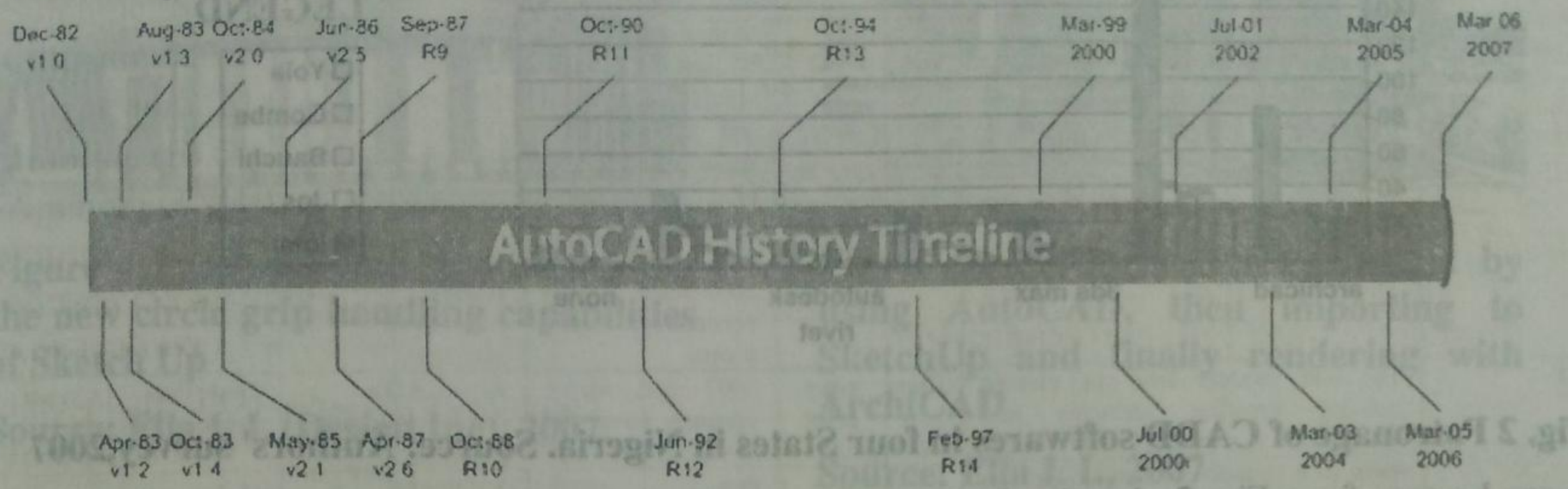

Figure 1: AutoCAD history timeline (source: CAD correspondence institute, 2007)

There are hundreds of CADD programs available in the CADD industry today. Most of them are simply drafting programs, while some offer certain engineering analysis, design or database capabilities. Some programs are more elaborate than the others. There are programs that enable one to do 2D drawings, 3D drawings, renderings, shadings, engineering calculations, space planning, structural design, piping layouts, plant design, project management, etc. There is a CADD program for virtually every engineering discipline one can think of (http://www.caddprimer.com).

All these softwares have a continuum of updating that includes easier, and sometimes, inventive approaches to solving problems. From Fig.1, it can be seen that versions 1.2, 1.3 and 1.4 all came out in the same year. One cannot envy the architects that were trying to adjust to this "supersonic" change in components. This paper is going to look into how the users of these newer software have adjusted to the rapid changes and show the striking features of some CADD softwares. The aim of this is to educate professionals on aspects of the software that would be useful in translating their designs to an understandable format.

The vastness of these softwares makes them almost impossible for one to master all of their usages. In fact, it is quite unusual to see anyone that is using as much as 40% of the total softwares commands in anyone that he/she has mastered (CAD correspondence Institute). Therefore when a newer version comes, the users of the older version find it hard to pick up in time before another one crops in and the chain goes on and on leaving this designer in a "land of limbo."

THE EMPIRICAL SITUATION

It is therefore not uncommon to see architects still using AutoCAD® release12 that came out June 1992 (Fig.1), or ArchiCAD® version 3 in this present year that we have ArchiCAD® 11. To investigate how architects, draftsmen, surveyors, engineers and other professionals are adjusting to the fast changes in the evolution of these programmes, questionnaires were taken to different

firms/organisations/government setups spanning from Yola through Gombe, then through Bauchi and cumulating in Jos; forty for each state. The targeted users were the practicing professionals, who need CADD to aid their designs. The results of these findings are shown below:

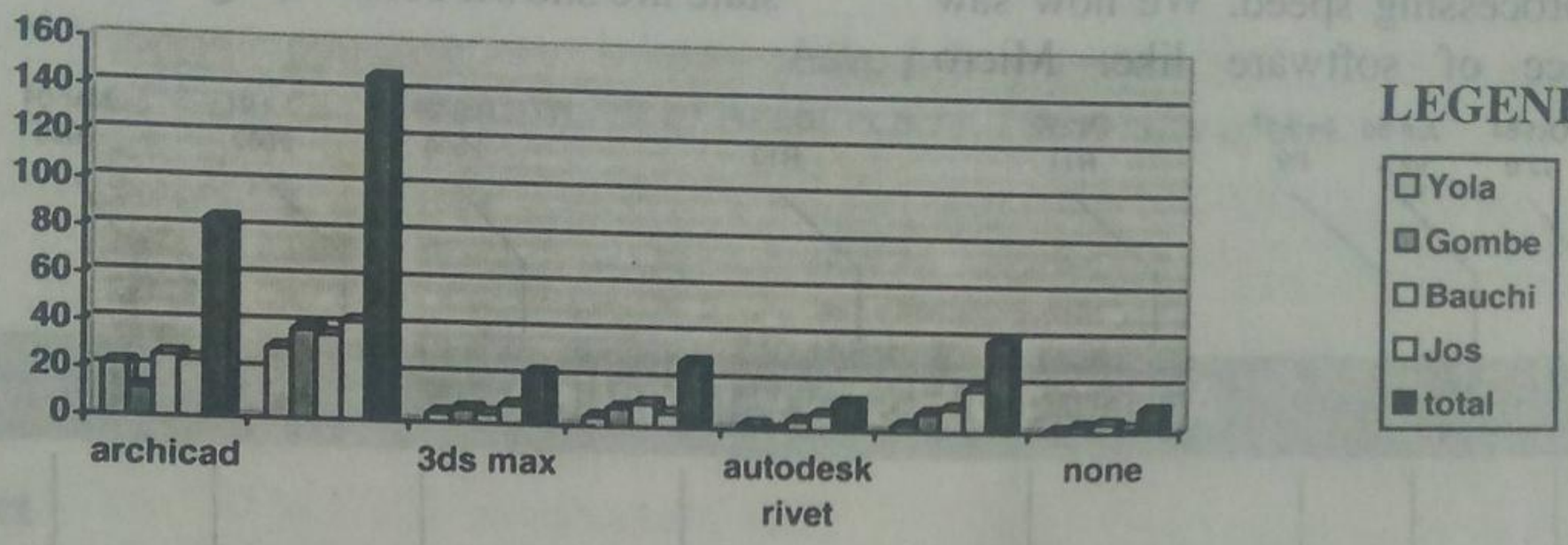

Fig. 2 Patronage of CADD softwares in four States in Nigeria. Source: Authors' survey,2007

It can be seen from Fig. 2, that the CADD software with the most patronage is AutoCAD® with 146 users, followed by ArchiCAD® with 84 users. The third is SketchUp® with 49 users. This trend, combining with lack of enough space to discuss all the softwares, limits this research to concentrate on the striking features of these three software.

During the course of the data gathering, it was discovered that a federal parastatal did not accept soft copies of drawings that came from any versions other than that of AutoCAD® 2000 either before or after! In Fig. 3, it can be seen that in AutoCAD® a whooping sum of 74 users out of the 146 users (about 50%) make use of versions below 1998. The other software data bear similar appearances.

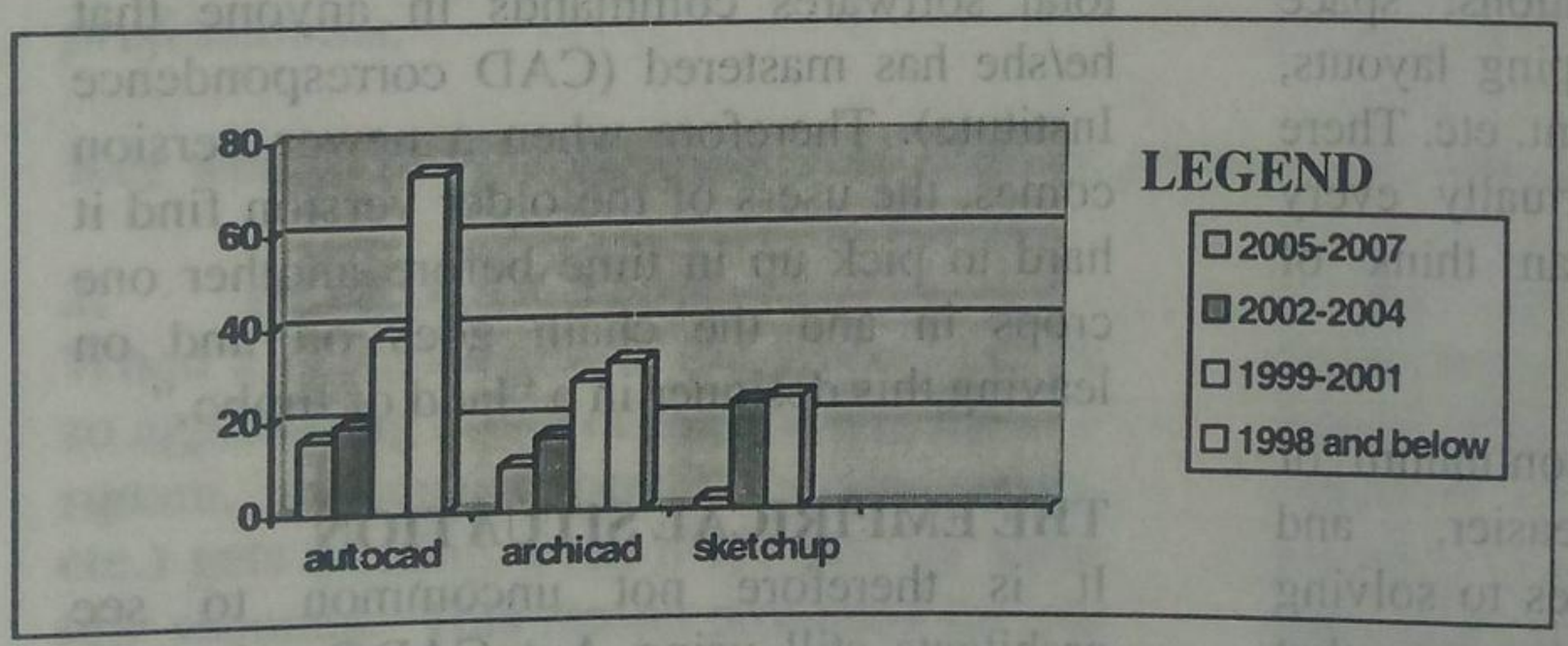

Figure. 3 Patronage of 3 different CADD software versions in the four states. Source: Authors' Survey, 2007.

The likelihood of this datum being as it is, is a function of these users not knowing what advantages and striking features these upgraded softwares are now having.

4. STRIKING FEATURES OF THE SELECTED CADD SOFTWARES:

A CADD program contains hundreds of functions that enable you to accomplish specific drawing tasks. The functions are organized into modules that provide easy access to all the commands. The program is divided into modules such as draw, edit, data output, function control, data storage and management. Below are some works that make use of some striking features of these CADD software.

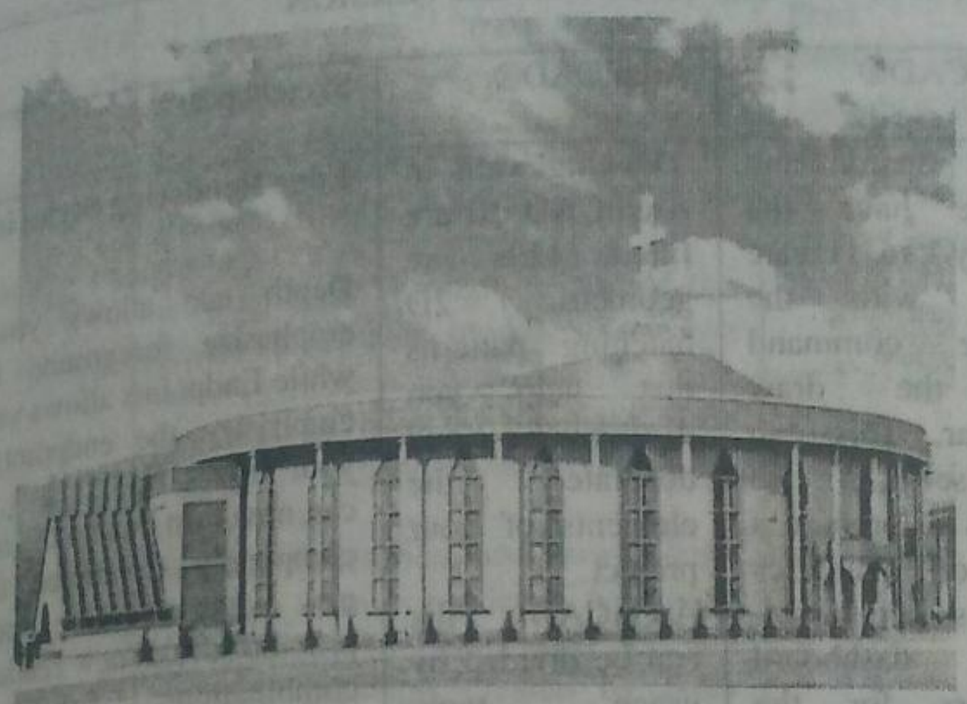

Figure 4 Proposed church design using the new circle grip handling capabilities of Sketch Up

Source: Ella I. I. (Design Inc), 2007.

Figure 5. Proposed office complex by using AutoCAD, then importing to SketchUp and finally rendering with ArchiCAD

Source: Ella I. I., 2007

A program may also have a number of specialized functions such as layers, database and 3D. Let's have a look at the CADD modules (http://www.caddprimer.com) and how the striking features of AutoCAD, ArchiCAD® and SketchUp® are visible in them.

MODULE	DESCRIPTION	TOOLS	STRIKING FEATURES OF NEWER VERSION		
			AutoCAD®	ArchiCAD®	Sketchup®
DRAW	The draw module provides access to all the drawing functions of CADD. Whenever one need to draw something this group of functions is used. The draw module enables one to draw lines, arcs, circles, ellipses, text, dimensions, symbols, borders and many other drawing components. Draw is CADD.s most frequently used module because all drawing work is Accomplished using it.	Line types, multiple parallel lines, flexible curves, ellipse and elliptical arcs, text, dimensions, hatch patterns, polygons, arrows.	2007 version and above have the ability to create table with the _table command on the draw toolbar. This can be useful if one wants to prepare a bill of quantities for instance. Also , a dashboard appears for the draw tool bar in 2007 and above versions for easier access	Drawing walls in ArchiCAD 10 are filled, Fills are geometric 2D hatching patterns that help you distinguish and decorate the elements of your project. ArchiCAD Fills can be divided by usage, type, category, mode, scaling and orientation/ direction.	**Edge Rendering Styles in 5** Depth cue allows you to emphasize foreground lines while Endpoints allows you to emphasize the endpoints of your model. Additionally, you can now turn on and off edges completely. Combined, these new edge rendering options provide several new rendering combinations for your models.
EDIT OR MODIFY	The edit module lets one change existing drawing elements and manipulate them in a number of ways. One can move, copy or erase drawing components. One can enlarge or reduce the sizes of diagrams or change the colour and line type of drawing components. One can also change the size and style of text and dimensions, as well as edit a dimension to show different units of measurement. A good CADD program is designed to change the appearance of all drawing elements created with CADD. The edit functions also act as convenient drawing-aid tools. They enable you to join missing corners of lines, trim drawing components along a line, stretch them to fit a new shape, etc. The list of editing capabilities goes on and on. The edit functions make CADD a dynamic drawing tool.	Erase, array, base point, editing window, fillet, mirror, move, cutting drawing objects, extending drawing objects, rotate and stretch.	2007 and above versions have the ability to join lines that were disjointed to become one line with the _join command located on the edit or modify toolbar.	ArchiCAD's intelligent cursor provides continuous feedback on the situation of the new element and its relation to other elements that are already present in the design - helping you ensure that your drafting work is accurate.	**Push/Pull: Create New Starting Faces in 5** The Push/Pull tool, in conjunction with the CTRL key, can be used to create a connected series of volumes (each with their own set of edges). This feature is very useful for creating space planning diagrams for building interior.
DATA OUTPUT OR SYSTEM CONTROL	The data output module enables one to display drawings on the screen and then print them on paper. There are two separate sets of functions that help accomplish this: · View-display functions · Print/plot functions The view-display functions allow you to display different views of a drawing on the screen. These functions are used quite often, because every time you need to draw something or edit something, you need to focus on that portion of the drawing. With the help of view-display functions, you can zoom in on a specific portion of the drawing. The print and plot functions allow you to print drawings using a printer or a plotter. One can control many aspects of printing and plotting. One can print the same drawing in different sizes by applying the appropriate scale factor. One can plot the drawings with specific colours, pen thickness, and line types.	In the viewing/display section: Display view, moving the view sideways, zooming the view to an exact size, zooming the view using window, saving and displaying views. In the printing section: Selecting a Scale for Drawings Composing a Drawing Layout Selecting Text and Dimension Heights	In the plot dialogue box of 2006 and above the settings for the what to plot, plot orientation, that one would have otherwise gone to settings in earlier versions are included. One can also plot to PDF used in Adobe® directly without converting in 2007 and above versions	Archibald gives you a high degree of flexibility in printing, plotting, and electronic publishing. For quick outputs of the current on-screen view, the Print and Plot commands are available directly from ArchiCAD's file menu. ArchiCAD 10 provides 2 major ways of viewing your design, the 3D view for perspectives and the 2D view for drafting.	SketchUp 5 allows you to print your designs using any Windows-compatible printing device. You can also Print to Scale and span a print across multiple sheets, allowing you to output a large drawing from a standard printer. For viewing, SketchUp implements the concept of a *camera* to represent your *point of view* (POV) of the model. Simply, you (the user) are treated as though you were a camera looking at your model as you work. This concept is particularly important when your model is something that you want to tour, such as a house, as though you were walking through it in the real world. In this case, SketchUp allows you to change your point of view to a specific height and angle to the model and walk through the model as though it were real.

		Choosing Pens, Colours and Line weights			
DATA STORAGE & MANAGEM-ENT	The data storage and management module allows you to store and manage drawing data. Through the use of the functions in this module, you can store drawings as files on the hard disk. One can manage the files in directories and sub-directories, and move, copy or delete them as needed. CADD data management functions also let you translate drawings created by other CADD programs. These functions convert drawing data to a generic format that can be read by any CADD program. Data exchange format (DXF) is one of the common data translation formats used by CADD programs.	Save, save-as, save-current, auto-save.	In 2007 and above, the External References palette allows you to attach, organize, and manage all file references associated with your drawing. You can attach and manage referenced drawings (Xrefs), attached DWF underlay, and imported raster images.	ArchiCAD 10 allows you to save works in 3ds formats, which is compatible with lots of other 3 dimensional programs. The programme also allows the importation of files from several file formats including dwg which is a basic AutoCAD file format	SketcUp 5 allows you to save works in 3ds formats, which is compatible with lots of other 3 dimensional programs. Also, SketchUp can save animations in AVI format (video), which can also be played back in most video programmes.
SYSTEM CONTROL	The system control module (also known as system defaults) allows one to control how CADD works. CADD programs are designed for a broad range of professionals, including architects, designers, engineers and surveyors. With the help of system control functions, one can set the working environment of CADD to suit your needs.	Workspace, layers, and other system control modules are included.	In 2007 and above, one can organize the workspace settings to suite his/her needs	ArchiCAD is for architects and is already configured to fit the architect. However, there are a number of areas that can still be customized to meet specific references, these are the unit and grid types.	In SketchUp 5 and above, you can customize your workspace to fit your particular endeavour, with more drawing unit types to choose from.
SPECIAL FEATURES	CADD programs usually offer a number of special features that make working with CADD easier and allow one to automate many drawing tasks. For example, you can create layers in a drawing that allows one to segregate drawing components. One can develop spreadsheets and databases that can be used to create many types of project reports. One can create three dimensional (3D) drawings, such as isometrics and perspectives, with the help of 3D functions. One can also accomplish many other automated tasks with the help of macros. The number of special features a CADD program has or how elaborate they are varies from one program to another. is, and how it is sold.	3-D drawings, isometric, oblique, rendering, and other intelligent features.	In 2007 and above one can create solid primitives (cones, helix, cylinders, and etcetera). One can now use grip tools for 3-D, add edges and faces, press and pull areas, and even create sections from 3-D objects.	The Truss maker in ArchiCAD 10 automatically generates roof trusses after data has been collected about the roof. In addition to this feature, is the 3d cutting plane, which creates 3d sections in 3 easy clicks.	Google® the most inquired search engine in the world has now incorporated Google sketchUp6® to it's search machine to help in handling 3d drawings.

Table 1. Similar commands in all CADD software (source www.cadprimer.com), showing the striking features of newer versions of AutoCAD®, ArchiCAD® and Sketchup® (source authors' research, 2007).

CONCLUSION

The research work has attempted to show some of the problems affecting the migration of architects/designers to newer versions of ...; it has been able to show that the majority of users of these softwares are not inclined to change to the newer versions, despite their knowing that the advantages which these newer versions give are enormous and numerous, especially in the special features section.

RECOMMENDATIONS

The following recommendations can be derived as a solution to architects/designers attitude towards changing to newer versions:

- Awareness programmes could be considered included in the formal and non formal sectors. In schools, this can be done by introducing paperless design studio that facilitates the use of CADD programmes to achieve the young upcoming architects dream. Also, firms, companies and governmental parastatals should always be ready to release their workers to go for workshops and tutorages organized for the training of architects in newer CADD software.
- Insistence by agencies and parastatals on format of soft-copies of schemes submission for approval should be made in a way that they only allow CADD software that were released in the past 4 years before the time of the submission of the scheme to be approved by the government board or parastatals.
- More architects and construction industry professionals should be involved in the programming fields. This will go a long way in making these newer software more efficient for architecture and construction.

REFERENCES

Finkelstein, E. (2001). *The AutoCAD® 2002 bible.* New York: Hungry minds.

Reffat, R. (2007). "Revitalizing architectural design studio teaching using ICT: Reflections on practical implementations" *International Journal of Education and Development using ICT 3(1)* pp76.

Walker, J. (1994). "The autodesk file: bits of history, words of experience" *Document prepared for the autodesk® corporation.*

From the net:

AutoCAD® 2007 preview guide. www.tailor-tech.com/autocad. *Accessed on 6/05/2007* CADD Primer. http://www.caddprimer.com.

Emmanuel G., Nicolas T., and Guillaume L. (2006). "3D-Audio Matting, Post-editing and Re-rendering from Field Recordings". www.euraspJASP07.pdf. *Accessed on 2/02/2007.*

The CAD correspondence institute. "2007 new commands". www.cci.org. *Accessed on 13/04/2007.*

www.graphisoft.com/ArchiCAD10/help. *Accessed on 4/06/2007.*

www.sketchup.com/sketchup5/tutorials. *Accessed on 12/03/2007.*