SIMON DWYER

Central Queensland University

RACHEL FRANKS

State Library of New South Wales; University of Newcastle

On Stage and Online: An examination of low-cost digital production tools for lighting, sound and stage management

ABSTRACT

Theatre practices are increasingly being based in a digital environment. With the advent of the Internet and ever more powerful laptop computers, tablets and other mobile devices digital technologies are rapidly replacing copious hard-copy binders of production information, faxes and parcels of couriered materials. This article examines the theoretical possibility of creating a suite of theatrical documentation in a digital format using accessible 'off-the-shelf' software. This tests the thesis that, despite an increasing reliance on digital technologies, a completely digital production process for three production departments (lighting, sound and stage management) is not yet possible. The article examines software suites to provide examples of products that are available as well as highlighting the current gaps in the market to encourage further research and development in this growing area.

KEYWORDS

lighting

production

sound

stage

management

theatre

INTRODUCTION

Theatre practices are increasingly being based in a digital environment. With the advent of the Internet and ever-more powerful laptop computers, tablets and other mobile devices digital technologies are rapidly replacing copious hard-copy binders of production information, faxes and parcels of couriered materials. This article examines the theoretical possibility of creating an entire suite of theatrical documentation for three production departments in a digital format using accessible 'off-the-shelf' software to support theatrical

contributions to popular culture. This tests the thesis that despite the increasing reliance on digital technologies, a completely digital production process is not yet possible.

The lighting, sound and stage management departments were selected as being representative elements that engage with various technologies as the production process progresses from initial concept to performance through to close and storage or archive. The significant advances and technological influences in the creation processes for costume, properties and scenery are acknowledged here but are not surveyed within this work. The staging department is also omitted from the research as software for automated flying systems falls outside the objective of examining low-cost 'off-the-shelf' applications.

For the purposes of this research 'low-cost' was defined as being less than AU$50, a sum that could reasonably be afforded by a range of early practitioners or those in education and community theatre working to deliver popular production titles. To provide a consistent hardware platform that was widely available in a standard configuration the Apple Macintosh was utilized. The survey also focused on software for the performance phase of a production so, as an example, composition applications were omitted from the results. With a focus on the performance phase, this article examines a number of software suites to provide examples of products that are available as well as highlight the current gaps in the market to encourage further research and development, in this growing area.

STAGE MANAGEMENT

The stage management department provides two important roles. First, it performs the vital secretariat function of the production, recording as much information as necessary to enable the coordination and delivery of the performances and any possible future seasons. Second, this department 'runs' the show through the calling of cues and is often looking after the properties and acting company.[1] The department can range from a single person on a small show through to four or more on a complex production.[2] For smaller productions, it is not uncommon to find the stage manager operating the sound or lighting activities in addition to their other duties.

The core artefact created by the stage management team is the prompt copy, sometimes known as the prompt book. Often stored in one or more ring binders, the prompt copy contains an annotated script detailing actors' movements, cues and other relevant information along with crew plots, design information and research notes.[3]

The research for this article did not uncover any applications which successfully provided a digital repository with the necessary functionality that could replicate or replace

the current collection, collation and dissemination of production information. There are perhaps two significant hurdles that prevent the transition, for this department, to a fully-digital workflow. First, the digitization of a complete script from a physical medium.[4] In Australia, this reproduction is likely to result in a breach of the *Copyright Act 1968* (Cth) (the *Act*) as the copying would reproduce more than an insubstantial part of the original work.[5] Copyright provides enforceable legal rights for an artist's original works and covers a wide range of creative outputs from written scripts and scores, through to drawings and sculptures.[6] It is not necessary but often the copyright mark (©) immediately followed by a year is placed on a work to identify that the material is subject to the *Act* (and to the principles of equity and the common law).

Despite a claim to copyright few published works overtly assert copyright. For instance, the works of an Australian author published before 1955 would be out of copyright under the current *Act* (s 33) unless the owner of the original works takes steps to extend the duration of copyright through elaborate legal arrangements. Yet, the 1984 Currency Press edition of *On Our Selection* (written by Bert Bailey and Edmund Duggan based on the novel of the same name, originally published in 1912) lists the following as copyright holders: 'Introduction copyright © Helen Musa 1984'; '"Dad and Dave in the Cinema" copyright © Andrew Pike 1984' and '*On Our Selection* copyright © Currency Press 1984'.[7] Small companies are unlikely to have the resources to retain legal counsel to navigate the complexities of copyright, and are even less likely to be able to defend a claim, should an issue of copyright infringement arise. It is, therefore, often easier to procure original copies of the script for the company to work from.

Second, for many productions, particularly musicals, the scripts or scores are only hired and therefore may not be readily available as formatted text in an electronic medium. Items that are available are often in secured formats suitable for e-reader applications and offer little opportunity to manipulate the text into a size and arrangement suitable for the prompt copy. If undeterred by the copyright issues noted here, attempts to scan or copy the physical text may damage the item and result in additional charges for its repair or replacement.

Furthermore, the creation of formatted text from a scan or copy is a significant economic and technical undertaking. Again, the issue returns to needing to reproduce a substantial part of a work for a theatre company to present a single performance or season of performances. It should be noted that allowances differ, under the *Act*, for reproduction for other uses such as research, study, criticism or review.[8]

It is also possible that the lack of a core application that replicates the functionality of the prompt book has been limited by available technology. The annotation of a script is a core function – pauses need to be marked, changes in text made, cues inserted, moved and deleted – often continuously in real time as the company works through the script. The advent of touch screens with a stylus is an advance towards replicating the functionality of paper, yet the speed and ease of use has yet to match that of the physical artefact. One area in which digital can excel in this space is in version control; each action can be logged and timestamped to record the development of the prompt script as rehearsals progress. This leads us to consider that if the ideal application that provides all the functionality necessary for the stage manager's role is not available, what options do exist?

In rehearsal, the stage management team coordinates the various appointments for wardrobe fittings, voice and singing coaching, fight or dance chorography in addition to the acting calls for the company. Traditionally these are posted on a noticeboard in or near the rehearsal space. EmptySpace Technology offers a web-based solution called VirtualCallboard. Based around a calendar, the software allows the scheduling and notification of calls by email, or the website, to the company. Additionally, the system facilitates attendance tracking and reporting if that functionality is required by the organization.[9]

In addition to performance-specific applications, stage managers can adapt the vast array of calculators, converters, metronomes, timers and reference tools that are published for a wide range of industries often at no or low cost. With the combination of applications that exist it is possible to document the production and its requirements in a digital format, albeit with challenges in consolidating that information in a readily retrievable way that complies with the current legal framework for artistic works.

LIGHTING

Lighting designers and technicians have long been early adopters of technology.[10] The first computerized lighting fixtures and controls appeared in the 1970s and are commonplace today.[11] High levels of familiarity with computing and networking technologies has allowed lighting teams to take advantage of the largest number of options for a fully-digital workflow.

On a small production, the stage manager can be the only crew member, operating lights and sound in addition to their other duties. [12] One multifunction application that can provide a single interface to control the lighting, sound and video is QLab which is offered in two modes, as a daily rental (often referred to as software as a service or SaS) or as an

outright purchase. This flexibility allows for a company to pay for a larger package to prepare the show using all the features of the product and then use the free version to operate a simple show or a lower-cost version only on performance days. The licensing options are particularly flexible with a single licence allowing for the operating computer, a backup and an editing station for the single fee. A rental licence can be for any number of days which do not have to be consecutive, facilitating travel and non-performance days.

QLab provides a unified cue list from which changes in the sound, lighting, video or any combination of these to be replayed. One of most useful features of the cue list for stage management is that the cues can be labelled using any unique text string, thus preshow music can be labelled as such, rather than having a start point of 'one' and then using whole number increments. As well as labelling cues, there are free text fields for a description and notes to annotate each cue with useful information such as execution point, version or original source material. The interface is simply laid out using a large 'go' button on screen or the space bar to trigger a single cue or series of linked cues. There are other suites of lighting-specific, interoperable applications such as LX Series which incorporates a design tool (LXBeams) to layout, document and then report various data sets necessary for the realization of the design. A second tool (LXConsole) is then used to create, edit and play lighting cues via a low-cost interface or directly through the computer's Ethernet connection.

Other applications address a single element of the lighting design such as the plotting and replay of cues. Examples of this include D:Light, Footlight and QLC+. Despite being freeware, these applications offer a level of functionality similar to some expensive, paid options. These can be complemented with drawing and documentation applications that focus on lighting design such as Drafty or more general drawing programmes such as SketchUp or FreeCAD.

Similar to the situation for the stage management department, there is not a single application for lighting that provides a unified workflow from design concept to post-production archiving. Through the deployment of a number of individual applications a digital workflow can be achieved. For instance, the theatre plan can be imported from a FreeCAD file and the lighting design can be superimposed and documented in LXBeams before the performance states recorded and replayed using QLab. This use of multiple applications somewhat replicates a traditional 'analogue' approach where designs were recorded on paper before being manually replayed each performance, yet allows considerable flexibility, especially when collaborating with other members of the creative team.

SOUND

Audio production was one of the first mainstream users of fully-digital workflows with the advent of compact disks in the early 1980s.[13] Modern computing combined the ready availability of high-quality royalty and public domain sound effects, incidental music and backgrounds. Over time, the resources available to the sound designer have increased immensely.

Included with every Apple computer is an audio mixing application (GarageBand) with additional products tailored to live music production (MainStage) and studio recording (Logic Pro) available for purchase, with the former an affordable add-on, the latter such a significant investment that it falls outside the scope of this article. The base-level consumer product provides multitrack mixing to a single stereo track. There are numerous inbuilt effects and a note pad for annotating tracks as a recording session occurs. As a consumer product, there are several limitations, some of which may affect its application to theatre. MP3 files cannot be used as a source, possibly due to their early adoption as a format for pirated music. Another limitation is that MIDI support is limited.[14] For performances that require a high degree of technical coordination or a single stage manager/operator this possibly renders the product unsuitable.

Two alternative products are Macs Cue and Audacity. Audacity has a simple polished interface and overcomes the file type limitations previously discussed with the capability to processes common MPEG-1 Part 3 (MP3) and Waveform Audio (WAV) files.[15] It is, however, more suited to sound production than live mixing for a performance. The application can add fades, pan output and add effects from the built-in generator to existing files or create new files from a USB or Thunderbolt interface or utilise the existing microphone or line input. Should any of the 62 built-in effects not meet a production's requirements, the capability can be expended through third-party plug-ins.

Macs Cues provides both a mixing capability and playback via a cue sheet. Although lacking interfaces to other devices and the polished appearance of QLab, the application does have the ability to insert pauses between cues and link cues which is useful for scene changes where incidental music plays before a background effect. The interface is able to hide the edit functions which is important in performance mode, along with a free text field which can be used to add notes on the effect or the cue point and necessary operator actions. As with the Apple products, the number of supported file types is limited.

Like other departments, although there is not a single application that can facilitate the entire workflow in a digital environment, the production requirements could still be managed

in a fully-digital workflow. Most source sounds and effects are available in a digital format which can be edited and transformed to the specific requirements of the production without having to be transferred to an analogue medium for replay during a performance. The necessary cue sheets and recording information can all be collated in either a spreadsheet or word processing document using LibreOffice or OpenOffice.

MAINTAINING THE DIGITAL ARTEFACT – THE 3:2:1 RULE

As an artefact, digital production information is more ephemeral than paper. Files can easily be deleted, USB keys lost and data corrupted during transmission. Thus, in moving to a digital platform, the accessibility and maintenance of records created in preparation for a performance, and indeed for a life either as part of an archive or a production that may be remounted, requires consideration. Applications become depreciated. Hardware and technologies evolve. These changes can render what was once readily accessible information into a string of binary code that is no longer usable.

While less physical space is required, the digital footprint can be quite substantial. Peter Krogh was the first to propose the 3:2:1 rule.[16] The rule has gained widespread acceptance and simply states that an item should be stored in three different places in at least two different mediums and in one offsite location.[17] Cloud storage solutions (such as Dropbox, Google Drive and OneDrive) are relatively inexpensive and meet these criteria which can be combined with an offline hard drive stored at a secure location in addition to any 'working' copies of the data.

The use of cloud computing brings with it an additional consideration of personal security. The prompt copy contains a wide range of highly confidential personal and financial information. It is much easier to secure and vet access to physical files than it is for digital information. Furthermore, the use of these services, provided by large multinational corporations are not governed by Australian privacy provisions or guidelines and can be subject to scrutiny by unknown agents.[18] Encryption of files provides limited protection against a determined attack.

Storage of digital information is as much a space issue as retaining physical items. Most companies have a limit on the size of a file that can be stored ranging from as little as 250MB (such as a reasonable drawing file) to several terabytes (the source and final sound files for example). The storage and use of such large files will also necessitate a good high-speed Internet connection which may not be accessible or affordable.

Creation and maintenance of production documentation need not be binary. For

instance, there is a continuum ranging from a fully-digital archive that may be used by the sound department, a mixture of printed and accessible hard-copy records with some items only being available in a digital format such as what the lighting team's records through to a full hard-copy record at the opposite end for the stage management department. Often what is possible is shaped by both budget and available resources of the producing company and indeed the creative team.

CONCLUSION

The digital environment that has readily been adopted in the production departments of theatre companies has not been sufficiently serviced through the creation of specialist applications that support a complete workflow. As a result, practitioners adopt several general applications to create, analyse, report and document a production through the various phases from rehearsal to performance and beyond. Such tools do offer significant cost savings to, especially smaller, theatre companies in the presentation of popular stage titles, facilitating community engagement through more productions and more affordable ticket prices thus making popular culture more popular through greater accessibility.

The stage manager relies on a range of standard office productivity software to create the prompt book compared with the lighting department that has an extensive array of documentation tools (even if these are not tightly integrated to form a complete end-to-end digital workflow), from the first design concepts through to the executed cues on stage during performance. The sound department often starts with a digital artefact in the form of special effects or incidental music which are worked with and transformed into a final composition for performance. As with stage management and lighting, cue sheets and other necessary records of the creation process and subsequent performance of the sound takes place using standard office productivity applications.

There are some drawbacks to using the free or low-cost software examined in this article. The coding is often undertaken by individuals as a hobby or as part of a larger project. Consequently, there is often minimal support and, significantly, the risk that the software will not be maintained in the long term. Similarly, as 'boutique' applications there is limited cross compatibility such that if support finishes the data cannot always be moved into another application. This article also noted the challenges in archiving digital materials for later use and, in particular, the security of personal and financial information relating not only to the organization but also its staff.

Technology certainly has made the production process more efficient and improved

the ability to share information, collaborate on design and corroborate the outcomes of difficult technical issues in all phases of a production. While the hardware and underlying connectivity is almost universally accepted, the software that will enable maximum use of these technologies is still being developed and represents an opportunity for further research and prototyping.

ACKNOWLEDGEMENTS

REFRENCES

[1] See Peter Maccoy, *Essentials of Stage Management*, 2nd ed. (London: A & C Black, 2004), 10-18; and Thomas Kelly, *The Backstage Guide to Stage Management* (Backstage Books: New York, 1999), 17-21.

[2] Maccoy, 4.

[3] Maccoy, 87; and Daniel Ionazzi, *The Stage Management Handbook* (Cincinnati: Betterway Books, 1992), 33-35, 44-45.

[4] It should be noted that there is also a broader issue of rights which is not examined in this article. For instance, if a script is specifically commissioned and thus 'owned' by the production company the copying of a script may be permitted. This article is examining the issue from the position of a community or education setting where a piece is performed under licence by an agent of the script's original author.

[5] Australian Copyright Council, 'Permission: Do I Need It?', http://www.copyright.org.au/acc_prod/ACC/Information_Sheets/Permission__Do_I_Need_it_.aspx.

[6] *Copyright Act 1968* (Cth) Part 2, Division 1; and The Arts Law Centre, 'Copyright,' https://www.artslaw.com.au/info-sheets/info-sheet/copyright/.

[7] Bert Bailey and Edmund Duggan, *On Our Selection* (1912; repr., Sydney: Currency Press, 1984).

[8] *Copyright Act 1968* (Cth) ss 40-43.

[9] The research did locate several similar applications which were specifically tailored for the needs of film and new media call. To maintain the focus on community or education settings they have not been further examined in this article.

[10] Richard Pilbrow, *Stage Lighting Design: The Art, the Craft, the Life* (New York: Design Press, 1997), 165.

[11] Simon Dwyer, "Lighting as Facilitator of the Theatrical Transaction," *TEXT* Special Issue 34 (2016): 1-17, http://www.textjournal.com.au/speciss/issue34/Dwyer.pdf.

[12] Soozie Copley and Philippa Killner, *Stage Management: A Practical Guide* (Ramsbury: The Crowood Press, 2001), 10.

[13] See Thomas Fine, "The Dawn of Commercial Digital Recording," *ARSC Journal* 39, no. 1 (2008): 1-17.

[14] MIDI (Musical Instrument Digital Interface) is an industry protocol that facilities communication between electronic musical instruments, computers and other audio devices.

[15] MPEG (Moving Picture Experts Group) is an organization that sets standards for digital audio and video and related data.

[16] Peter Krogh, *The DAM Book: Digital Asset Management for Photographers,* 2nd ed. (Sebastopol: O'Reilly Media, 2009), 207.

[17] A search using Google for "3 2 1 Rule" on 1 September 2017 returned around 20,400,000 results with the same search term in Bing returning 2,210,000,000 results. The first ten pages of results directly referenced the rule as a backup methodology indicating widespread acceptance of this practice.

[18] Office of the Australian Information Commissioner, 'Privacy Fact Sheet 17: Australian Privacy Principles,' https://www.oaic.gov.au/individuals/privacy-fact-sheets/general/privacy-fact-sheet-17-australian-privacy-principles.

SOFTWARE LINKS

Audacity	http://www.audacityteam.org/
D:Light	http://www.getdlight.com/index.php/en/
Drafty	https://drafty-app.com/
Dropbox	https://www.dropbox.com/
Footlight	http://footlight.harryshamansky.com/
FreeCAD	http://www.freecadweb.org/
GarageBand	http://www.apple.com/au/mac/garageband/
Google Drive	https://www.google.com.au/drive/
LibreOffice	https://www.libreoffice.org/
Logic Pro	http://www.apple.com/au/logic-pro/
LX Series	http://lx.claudeheintzdesign.com/
Macs Cue	http://www.clgizmos.com/macscue/index.html
MainStage	http://www.apple.com/au/mainstage/
OneDrive	https://onedrive.live.com/about/en-au/
OpenOffice	https://www.openoffice.org/
QLAB	https://figure53.com/qlab/
QLC+	http://www.qlcplus.org/
SketchUp	http://www.sketchup.com/
VirtualCallboard	http://www.virtualcallboard.com/

CONTRIBUTOR DETAILS

Simon Dwyer has over twenty years of experience working in many technical and production roles in the entertainment industry across Australia and New Zealand. He is currently a doctoral candidate at Central Queensland University examining the theatricality of the lighting of the Sydney Opera House. Simon has presented original research in the creative

industries at numerous conferences and has written on a wide range of topics including architecture, education, facilities management, literature and the performing arts.

Rachel Franks is the Coordinator, Education & Scholarship at the State Library of New South Wales, a Conjoint Fellow at the University of Newcastle, Australia and is currently researching true crime at the University of Sydney. Rachel holds a Ph.D. in Australian crime fiction and her research on crime fiction, true crime, popular culture and information science has been presented at numerous conferences. An award-winning writer, her work can be found in a wide variety of books, journals and magazines as well as on social media.

SUGGESTED CITATION

Dwyer, Simon and Franks, Rachel. (2017), 'On Stage and Online: An examination of low-cost digital production tools for lighting, sound and stage management', *Peer Reviewed Proceedings of the 8th Annual Conference Popular Culture Association of Australia and New Zealand* (PopCAANZ), Wellington, New Zealand, 10-11 July, 2017, P. Mountfort (ed), Sydney: PopCAANZ, pp. 127-137. Available from http://popcaanz.com/conference-proceedings-2017/.