Open-Source Software Alternatives for Graphic Communications

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C M Y K

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Introduction

Graphic Communications programs across the spectrum of educational levels tend to vary considerably in terms of curriculum and facilities. However, software made by Adobe Systems Incorporated, San Jose, CA, seems to be a constant across programs. SEC filings indicate that Adobe Systems Inc. generated revenues of $5.85 billion in fiscal year 2016, representing 22 percent year-over-year growth ("Adobe Reports," 2016). The use of Adobe software in creative and production processes has become standard across the graphic communications industry, with the majority of employers looking to hire graduates with Adobe software experience.

The cost of Adobe Systems Inc. software to educational programs is significant. Anecdotally, the authors believe that Adobe absorbs the largest portion of most graphic communications program budgets. Adobe does not offer free licensing to educational institutions as many major graphic communications software vendors do (AutoDesk, Inc. is a notable example, AutoDesk, 2017). Rather, Adobe offers various educational pricing programs, some at the institution level and down to the individual educator level. Year 2017 published rates for a one year contract for one Adobe Creative Cloud license is $240.00. As a means of perspective, the authors of this research have a 24 workstation lab, with 2 additional instructor workstations. The annual cost of Adobe software for this program in 2017 was $5,625.00, the single largest program budgetary expense behind faculty salaries. Student versions of the software are similarly priced, with Adobe Systems Inc. marketing their products to students.

With the backdrop of rising operational costs for program administration, and tight resources for programs at all levels of the educational spectrum, the authors were compelled to investigate alternatives to Adobe Systems Inc. software that might be suitable for graphic communications programs. The specific focus of this research was to investigate specific software skill sets that graphic communications students need to develop, and whether free and open-source software alternatives to Adobe Systems Inc. software might be used to teach these skills.

Literature review

To investigate the usefulness of free and open-source software solutions for graphic communications education, literature was reviewed to help clarify what baseline of software-related graphic communication skillsets need to be taught. The authors focused on only more recent sources, as software-related graphics skills change and evolve so quickly.

A study by Bridges (2016) utilized a modified Delphi Technique to rank graphic design-related competencies on a Likert scale. These competencies were broken down into two sections: First, the most needed graphic

design skills and content knowledge and second, the most needed graphic design tools. The survey sampled eighteen university-level graphic design educators and twenty-five graphic communications industry professionals. The top ten most critical skillsets determined by the research included applying basic principles of graphic design and exhibiting strong interpersonal skills. It is notable that each of the top ten skillsets were soft skills that could be developed in students in a variety of ways and with various tools. However, the study also investigated the specific tools recommended. The brand name software, Adobe Creative Suite (Now Adobe Creative Cloud), was identified as the most necessary tool for an effective college-level graphic design program (Bridges, 2016).

We also reviewed graphic communications-related accreditation standards for evidence of software-vendor specific skillsets. The Accrediting Council for Collegiate Graphic Communications (ACCGC) accredits college-level programs, but is entirely non-prescriptive in its standards. Because of this, the standards do not define for accreditation any specific software-vendor skillsets required. Rather, the educators are required to develop a customized program-specific set of skillsets with input from industry and advisory board (ACCGC, 2017).

By contrast, PrintEd accreditation (PrintEd, 2017), designed for both high school and community college technical programs, is highly prescriptive and provides great detail on very specific skillsets required. As of this writing the standards were last updated in 2014, and PrintEd included six accreditation areas: *Digital File Preparation and Output; Digital Production Printing; Graphic Design; Introduction to Graphic Communications; Offset Press Operations/Bindery & Finishing; and Screen Printing*. Each was defined by a set of Graphic Communications Skills Competencies (GCSC). While the *Graphic Design* accreditation area does not specify specific software requirements, the *Introduction to Graphic Communications* area does specify the following:

Review professional software applications

    a. Page Layout, i.e. Adobe InDesign, QuarkXPress

    b. Image Editing, i.e. Adobe PhotoShop

    c. Illustration, i.e. Adobe Illustrator

Since "i.e." has a latin meaning of "id est", which means specifically, "that is," we can assume that these specific software packages are required to be taught in order to achieve accreditation. However, this stipulation may not have been the intent of the framers of the GCSC.

Also reviewed were National Association of Schools of Art and Design (NASAD) accreditation standards for college-level programs (NASAD Handbook, 2016). NASAD accreditation is for fine arts-oriented graphic design programs and is somewhat prescriptive in that the standards specify skillsets to be taught by accredited programs. With NASAD, there were no specific software identified. However, curricular standards for Digital Media programs include the following standard related to software skills:

> "*Understand of the characteristics and capabilities of various technologies (hardware and software); their appropriateness for particular expressive, functional, and strategic applications; their positions within larger contexts and systems; and their influences on individuals and society*".

Job descriptions for industry related positions were also investigated. Reviewed were a variety of published job description examples posted in the Human Resource segment of the Printing Industries of America (PIA) website. (Printing.org, 2017) These positions included: Graphic Designer; Preflight Technician; Graphic Services Coordinator; and Color Manager. All position descriptions reviewed included required vendor-specific experience in one or more Adobe System Inc. software applications, including Adobe Photoshop, Adobe Illustrator, Adobe InDesign, and/or Adobe Premiere. (Printing.org, 2017)

Our literature review also focused on Adobe's own certification exam requirements and the key skills the framers of the exam considered necessary for those exhibiting proficiency in graphic communications subject areas. We reviewed the Adobe Certified Associate (ACA) program exam objectives, which allows individuals to demonstrate basic proficiency in graphic communications subject areas using Adobe's digital media tools (Adobe Certified, 2017). Adobe also offers an Adobe Certified Expert (ACE) program, which demonstrates a professional-level expertise in various Adobe programs (Adobe Certification, 2017). The objectives for the ACA-level certification for Adobe Photoshop, Adobe InDesign, Adobe Illustrator, and Adobe Premier are shown in Table 1. The ACA exam costed $105.00 in 2017 and was administered through Certiport, Inc. (2017), an on-line

testing company. The exams take about one hour and are a combination of multiple-choice questions on soft skills, and hands-on testing with the Adobe software application simulated through a specialized web browser.

Note that the objectives for ACA certification are written in a broad way, and do not denote software-specific functions. Rather, they are skillsets within visual communications, digital media, print media, and graphic design that could potentially be accomplished with a variety of software. However to pass the exam, basic familiarity with the Adobe-specific software menus and functions are required.

Table 1: Adobe ACA Certification Knowledge Objectives		
Photoshop (Visual Communication Using Adobe Photoshop)	**InDesign** (Print & Digital Media Publication Using Adobe InDesign)	**Illustrator** (Graphic Design & Illustration Using Adobe Illustrator)
Demonstrate knowledge of layers and masks	Demonstrate an understanding of and select the appropriate features and options required to manage colors.	Demonstrate knowledge of how to create documents
Demonstrate knowledge of importing, exporting, organizing, and saving.	Demonstrate knowledge of layers.	Demonstrate knowledge of how to use drawing and shape tools.
Demonstrate knowledge of producing and reusing images.	Demonstrate knowledge of exporting, packaging, saving, and organizing files.	Demonstrate knowledge of how to use type tools.
Demonstrate an understanding of and select the appropriate features and options required to implement a color management workflow.	Demonstrate knowledge of how to create multiple-page documents.	Demonstrate knowledge of how to use scanned or photographic images.
Demonstrate knowledge of working with selections.	Demonstrate knowledge of how to use styles.	Demonstrate the ability to create realistic graphics.
Use Photoshop guides and rulers.	Demonstrate knowledge of how to use frames in a page layout.	Demonstrate knowledge of how to modify and transform objects.
Transform images.	Add text to a page layout.	Demonstrate an understanding of and select the appropriate features and options required to manage color, pattern, and gradient swatches.
Adjust or correct the tonal range, color, or distortions of an image.	Add graphic, image, and video content to a page layout.	Demonstrate an understanding of vector drawing concepts.
Demonstrate knowledge of retouching and blending images.	Demonstrate knowledge of how to create special page elements using InDesign tools.	Demonstrate knowledge of how to work with brushes, symbols, graphic styles, and patterns.
Demonstrate knowledge of drawing and painting.	Demonstrate knowledge of how to add interactive elements using InDesign tools.	Import, export, and save files.
Demonstrate knowledge of type.	Demonstrate knowledge of how to prepare page layouts for publishing to print.	Demonstrate knowledge of layers and masks.
Demonstrate knowledge of filters.	Demonstrate knowledge of how to prepare page layouts for export to multiscreen devices.	
Demonstrate knowledge of preparing images for web, print, and video.		

Research Problem

The objective of this study was to determine the viability of open-source alternatives to Adobe Systems Inc. software for use by graphic communications educators. The specific focus of this research was to investigate specific software skill sets that graphic communications students need to develop, and to provide guidance about whether free and open-source software alternatives to Adobe Systems, Inc. software might be used to teach these skills in graphic communications programs.

Methodology

Open-source software is generally provided to users with a Copyleft License, allowing the user to employ the software for general use without compensation to the developer(s). The software is typically developed by multiple coders, and allows users to freely view, copy, alter, or share the source code (What is Open Source, 2017). Open source licensing is different from proprietary software copyright licensing, where the software developer has exclusive control and a business model for generating revenue from the license. There were several parameters for the software selected for our research. It had to be open source, with regular version updates over the past several years, positive on-line reviews, multiple platform compatibility, and no fees required for publishing work created with the software. The open-source software analyzed in this study included:

1. **Gimp,** an open-source, image editing program with functions similar to Adobe Photoshop. Gimp is compatible with Mac OS X and Windows. (gimp. org, 2017)

2. **Inkscape,** an open-source illustration and vector-editing program with functions similar to Adobe Illustrator. Inkscape is compatible with Mac OS X and Windows (inkscape.org, 2017)

3. **Scribus,** an open-source page layout program with functions similar to Adobe InDesign. Scribus is compatible with both Mac OS X and Windows. (scribus. net, 2017)

Each of these programs was compared to its Adobe Systems Inc. counterpart. The Adobe Certification Associate (ACA) objectives are well defined, and provide a comprehensive benchmark for required skillsets in each category of software. With the ACA objectives as a backdrop, we investigated each open source alternative to determine whether the functions existed in the software applications to teach students the certification objectives.

Each software application was downloaded to a Macintosh OS X workstation for review alongside the Adobe Creative Cloud application. The same files and documents were created on both compared software applications. As functions were explored, notes were made on which functions of the open source software were compatible with Adobe Systems Inc. software and where shortfalls existed.

Findings

The tables below show the Adobe certification exam objectives in the context of each free and open-source software. Any items not actionable or severely limited within these programs have been noted with a "no." Note that Table 2 defines image editing skills in the exam entitled, "Visual Communication Using Adobe Photoshop." Our review examined Gimp and Photoshop functions in light of the knowledge objectives.

To analyze image editing software, key functions can be divided into (a) color modes and color channels, (b) selections and masking, (c) layers, (d) managing color and display simulation, and (d) importing & exporting file formats. From these basics, editing functions like color correction, compositing, and advanced color editing can be accomplished. Adobe Photoshop has extensive toolsets for all of these functions. Gimp has many similarities to Adobe Photoshop and allows for the use of core image editing competencies. Gimp users are able to create layers, make selections and masks, view and edit channels, utilize a color management workflow, and export to various file formats (GIF, JPEG, PNG, TIFF, MNG). Also included are many useful filters for special effects. Color adjustment is available via several tools: color balance, hue saturation, brightness contrast, levels, curves, and threshold. Images may also be scaled with the option to adjust resolution and the interpolation style. The user interface is similar to Adobe Photoshop, with many of the same tools, menu items, and similar iconography (see Figure 1). The researchers had little trouble learning the basic tools and editing and compositing an image in Gimp.

Table 2: Gimp for ACA Exam: Visual Communication Using Adobe Photoshop	
ACA Exam Objective	Actionable by Gimp: Yes or No
Demonstrate knowledge of layers and masks	Yes
Demonstrate knowledge of importing, exporting, organizing, and saving.	Yes
Demonstrate an understanding of and select the appropriate features and options required to implement a color management workflow.	Yes
Demonstrate knowledge of working with selections.	Yes
Use Photoshop guides and rulers.	Yes
Transform images.	Yes
Adjust or correct the tonal range, color, or distortions of an image.	Yes
Demonstrate knowledge of retouching and blending images.	Yes
Demonstrate knowledge of drawing and painting.	Yes
Demonstrate knowledge of type.	Yes
Demonstrate knowledge of filters.	Yes
Demonstrate knowledge of preparing images for web, print, and video.	Yes

Note that Table 3 defines illustration skills in the ACA exam entitled, "Graphic Design & Illustration Using Adobe Illustrator." Our review examined Inkscape and Adobe Illustrator functions in light of the knowledge objectives. Based on the researcher's experience, basic functions of illustration and vector editing software can be analyzed into (a) path and object creation and transformation, (b) flat and gradient color control, (c) layering, (d) bitmap image modeling and conversion, (e) typographic functions, and (f) importing and exporting file formats.

Inkscape has many of the same basic functions as Adobe Illustrator, with the ability to create and edit vector shapes in a variety of ways. Like the other open source

Table 3: Inkscape for ACA Exam: Graphic Design & Illustration Using Adobe Illustrator	
Exam Objective	Actionable by Inkscape: Yes or No
Demonstrate knowledge of how to create documents	Yes
Demonstrate knowledge of how to use drawing and shape tools.	Yes
Demonstrate knowledge of how to use type tools.	Yes
Demonstrate knowledge of how to use scanned or photographic images.	Yes
Demonstrate the ability to create realistic graphics.	Yes
Demonstrate knowledge of how to modify and transform objects.	Yes
Demonstrate an understanding of and select the appropriate features and options required to manage color pattern, and gradient swatches.	Yes
Demonstrate an understanding of vector drawing concepts.	Yes
Demonstrate knowledge of how to work with brushes, symbols, graphic styles, and patterns.	Yes
Import, export, and save files.	Yes
Demonstrate knowledge of layers and masks.	Yes, layers
No, masks	

Figure 1: The Gimp interface with an image selection and channel box.

software examined, Inkscape's workspace is considerably different than Adobe Illustrator, with only a few similarities in terms of tool placement and iconography. That said, the software interface was clean and well organized. The researchers found that Inkscape was more time intensive to learn than Gimp.

With Inkscape, users are able to create vector objects with the pen tool (bezier curves) and place and edit preset geometric and non-geometric shapes. These object paths may also be manipulated through a union, difference, intersection, exclusion, division, cut path, combine, and/or break apart action. A type tool is available with useful typographic formatting options, and users have the option to convert text to outlines. In terms of color, there is no option to create new swatches and colors are added based on hexadecimal/RGB color space, however, users have the option of installing GIMP palettes. There is a useful preferences dialog box for color management and display simulation of CMYK. Inkscape includes robust layer support. Inkscape can import Adobe Illustrator documents and a variety of other formats and export documents as PNG, SVG, SVGZ, PDF, EPS, LaTeX, POVRay, HPGL.

Note that Table 4 defines page layout skills in the ACA exam entitled, "Print & Digital Media Publication Using Adobe InDesign." Our review examined Scribus and Adobe InDesign functions in light of the knowledge objectives. To master the functions of page layout software, skills must be developed in the areas of page formats,
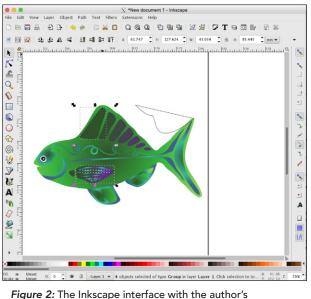

Figure 2: The Inkscape interface with the author's illustration showing path selections.

master pages; content frames, layers and transparency; paragraph and character styles; typographic functions; page imposition, bleed assignment; spot colors and registration black; vector tools; font management; preflighting; exporting various PDF standards with printer's marks; as well as color management functions. Adobe InDesign has all of these functions.

The researchers examined these functions in Scribus while laying out a somewhat complex multipage document (see Figure 3). Having worked extensively with Adobe InDesign, it did take the researchers time and effort to become acclimated to the Scribus interface. However, the basic process of developing a layout in Scribus is similar Adobe InDesign.

Table 4: Scribus for ACA Exam: Print & Digital Media Publication Using Adobe InDesign	
ACA Exam Objective	Actionable by Scribus: Yes or No
Demonstrate an understanding of and select the appropriate features and options required to manage colors.	Yes
Demonstrate knowledge of layers.	Yes
Demonstrate knowledge of exporting, packaging, saving, and organizing files.	Yes
Demonstrate knowledge of how to create multiple-page documents.	Yes
Demonstrate knowledge of how to use styles.	Yes
Demonstrate knowledge of how to use frames in a page layout.	Yes
Add text to a page layout.	Yes
Add graphic, image, and video content to a page layout.	Yes, static graphics
No, video	
Demonstrate knowledge of how to create special page elements using InDesign tools.	No
Demonstrate knowledge of how to add interactive elements using InDesign tools.	No
Demonstrate knowledge of how to prepare page layouts for publishing to print.	Yes
Demonstrate knowledge of how to prepare page layouts for export to multiscreen devices.	No

Scribus allowed straight forward creation of new document formats, master pages, layers, and text and image frames. Gimp offered excellent typographic formatting options, with font management if font substitutions or additional paths need to be edited. Typesetting automation with paragraph styles and character styles was simple to master.

Since Pantone, Inc. charges a licensing fee and Scribus is open source, Scribus lacks the preloaded Pantone color swatches that are part of Adobe InDesign. Instead, users can create a swatch in standard color spaces (RGB, CMYK, HSV) and then name the swatch as they chose, such as "PMS 186." This requires looking up the CMYK equivalent for the PMS build.

Unlike Adobe InDesign, Scribus does not support the creation of interactive digital formats with the latest version. Therefore no interactive elements are available and so exporting HTML, epub or Interactive PDF formats is not possible. Files formats for export from Scribus include: PDF, EPS, JPEG, PNG, TIFF, and XPM. For the most part users can go through a similar file export process to file packaging in InDesign. Here, users may prepare a compressed project folder with associated files; a much more basic approach compared to Adobe InDesign. Pre-press may be addressed, with the option to adjusting bleeds and overprinting. Color management is similar to other software applications and display proofs were made without difficulty. Printer's marks can be added to output files. PDFs may also be manipulated according to the PDF box model (i.e. trimbox, bleedbox, etc.).
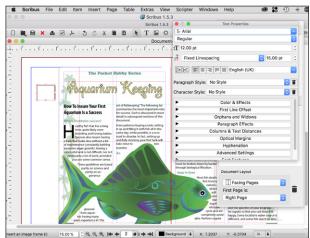

Figure 3. The Scribus 1.5.3 interface with the author's page layout. Functions shown include the Document Layout pallet and the Text Properties pallet.

Recommendations & Conclusion

This research was intended to provide insight into the viability of teaching open source software as an alternative to Adobe Systems Inc. software. The study was initiated due to the high cost of Adobe systems Inc. software for educational programs that often have limited budgets. It is assumed that the vast majority, if not all graphic communications instruction will continue to use Adobe software to teach photo editing, illustration, and page layout. However, in extreme cases, where funding is not available, open-source software may be considered to be used as a replacement. However, this could put these students at a significant disadvantage, even though the student may have been taught very high level skills.

Could an educator prepare students for the ACA exam with open source software?

In theory, the researchers believe that the open source software alternatives studied in this paper could be used to teach almost all of the knowledge objectives in the three ACA exams reviewed. General knowledge, such as project management, file management, font management, image types and resolution, file formats, color spaces, page formats, and typography can all be taught without the use of software. For hands-on skill development the open-source alternatives studied in this paper have very similar functions to Adobe Systems, Inc. software. Specifically, Gimp and Inkscape allow for the same skillsets to be developed as intimated by the knowledge requirements in the Adobe Certified Associate exam. Scribus had most of the functions of Adobe InDesign, lacking only the interactive features. While the software studied have similar functions, without experience with the Adobe workspace, menus and pallet system, an exam taker would be unlikely to pass the ACA exam.

Let us imagine that an educator had no funding for software and was challenged to teach her students with the open source software to prepare them for the ACA exams, one option would be to use the open source alternatives for skill building projects, and then to use the trial versions of the Adobe Systems Inc. software to transferring skills, familiarizing students with the Adobe Software Inc. workspace. Up until 2016, Adobe provided 30-day trial periods for their software. This changed in 2017, with Adobe shortening the trial period to 14 days. This increases the challenge of software skill transfer.

Barriers to using open source software in the classroom.

Anecdotally, it seems to the researchers that most people, including teachers, are averse to learning multiple software for the same application. Once a person masters a word processing application like Microsoft Word, she is unlikely to be motivated to learn another unless it is absolutely necessary. This is particularly true of most students, who are already challenged with learning the general knowledge that surrounds the use of sophisticated software applications. What often occurs is that frustration arises when a similar application has a differences in menus or nomenclature. Consider the frustration people often exhibit when moving from a Windows OS to a Macintosh OS (or vice versa)

Adobe Systems Inc. software are immersed in the education and industry work culture of graphic design and premedia. As covered in the literature review, job descriptions often cite the need to skills in specific software. It is more likely for the description to cite "Adobe InDesign," than "Page Layout Software." Further, if a soon-to-be graduate adds "Gimp" and "Inkscape" to his resume, but an employer is looking for experience with Photoshop and Illustrator, the student is likely to appear to be less qualified. Add to this that many colleges have course titles in the catalog that includes the Adobe Systems Inc. software name, such as "Introduction to Adobe Illustrator," rather than a generic "Introduction to Illustration Software."

The present and future of Adobe Software Inc. software application alternatives.

While this research focused on just three open source applications, there are quite a few other free applications available for graphics work. Each new version seems to be better than the last. There are also cloud-based software alternatives (software run through a Web-browser and not installed on a workstation). Examples include pixlr.com for image editing and vectr.com for illustration, both free to use. Sophisticated cloud-based page layout software is also available, though for pay. Examples include chili-publish.com and EFI's SmartCanvas, which is accessible through their Digital Storefront CMS. It is conceivable that a time may soon come when Adobe Systems Inc. software losses some of its exclusiveness. Should this happen, Adobe may be more willing to reconsider its approach to the education community as a revenue-generating business model.

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Visual Communications Journal Submissions Guidelines

Manuscript Form and Style

» Prepare manuscripts according to the APA style, including the reference list.

» List your name and address on the first page only. Article text should begin on the second page.

» Provide a short biography for yourself that can be used if the article is accepted for publication.

» All articles must be submitted in electronic form on a CD-ROM or as an email attachment.

» Submit a Microsoft Word document, maximum of 10 pages (excluding figures, tables, illustrations, and photos). Do not submit documents created in page-layout programs.

» Word documents must have been proofread and be correct.

» Call out the approximate location of all tables and figures in the text. Use the default style "Normal" on these callouts. The call-outs will be removed by the designer.

» Use the default Word styles only. Our designer has set up the page layout program styles to correspond to those style names.

- Heading 1
- Heading 2
- Heading 3
- Normal

Graphics

» Be sure that submitted tables and other artwork are absolutely necessary for the article.

» Write a caption for each graphic, include captions in a list at the end of your Word document.

» Electronic artwork is preferred and should be in PDF or TIFF format.

» Send all artwork files and hard copies of these files with your submission.

Tables

» Set up tables in separate documents, one document for each table.

» Do not attempt to make it "pretty." Use the default Word style "Normal" for all table text. Do not use any other formatting.

» Do not use hard returns inside the table ("enter" or "return").

» Get the correct information into the correct cell and leave the formatting to the designer.

» Tables will be formatted by the designer to fit in one column (3.1667" wide) or across two columns (6.5" wide).

Artwork

» Scan photographs at 300 ppi resolution.

» Scan line drawings at 800 ppi resolution.

» Screen captures should be as large as possible.

» Graphics should be sized to fit in either one column or across two columns.

- One column is 3.1667" wide, two columns are 6.5" wide.
- Graphics may be larger than these dimensions, but must not be smaller.

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» Members of the Graphic Communications Education Association, or students of GCEA members, may publish in the *Visual Communications Journal.*

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