A TEACHING AND LEARNING SOFTBOARD APPLICATION

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Abstract

A soft-board application allows users to write, draw, and manipulate graphics just like they would do with physical aids such as chalk/white boards or pen and paper. These applications have over the years advanced from basic shapes and colouring to merged shapes, rotating shapes, patterns, and web themes. At the same time, existing tools on soft-board applications are limited to texts, selections, arrows, pencil, connectors, basic shapes, stars, and flowcharts, hence less appropriate for teaching and learning. This paper investigates tools needed in teaching and learning and develops an extended soft-board application with most tools for physical and biological sciences. A comparative analysis with related applications is made, scoring our application highest on easy of use, learnability, and usability features of effective user interface design.

Introduction

A Soft-board application is a software application that can be used by learners, teachers, and facilitators, among others, to perform activities such as illustrations, drawings or other writings just like they would do on a chalk/white board, or using pen/pencil and paper. The application can be used as a teaching/learning aid instead of physical teaching/learning aids such as chalk/white board, charts, to mention and allows work to be saved for future reference.

This application ultimately provides all those and even many more utilities (functionalities) that a teacher/learner needs in an educational well-being especially in this era where education is diverting away from hard-materials such as text books and chalk boards in preference to soft-materials such as e-learning tools and soft board application.

Critique of the Related Applications

Despite of the growing number of Computer applications in education, little emphasis has been given to applications that can enable teachers and learners develop sketches as well as illustrations (diagrams/drawings) in a specific and local context. As a result, tools provided by the existing softboard applications are not optimised for Ugandan educational needs. Consequently, the need to extend such applications is eminent to facilitate production of good teaching content and hence learning.

The UGADraw System

The UGADraw System Features

The UGADraw system provides an environment where the teachers/instructors and learners can illustrate diagrams or drawings, write freehand, perform paint operations (in a local context) and perform chart/graph operations, among others. Therefore, it provides an environment equivalent to a chalk or whiteboard. The features of UGADraw system include:

❖ The software can be installed on a Windows Operating System environment and used offline.
❖ Provision for the user (teacher, instructor or learner) to write free hand.
❖ Provision to perform extended paint operations (including local contexts).
❖ Perform chart and other drawing operations.

The UGADraw System Model

UGADraw is a non-distributed system that is used offline. It constitutes individualised (group) self-paced e-learning where an individual or a group of individuals (such as in a classroom environment) use the system offline (maybe, with the aid of other hardware such as a projector).

The UGADraw Tools

UGADraw – PicEditor

This component provides the user with the ability to perform extended paint operations. Figure 1 shows the screenshot of UGADraw – PicEditor on start up.
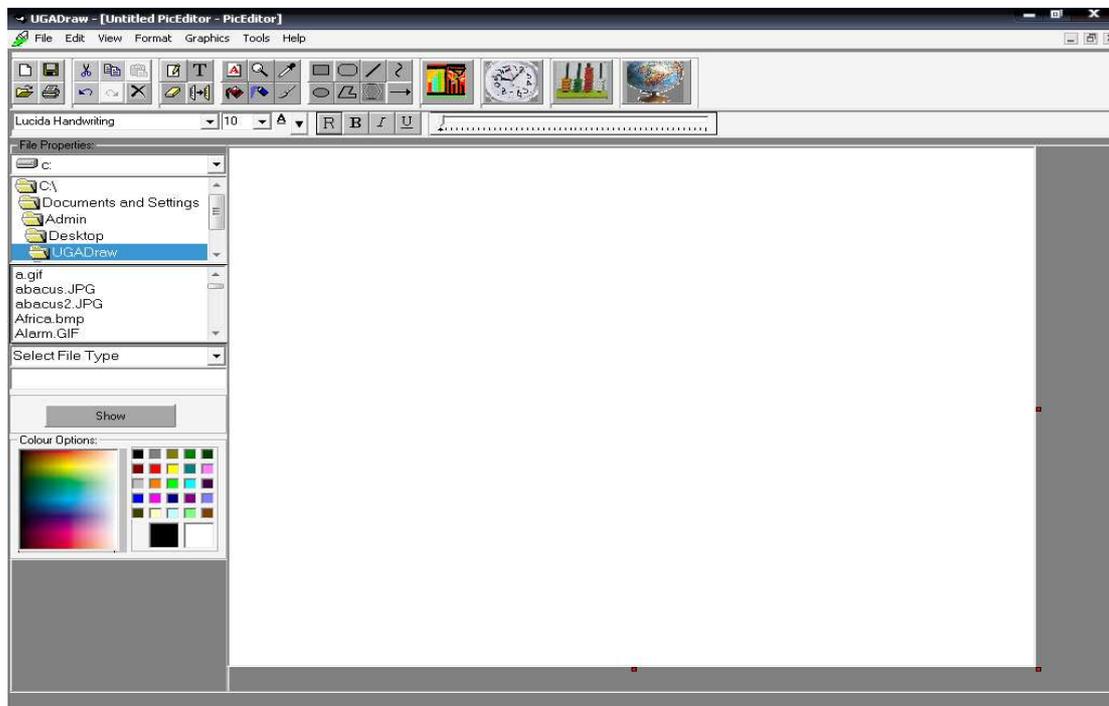

Figure 1: Screenshot of UGADraw - PicEditor

This PicEditor provides the user with the ability to edit, design and manipulate pictures that may be used for teaching purposes, or may used in conjunction with other applications for example, Microsoft PowerPoint for presentations. The features are mainly tailored towards meeting Ugandan educational needs.

The title bar contains the name of the main application and the name of the sub-application (when maximised). It also contains buttons for minimising, maximising (or restoring) and closing the main application.

The menu bar contains the following menus: File, Edit, View, Format, Graphics, Tool and Help. The File menu contains items such as; New, Open, Save, Save As, Print and Recent Files. The Edit menu contains the following items; Undo, Redo, Cut, Copy, Paste, and Delete. The Format menu items include Font, Draw Styles, Fill Styles, Background Colour, Foreground Colour and the Fill Colour. Meanwhile the Graphics menu contains graphics manipulating items such as Rotations and Colour Filtering. Whereas, the View menu provides options for visualizing Toolbars, Status bar, and Zoom. The Tools and Help menus contain the other sub-applications (SoftBoard, ChartEditor and Drawing Tool) and Help Tips and About respectively.

When this sub-application is maximised, the menu bar also accommodates the buttons for minimising, restoring, and closing this sub-application. Otherwise, these buttons are located on the sub-application's title bar including the name of this sub-application when restored (not maximised).

It has a standard toolbar that contains the short-cuts to some of the most commonly used items on the menus. This toolbar also contains some additional tools that may not be there in the menus such as Text, Labels, Eraser, Pencil, Select-Drag-and-Drop, Shapes (both regular and irregular), as well as graphics manipulating tools such as Brushes, and Fill. Besides, buttons are also included for easy access to UGADraw's ChartEditor, Abacus Math, Teaching Clock and Maps.

Meanwhile, the formatting toolbar provides easy access for changing font attributes. It also provides a Slider used to change the size of drawings, brushes and pencil.

It has a sidebar that gives the user the ability to easily such for graphics files in the computer's drives for editing or viewing. The sidebar also provides options for colours including standard colours and mixed (or already customised) colours.

It has an adjustable interface for editing the pictures. The contents of this editing surface can thereafter, be saved or printed.

The status bar, when activated gives the file being worked on and the position of the mouse pointer relative to the editing interface.

Figure 2 (below) shows the demonstration or illustration of one tool that is, maps as used as visual aid in a classroom environment.
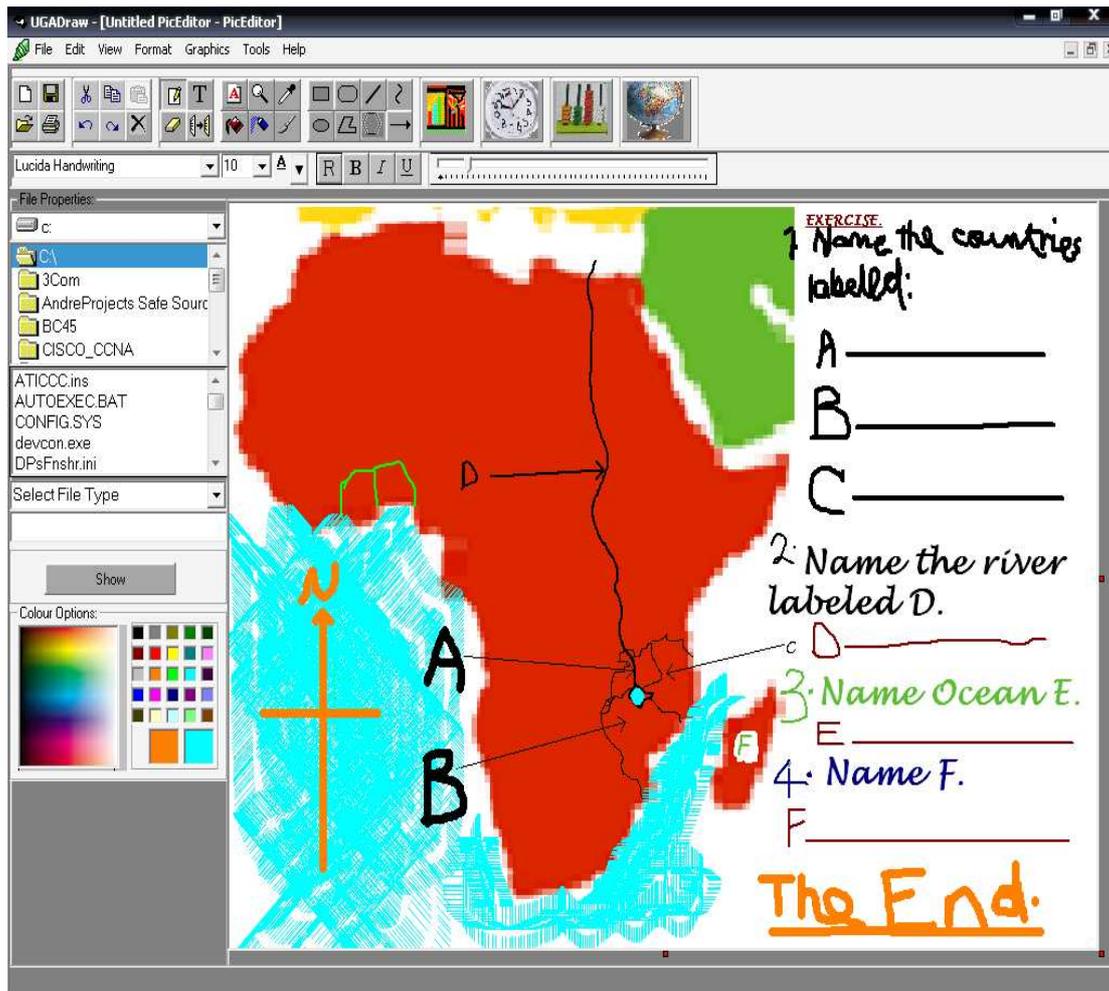
Figure 2: UGADraw – PicEditor illustrating map of Africa

UGADraw – SoftBoard

This feature allows the user such as a teacher to perform illustrations, free hand writing among others in a conventional classroom setting. It can be used as a visual aid instead of a chalk/whiteboard with the aid of an electronic projector. The free hand writing can be done by using MousePen as the pointing device instead of the standard mouse since it allows free hand writing more naturally than the standard mouse. This allows the teacher or the instructor to write in any language instead of the keyboard text that restricts the user to keying only alphabets or symbols available on the keyboard. Whereas with the help of suitable pointing device (such as MousePen), the user can perform illustrations such as deriving equations, drawing sketches or writing symbols in any language free hand. Figure 3 shows the screenshot of UGADraw – SoftBoard.
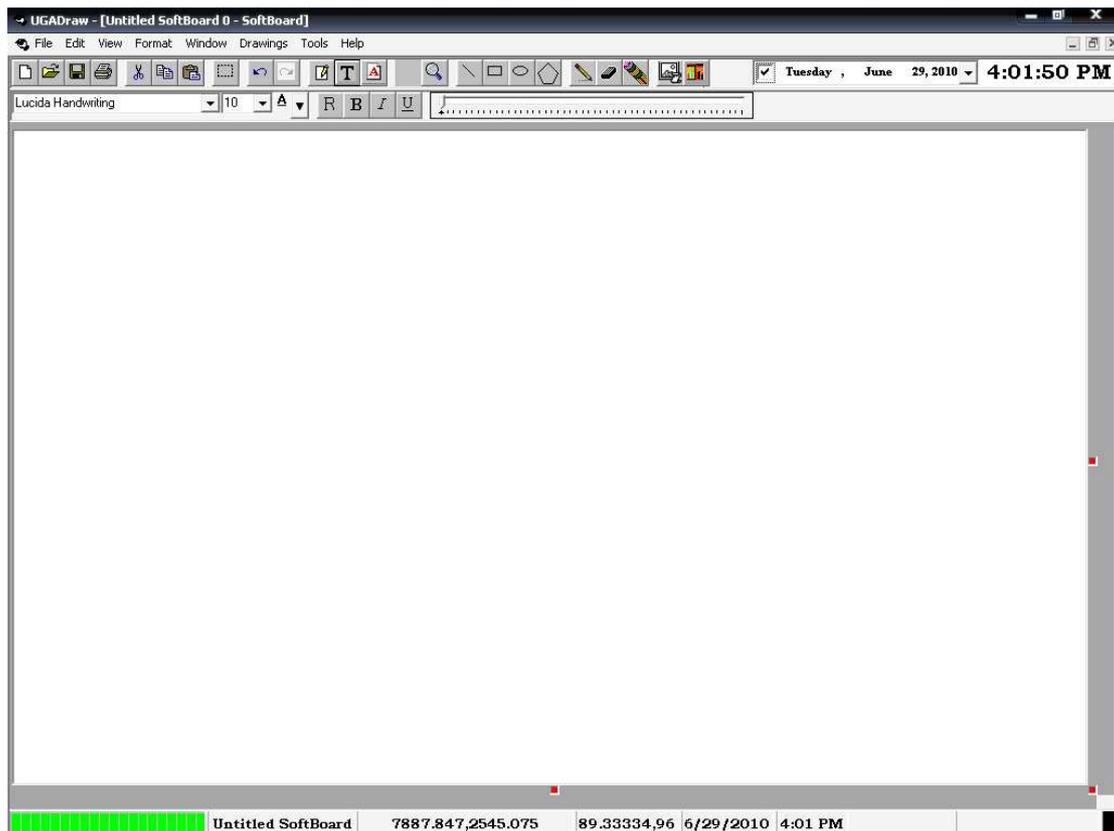
Figure 3: Screenshot of UGADraw – SoftBoard

 This is the interface for the SoftBoard that provides the user with various tools for illustrations and text (both keyboard text and handwritten text) for instructional and/or teaching purposes.

It has a title bar that (when maximised), contains the name of the main application (that is, UGADraw), the name of the file being worked on (which assigns it a default name 'Untitled SoftBoard' for an unnamed file) and the name of the sub-application processing that file (that is, SoftBoard). This title bar also contains minimise, maximise (or restore) and close buttons for minimising, maximising (restoring) and closing the whole (main) application. But when minimised or restored, the file name and the sub-application named are transferred to the sub-application window title bar.

It also has a menu bar that contains the following menu items; File, Edit, View, Format, Window, Drawing, Tools and Help. The File menu contains items such as New, Open, Save, Save As, Print and Recent file list for file operations. The Edit menu contains functions for editing the file such as Undo, Redo, Cut, Copy, Paste, Select All and Print Screen (for capturing the screen contents). The View menu has the items for changing the visibility of some tools such as the Tool bars, Status bar as well as the Rulers (vertical and horizontal).

The Format menu has items such as Text, Board Colour, Text or Writing Colour and Drawing Colour for formatting (changing) the appearance (colour) of the board, text and drawings as well as formatting text settings. The Window menu contains Zoom item for changing the size of the board. It also contains the list of other open windows. The Drawing menu contains items such as Drawing Tool (that enables the

user to quickly access the window for drawing/diagram operations), Shape Styles, Line Styles and Fill Styles for customising the shapes, lines and filling of the shapes respectively. The Tools menu has list of sub-applications that are available with this application. These items act as short-cuts to those sub-applications such as PicEditor, ChartEditor and Drawing Tool. The Help menu items contain Help Tips and About.

The menu bar also contains the buttons for minimising, restoring and closing this sub-application when the sub-application is maximised. Those minimise, maximise and close buttons are transferred to the sub-application window when minimised or restored.

This interface also has a standard toolbar that contains icons for ease of use and accessibility of some of the most common file operations in the menus such as New, Open, Save, and Print, Cut, Copy, Paste, Undo, Redo and Selection. The standard toolbar also contains buttons for various tools such as Pencil, Text, Label, Zoom, major Shapes, Eraser, Clear and the Handwriting tool (that requires MousePen i608 as the pointing device instead of the standard mouse). Also, the icons for PicEditor and ChartEditor are included for easy access to those programs. Additionally, calendar (monthly) and a digital clock are also shown in the standard toolbar.

It also has a formatting toolbar that contains options for changing font attributes such as the name, size, text colour, and regular, bold, italic and underlined text. The formatting toolbar also contains a slider that is used to adjust the size of handwritten text, drawings and pencil.

It has a board that is used as the interface performing all the writings, drawings, illustrations and text.

The status bar contains the progress bar, the file name, position of the mouse pointer on the board, the size of the board, the system time and date. The status bar also gives the name of the active tool being used.

It provides the user with the ability to save and/or print the contents of the board, open a new board as well as open existing files in the computer's drives that can be supported by this SoftBoard.

Figure 4 (below) shows the demonstration of UGADraw – SoftBoard to perform illustrations (using standard mouse as the pointing device but not the required/appropriate pointing device).
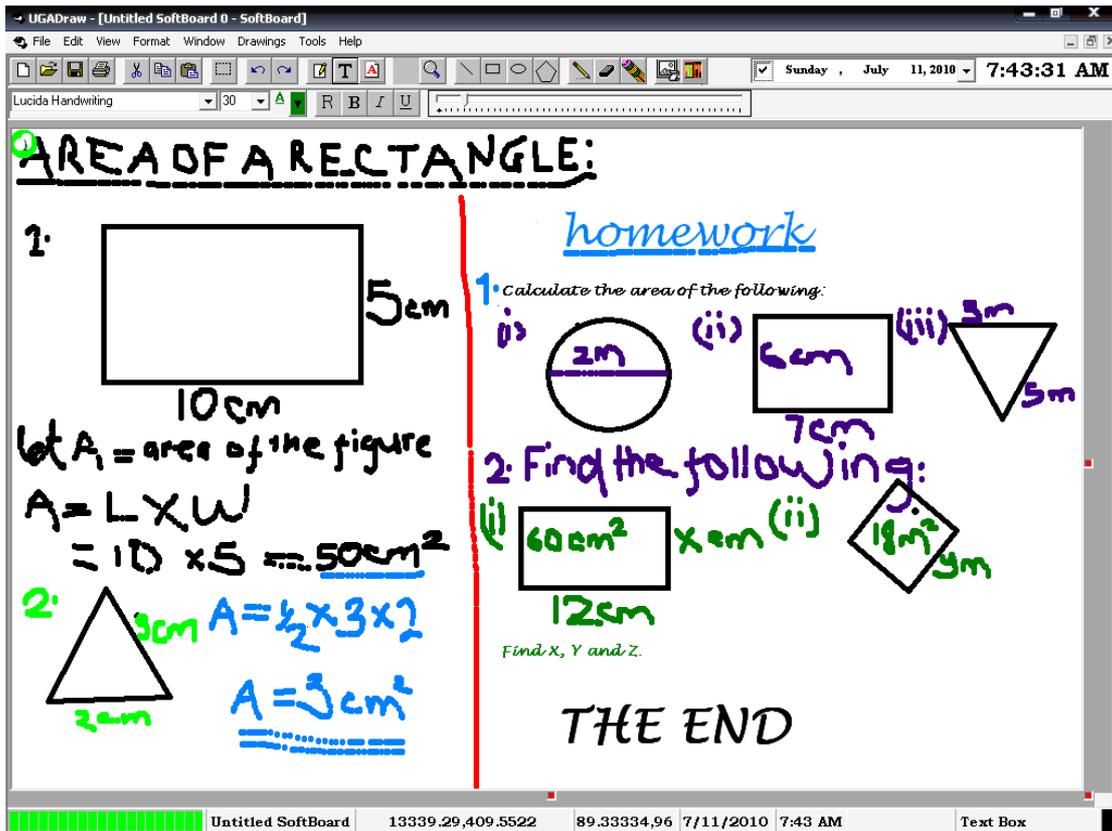
Figure 4: UGADraw – SoftBoard performing illustrations

UGADraw – ChartEditor

The UGADraw – ChartEditor provides a customisable interface that allows the user to form graphs or charts of different types. It has data sheet that is used for entering the data to be graphed. The Figure 5 (below) shows the screenshot of the demonstration of the UGADraw – ChartEditor to plot graphs and Charts of different flavours.
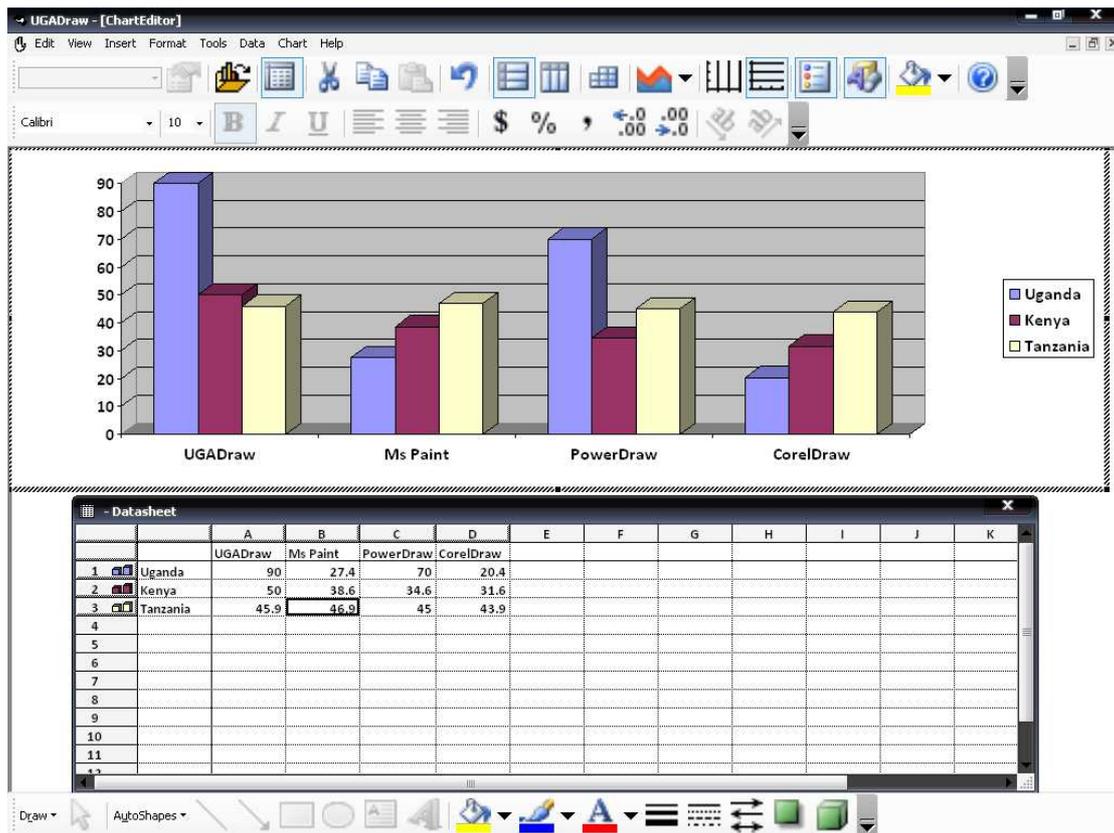
Figure 5: Screenshot of UGADraw - ChartEditor

This UGADraw – ChartEditor has a title bar that contains the main and sub-application name (when maximised), minimise, restore and close buttons for the main application.

The menu bar contains various menus for the chart including Edit, View, Insert, Format, Tools, Data, Chart and Help. When the sub-application is maximised, the menu bar also accommodates minimise, restore and close buttons for the sub-application.

The standard toolbar contains various options for the editing the chart such as cutting, copying, importing files, chart types, grids, axes, to mention that provide ease of use of the sub-application.

Whereas, the formatting toolbar contains options for formatting text to be put in the chart (or graph) and the text and/or figures in the datasheet.

This UGADraw – ChartEditor interface can be modified for other chart types and Diagrams as shown in Figure 6.
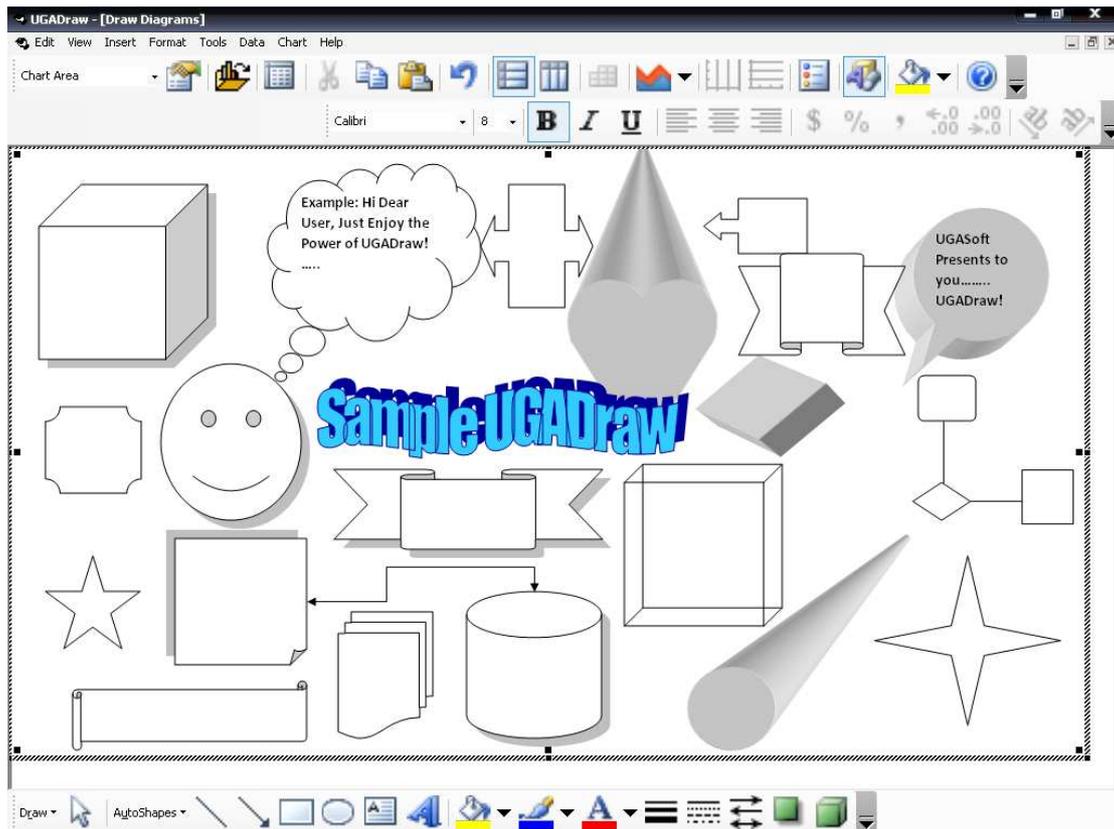
Figure 6: Screenshot of UGADraw – ChartEditor for Diagrams

Comparative Evaluation

The UGADraw system was evaluated with some other existing applications such as Ms Paint, CorelDraw, PowerDraw, among others to assess its quality using summative type of evaluation. The evaluation paradigm adopted for the assessments include 'Quick and dirty' and Predictive evaluation. 'Quick and Dirty' was used with some intended users such as teachers whereas predictive paradigm was used with some Computer Science students. Several usability goals were considered during the evaluation.

The Table below shows the summary of the comparative evaluation

Usability Goals	Related Tools			
	Ms Paint	CorelDraw	PowerDraw	UGADraw
Effectiveness	***	***	***	***
Efficiency	***	***	***	***
Safety	***	***	***	***
Utility	**	**	**	***

Learnability	**	*	*	***
Memorability	***	**	**	***
*** Strongly supported; ** Averagely supported; * Least supported				

Table 1: Comparative Evaluation

Conclusion

This paper discussed a teaching and learning application called UGADraw. It is a non distributed, offline software application that can be used by teachers, learners, instructors, among others. Major features of UGADraw include the provision of painting operations and tools in a local context to suit Ugandan educational needs, provision of an interface that can be used in a classroom environment as a visual aid by allowing free hand writing as well as sketching capability that allows work to be saved for future reference, and also provision of an interface that can be customised by the users to plot graphs, charts as well as diagrams such as data flow diagrams. Some applications of UGADraw include: classroom environment where it is used as a visual aid, and design of pictures for presentation purposes using applications such as Microsoft PowerPoint. UGADraw could also enhance electronic (e-) learning.

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