June 29, 2015

Ms. Jacqueline C. Charlesworth
General Counsel and Associate Register of Copyrights
United States Copyright Office
101 Independence Ave. S.E.
Washington, D.C. 20559-6000

Re: Docket No. 2014-7 (Exemptions to Prohibition Against Circumvention of Technological
        Measures Protecting Copyrighted Works)
        June 3, 2015 Questions Posed to Class 5 Witnesses

Dear Ms. Charlesworth,

Thank you for your invitation to respond to two follow-up questions regarding the May 28, 2015 hearing on the above-referenced matter. We respectfully respond on behalf the following witnesses: Aaron Benmark, Bobette Buster, Molly McClurg, Michael Wolfe, Jack Lerner, and Blake Reid.

I.   Screen capture technologies do not present a viable alternative to circumvention on any operating system.

As the extensive record in this proceeding—including our Reply Comment, other commenters' submissions and testimony, and opponents' admissions during the May 2015 hearings—demonstrates, all of the screen capture technologies mentioned in the hearings and in the comments of parties opposed to the proposed Class 6 exemption produce clips of very low quality—so low that they do not meet the needs of authors seeking to make fair use. Footage obtained with screen capture technologies is ridden with imperfections, including interlacing, dropped frames, frame rate issues, insufficient resolution, and artifacting.[1] Some of these

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[1] *See Question for Those Using Camtasia*, Avid Community (Jan. 30, 2006, 8:06 PM), http://community.avid.com/forums/t/8559.aspx; *Progressive Screen Capture with Interlaced-Looking Parts*, VideoHelp (Sept. 11, 2014), http://forum.videohelp.com/threads/367096-Progressive-Screen-Capture-with-interlaced-looking-parts; *"Jerky" and Out of Sync, Dropped Frames in Preview Window and Input*, Techsmith, https://feedback.techsmith.com/techsmith/topics/-jerky-and-out-of-sync-dropped-frames-in-preview-window-and-output; *How Many Dropped Frames is Normal?,* TechSmith, https://feedback.techsmith.com/techsmith/topics/how_many_dropped_frames_is_normal; *Dropped Frames*, VideoHelp (May 18, 2015, 9:08 AM), http://forum.videohelp.com/threads/371952-Dropped-framesSnagit:; *Never Use EzVid (Why it is the Worst Screen Recorder)*, Minecraft Forum (Aug. 4, 2013), http://www.minecraftforum.net/forums/off-topic/computers-science-technology/hardware-software-support/499609-never-use-ezvid-why-it-is-the-worst-screenCamStudio:; *Slow Frame Rate in Jing*, TechSmith, https://feedback.techsmith.com/techsmith/topics/slow_frame_rate_in_jing; *Where are the Video Setup and Frame Rate Settings in Snagit 11?,* TechSmith, https://feedback.techsmith.com/techsmith/topics/where_are_the_video_setup_and_frame_rate_settings_in_snagit_11?topic-reply-list%5Bsettings%5D%5Bfilter_by%5D=company_promoted; *Camtasia Studio Poor Video Quality Exporting to Mp4*, TechSmith, https://feedback.techsmith.com/techsmith/topics/camtasia_studio_lost_video_quality_on_production_to_mp4; *Screen Artifacts in QuickTime Version*, TechSmith, https://feedback.techsmith.com/techsmith/topics/screen_artifacts_in_quicktime_version; *Weird Screen Artifacts Replaying Video Recorded Using Camtasia*, Adobe Communities, https://forums.adobe.com/thread/1488216.

problems were demonstrated first hand in opponents' own exhibits.[2] At the May 27, 2015 hearing, for example, DVD CCA admitted that screen capture software produces footage of visibly diminished quality.[3] These quality problems wholly preclude using screen capture software to extract clips from DVDs.

Moreover, no one contends that screen capture is even *capable* of capturing clips of any quality from Blu-ray discs or other High Definition sources. It is commonly known that screen capture is entirely unsuitable for capturing Blu-ray clips, and opponents have admitted that no non-circumventing screen capture software is compatible with Blu-ray.[4] As we discuss extensively in our written comments, authors require the high-quality clips available on Blu-ray discs in order to make their points and simply cannot obtain suitable quality using screen capture technology.[5]

Even if screen capture software worked reliably, it remains unclear whether it is actually an alternative to circumvention. As our Reply Comment explains, authors cannot be certain how screen capture software works, and in particular, whether it involves circumventing the encryption on DVDs, Blu-ray discs, and other media, which authors fear could violate the DMCA.[6] With the exception of WMCapture, none of the screen capture programs identified by the opponents to the proposed exemption make the representation required by the exemption currently in effect—that the software "enabl[es] the reproduction of motion picture content after such content has been lawfully decrypted."[7] TechSmith, the manufacturers of Camtasia and Snagit apparently even urges its customers to *circumvent* TPMs to enable the screen capture technology.[8]

Screen capture software is not a viable alternative to circumvention regardless of what operating system a multimedia e-book author uses. No answers to the complex questions raised at the hearing and after the hearing about the compatibility of screen capture software with Mac OS X can change this fact. Nevertheless, below we provide detailed answers to each of the Office's questions regarding Mac compatibility.

> a. *At the hearing and in their papers, opponents of the proposed exemption referenced a variety of screen capture technologies as potentially viable alternatives to circumvention, including Camtasia, Movavi, Snagit, WM Capture, EzVid, CamStudio, Jing, and Screencast-O-Matic. Please address which, if any, of this software is operable on a Mac versus a PC, respectively.*

We have reviewed the specifications and websites of the manufacturers of the software in question, as well as comments by users, to determine operating system compatibility, and detail our results in Figure 1 of the appendix to this letter.

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[2] *See* 2015 Reply Comment of International Documentary Association et al. Docket No. 2014-07, Appendix F: Analysis of Opponents' Screen Capture Exhibits.
[3] *Transcript of Section 1201 Rulemaking Hearing Before the U.S. Copyright Office, Washington, D.C.* (May 27, 2015) at 58:13–61:16, *available at* http://copyright.gov/1201/2015/hearing-transcripts/1201-Rulemaking-Public-Roundtable-05-27-2015.pdf [hereinafter *May 27 Hearing*].
[4] AACS admitted that it is not aware of any screen capture technology capable of Blu-ray level quality. *Id.* at 45:1.
[5] *See* 2015 Reply Comment of Authors Alliance et al. Docket No. 2014-07 at 6–7.
[6] *See id.* at 11.
[7] *Id.*; *see* 37 C.F.R. § 201.40(b)(6)(i), (7)(i) (emphasis added).
[8] *See* discussion *infra*, at part I(a).

Of the eight screen capture programs mentioned in this proceeding, three—WM Capture, EzVid, and Cam Studio—are not compatible with Mac OS X.[9] Two other programs—Jing and Screencast-O-Matic—are compatible with OS X, but are not sufficient to capture high quality video. By their manufacturers' own descriptions, these programs only support basic forms of screen capture and are designed only to enable users to create short tutorial videos that track a cursor's movement on the screen.[10]

The remaining three programs— Movavi Screen Capture for Mac, Camtasia and Snagit—are not capable of capturing clips from DVDs or iTunes purchased videos on OS X. Beginning with OS X 10.7, Apple implemented its own measures to prevent capture of video content played from iTunes or the built-in DVD player that comes with the system software.[11] Techsmith, the maker of Camtasia, Jing, and Snagit, suggests in recent support documents that users employ potentially circumventing software such as Handbrake or VLC in order to defeat Apple's video protection.[12] Because the makers of these programs suggest that their utilization requires a separate circumvention that might itself violate Section 1201, neither program is likely to serve as an alternative to circumvention.[13]

> b. *The Office is also interested in understanding whether any limitations in software functionality can be overcome by installing an alternate operating system on a computer, such as by using Boot Camp on a Mac, or by using a virtualization program, such as Parallels Desktop, to emulate an alternate operating system.*

Screen capture programs that are only available on PCs are not a viable option for e-book authors who seek to operate in a Mac environment, notwithstanding the existence of programs like Boot Camp and Parallels Desktop. To use Boot Camp, a user must undertake a time-consuming and lengthy process that in most cases includes each of the following steps: purchasing a new Mac, moving data from an old Mac to another drive, or partitioning their existing Mac's hard drive; purchasing and installing a copy of Microsoft Windows; installing Boot Camp and Windows; and devising a mechanism to move large video files back and forth from one operating system to the other, which may require purchasing an external hard drive.

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[9] *See WM Capture*, WM Recorder, http://wmrecorder.com/products/wm-capture; Ezvid, http://www.ezvid.com/download; CamStudio, http://camstudio.org.

[10] *See* Jing, https://www.techsmith.com/jing.html; Screencast-O-Matic, http://www.screencast-o-matic.com/.

[11] *See Movavi Screen Capture For Mac*, Movavi, http://www.movavi.com/mac-video-recorder/ ("Please be aware that Movavi Screen Capture for Mac does not allow to capture [sic] copy protected videos and audios [sic]"); *Why Can't I Capture from a DVD?*, Ambrosia Software Inc. (Nov. 13, 2013), http://www.ambrosiasw.com/support/faqs/products/snapz-pro-x/Why-cant-I-capture-from-a-DVD; *Lion Killed My Snapz Pro X DVD Screen Capture Software*, Apple Support Communities (July 24, 2011, 1:59 PM), https://discussions.apple.com/thread/3207660?tstart=0.

[12] Mike Spink, *Camtasia (Mac): Cannot capture DVD video on OS 10.7, 10.8 or 10.9*, TechSmith, https://support.techsmith.com/hc/en-us/articles/203727498-Camtasia-Mac-Cannot-capture-DVD-video-on-OS-10-7-10-8-or-10-9 (last updated Jan. 20, 2015) [hereinafter Spink, *Camtasia*]; Mike Spink, *Snagit (Mac): Cannot capture DVD video on OS 10.7 or later*, TechSmith, https://support.techsmith.com/hc/en-us/articles/203732478-Snagit-Mac-Cannot-capture-DVD-video-on-OS-10-7-or-later (last updated Jan. 20, 2015) [hereinafter Spink, *Snagit*]. Techsmith makes exactly the same representation in connection with Jing. Mike Spink, *Jing (Mac): Cannot capture DVD video on OS 10.7*, TechSmith, https://support.techsmith.com/hc/en-us/articles/203733738-Jing-Mac-Cannot-capture-DVD-video-on-OS-10-7 (last updated Jan. 20, 2015) [hereinafter Spink, *Jing*];

[13] *See* 37 C.F.R. § 201.40.

In addition, creating a partition suitable for transferring large video files substantially reduces the storage space available to the main Mac OS portion of the machine—a critical consideration when managing the large files involved in the creation of multimedia ebooks.[14] Further, some University IT offices have warned students about security risks associated with using dual-OS machines.[15]

In short, a requirement that Mac users seeking to make fair use must utilize Boot Camp would be unduly burdensome. Any authors who wishes to use Apple hardware because of its ease of use and its well-developed ecosystem of media creation and editing tools would suddenly find herself the reluctant owner of a possibly insecure machine with significantly reduced storage space on the OS X side, and will be forced to do most of her media work in the Windows environment. In other words, requiring a Mac user to partition her hard drive and dual boot into Windows may pose an adverse effect similar to requiring her to purchase a PC.

Emulation software is an even less viable alternative. A machine running Windows OS using emulation software such as Parallels and VMware Fusion suffers severe constraints in operability. Emulators tax system resources, reducing the computing power available for playing and capturing video.[16] Reduced computing power naturally means more dropped frames, lower resolution, and visibly lower-quality output. Opponents have acknowledged that screen capture simply cannot handle the HD video output from Blu-ray discs without serious visual defects.[17] Indeed, our research indicates that a Blu-ray disc cannot even be *played* from within an emulator, much less captured.[18] Once the CPU is taxed by emulation software, DVD capture will naturally suffer as well.

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[14] *See Dual-booting: The Pros and Cons* (Mar. 20, 2014, 7:25 AM), Pocketnow, http://pocketnow.com/2014/03/20/dual-booting.

[15] *See Windows on a Mac*, University of Arizona Information Technology Services, http://uits.arizona.edu/services/win_mac/macosx (last visited June 18, 2015); *Windows on a Mac*, Stanford University IT, https://itservices.stanford.edu/service/helpdesk/osxresources/windowsonmac (last modified Jan. 25, 2010); *Computer Use Policies*, NC State University, http://www.csc.ncsu.edu/it/policies.html (stating that Dual OS boot setups are not allowed on departmental owned computers because of a "huge" likelihood that one of the operating systems may be offline for a long period of time, miss critical system updates, and thus face significant risks of being compromised); *Dual Booting & Virtualization*, University of Michigan Computing & Technology Support, http://cats.lsa.umich.edu/Policy-Help/virtual-machines-dual-booting (discouraging "highly" the use of dual booting for, in addition to other reasons, security compromises); *Basic Installation Notes*, University of Liverpool Computing Services, http://www.liv.ac.uk/csd/mws/install/basic.htm (noting that there are "a number of drawbacks" to dual booting, including risks that virus infections in one operating system could infect files in the other operating system, resulting in both systems being compromised); *Encryption: How to protect your computer and University Data*, Princeton University Office of Information Technology, http://helpdesk.princeton.edu/kb/display.plx?id=9944 (noting that Dual boot computers do not support encryption) (last updated Mar. 4, 2015).

[16] For many accounts of users running Parallels and experiencing extreme slowing of computer speed and operability see *Slowing Down Computer*, Parallels Forums, https://forum.parallels.com/threads/slowing-down-computer.90728/.

[17] *May 27 Hearing*, supra note 3, at 45:1.

[18] *See CyberLink PowerDVD 13 Ultra crashes and reports program is not running on a Virtual Machine*, Parallels, http://kb.parallels.com/en/118609 (last updated May 11, 2014) (stating that Virtual Machines, such as Parallels, cannot play Blu-ray discs).

    c. The Office is interested in understanding any differences with respect to the impact of older versus newer operating systems, including Mac OS 10.7, 10.8, and 10.9.

Because Apple has configured OS X 10.7 and later to block screen capture programs from capturing DVD clips, the only remaining option would be to configure a Mac with OS X 10.6 or earlier.[19] However, this alternative presents numerous disadvantages and is impossible in many circumstances, and thereby would not make screen capture viable for purposes of making fair use in multimedia e-books.

The install base of OS X 10.6 and earlier is extremely small. OS X 10.6 has not received a major update since mid-2011.[20] Meanwhile, Apple has been releasing its OS updates as free downloads since the release of Mac OS X 10.9 in 2013, so even older machines will most likely have upgraded to recent OS versions.[21] As a result, the vast majority of Mac users run the latest version of the operating system.[22]

Once a recent OS is installed, downgrading to an older version is challenging, even for experienced Mac users.[23] Additionally, Apple support explicitly discourages installing an OS earlier than that which was originally installed on that Mac.[24] Even if an author were to ignore this warning and go through the trouble of downgrading her OS, she would then need to find and install older versions of screen capture programs because the latest versions of these programs are only compatible with Mac OS X 10.9 and later.[25] However, older versions of screen capture programs will likely result in a lower level of quality footage. Further, iBooks Author is not compatible with Mac OS X 10.6 or earlier, so even if an author *could* downgrade to OS X 10.6, she would not be able to use one of the platform's most popular book authoring applications.[26]

    d. In responding to this question, please describe any differences that exist in using screen capture technology with respect to DVDs, Blu-Ray discs, and streaming services.

We reiterate that screen capture is not a viable alternative to other forms of circumvention with respect to any of these formats. Further, screen capture technology is particularly unsuitable

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[19] *See Why Can't I Capture from a DVD?*, *supra* note 11.

[20] *Mac OS X 10.6.8 Update v. 1.1*, Apple Support (Jul. 25, 2011), https://support.apple.com/kb/DL1400?locale=en_US.

[21] *See* Ryan Tate, *Apple Just Ended the Era of Paid Operating Systems*, WIRED (Nov. 22, 2013, 6:24 PM), http://www.wired.com/2013/10/apple-ends-paid-oses/.

[22] *See Desktop Operating System Market Share*, NETMARKETSHARE (May, 2015), http://www.netmarketshare.com/operating-system-market-share.aspx?qprid=10&qpcustomd=0.

[23] *See* Lou Hattersley, *How to Downgrade Mavericks to Mountain Lion. How to roll back Mac OS X 10.9 to 10.8 (and earlier)*, Macworld (Dec. 20, 2013), http://www.macworld.co.uk/how-to/mac-software/downgrade-mavericks-mountain-lion-3494785/ (stating that it is "by no means easy to roll back to an earlier operating system" because the process involves, among other things, creating a recovery install disk, cloning a hard drive, securely erasing the drive, and restoring and installing the older operating system).

[24] *See Don't Install a Version of Mac OS X Earlier than what Came with Your Mac*, Apple Support, https://support.apple.com/en-us/HT201686.

[25] *See infra* Appendix, Figure 1.

[26] Federico Viticci, *Apple Announces "iBooks Author" Mac App, Available For Free Today*, MacStories (Jan. 19, 2012 12:24pm PT) http://www.macstories.net/news/apple-announces-ibooks-author-mac-app/.

for procuring HD content because it introduces severe visual artifacts such as dropped frames and precludes obtaining full 1080p resolution.[27]

II.   HD e-books are technologically feasible.

We believe the concrete interest demonstrated by Ms. Buster and the Authors Alliance on behalf of its members to produce new e-books with embedded HD content in the three-year period following the grant of an exemption is more than sufficient to satisfy Section 1201's requirements. Nevertheless, we respond to the Office's second question:

> *The Office seeks additional information regarding the technical feasibility and specifications for incorporating high definition ("HD") film clips, including Blu-Ray clips, into e-books. Please address any limitations that may restrict such offerings, including by citing specific policies and providing the total file size limitations across the major e-book platforms, including, but not limited to, iBooks, Kindle, and Nook. It would also be helpful for parties to submit information identifying current e-books that include HD clips.*

Multimedia e-books with embedded HD content are not only possible, but currently available and growing in popularity. In Figure 2 of the Appendix we have provided several examples of multimedia e-books with embedded HD content that are presently being advertised and distributed.[28] These include an instructional guitar iBook with embedded HD video tutorials and several nature-focused children's iBooks from a series by Anne Crawly.[29]

Moreover, all three of the major e-book providers—Apple, Kindle, and Nook—produce e-readers capable of viewing HD content, as we describe in Figure 4 of the Appendix.[30] These e-readers also have large enough storage capacity to hold many HD e-books. Apple even provides specific guidance to e-book authors for incorporating HD clips into iBooks.[31]

As set forth in Figure 3 of the Appendix, each major e-book platform permits ample space for HD content. Currently, the 2GB file size limit for e-books published on the iBooks store is more than enough space to allow e-book authors to make fair use with embedded HD content.[32] The file size limit for iBooks created with iBooks Author is also 2GB. This free application allows even the most amateur e-book authors to create iBooks.[33] However, iBooks

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[27] *See May 27 Hearing*, *supra* note 3 at 45:1; *See* 2015 Reply Comment of Authors Alliance et al. Docket No. 2014-07 at 10–11.

[28] *See infra* Figure 2.

[29] *Id.*

[30] Amazon produces the Kindle Fire HD, see *Kindle Fire HD 8.9"*, Amazon http://www.amazon.com/Kindle-Fire-HD-9-inch/dp/B008GFRE5A (last visited June 22, 2015). Barnes and Nobles produces the Samsung Galaxy Tab 4 Nook, see *Samsung Galaxy Tab 4 Nook 10.1*, BN.Com http://www.barnesandnoble.com/u/samsung-galaxy-tab-4-nook-10-inch-tablet/379004300 (last visited June 22, 2015). Apple iPads have been capable of viewing HD content since the first generation iPad, see *Does iPad (First Generation) Support HD Videos From iTunes*, Apple Support Communities https://discussions.apple.com/thread/3041666?tstart=0 (last visited June 22, 2015).

[31] Apple, iBooks Asset Guide 5.2 Revision 29 (Version 5.1 Revision 2 is available at https://itunesconnect.apple.com/docs/iBooksAssetGuide5.1Revision2.pdf, content creator account required).

[32] *See Optimizing Performance in Your iBooks Author Books*, Apple, https://support.apple.com/en-us/HT202391.

[33] *See id.*

author is not the exclusive means to publish e-books. There are many similar programs, including Creatavist, which has no known file size limitations.[34]

There are also many examples of iBooks currently on the iBook store that exceed 3GB.[35] Textbooks in excess of 2GB are allowed, and the existence of iBooks larger than 3GB demonstrates Apple's willingness to allow e-books larger than 2GB in its online store.[36] Finally, file size limitations are constantly expanding. Apple recently increased its file size limitation for applications from 2GB to 4GB,[37] which suggests that we are likely to see similar increases with respect to iBooks.

The existence of large e-books demonstrates that it is undeniably feasible to incorporate an amount of HD sufficient to make fair use for most authors. Our research indicates that a fifteen-minute HD 1080p video with H.264 compression takes up just over half a gigabyte— leaving the vast majority of authors with ample space to make fair use of HD video.

III.   Conclusion

We appreciate the Office's continued consideration of this exemption. Please do not hesitate to contact us if you have any questions regarding this filing.

Respectfully submitted,

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[34] For more info about creatavist see *Creatavist*, CrunchBase, https://www.crunchbase.com/product/creatavist (last visited June 25, 2015).

[35] *E.g.*, Edward B. Burger et al., *Houghton Mifflin Harcourt Geometry*, iTunes Preview, https://itunes.apple.com/us/book/geometry/id680547627?mt=13 (last visited June 18, 2015) (click "view in iBooks") (a 3.18GB geometry textbook); Edward B. Burger et al., *Houghton Mifflin Harcourt Algebra 2*, iTunes Preview, https://itunes.apple.com/us/book/algebra-2/id697969003?mt=13 (last visited June 18, 2015) (click "view in iBooks") (a 3.01GB Algebra textbook).

[36] *See Everything You Need to Know About Publishing and Distribution for iBooks Author* (Jan. 19, 2012), 9To5Mac, http://9to5mac.com/2012/01/19/everything-you-need-to-know-about-publishing-and-distribution-for-ibooks-author/.

[37] *See Now Accepting Larger Binaries* (Feb. 21, 2015), Apple Developer, https://developer.apple.com/news/?id=02122015a.

APPENDIX

Figure 1:
Screen capture operating system capabilities
as represented by software makers' websites and specifications

Screen Capture Software (vendor)	Compatible with?					Notes
	Mac OS X 10.10	Mac OS X 10.9	Mac OS X 10.8	Mac OS X 10.7	Wind ows 7, 8, 8.1	
Camtasia (Techsmith)	Yes*	Yes*	No	No	Yes	*According to Techsmith support, though Camtasia says that it is compatible with 10.9 or higher, Apple DVD software 10.7 and beyond prevents it from working.[38] Workarounds suggested by Techsmith require using VLC or Handbrake, which may involve circumventing TPMs.[39]
Movavi	Yes**	Yes**	Yes**	Yes**	Yes**	**Movavi's website indicates that none of its screen capture software, on any platform, allows capture of protected formats.[40]
Snagit (Techsmith)	Yes†	Yes†	No	No	Yes	†Though Snagit's system requirements asserts compatibility with Mac OS 10.9 or higher,[41] Apple DVD software 10.7 and beyond prevents it from working. Workarounds suggested by Techsmith require using VLC or Handbrake, which may involve circumventing TPMs.[42]
WM Capture	No	No	No	No	Yes	WM Capture's requirements list includes only Windows 8, 7, Vista, XP, or Macs with Parallels or Bootcamp and Windows installed.[43]
EzVid	No	No	No	No	Yes	EzVid Wiki & Screen Recorder is compatible with Windows XP SP3, Vista, Windows 7, Windows 8, and Windows 8.1.[44] EzVid has obtained poor reviews by users and is known for having very low frame rates and poor sound quality.[45]
CamStudio	No	No	No	No	Yes	CamStudio asserts compatibility only with Windows operating systems.[46] CamStudio is a well-known purveyor of malware and is not sufficiently trustworthy for use by authors.[47]

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[38] *See System Requirements*, TechSmith, https://www.techsmith.com/camtasia-system-requirements.html.

[39] *See* Spink, *Camtasia*, *supra* note 15.

[40] *See Movavi Screen Capture For Mac*, Movavi, http://www.movavi.com/mac-video-recorder/ ("Please be aware that Movavi Screen Capture for Mac does not allow to capture [sic] copy protected videos and audios [sic]"); *see also Movavi Screen Capture For Mac*, Movavi, http://www.movavi.com/mac-video-recorder/ (Scroll to supported formats at bottom of page). *See also Help Center*, Movavi, http://www.movavi.com/support/ (click "Installation Questions").

[41] *See Snagit System Requirements*, TechSmith, https://www.techsmith.com/snagit-system-requirements.html.

[42] *See* Spink, *Snagit*, *supra* note 15.

[43] *See WM Capture*, WM Recorder, http://wmrecorder.com/products/wm-capture

[44] *See* ezvid, http://www.ezvid.com/download.

[45] *See Never Use Ezvid (Why it is the worst screen recorder)* (Aug. 4, 2013), Minecraft Forum, http://www.minecraftforum.net/forums/off-topic/computers-science-technology/hardware-software-support/499609-never-use-ezvid-why-it-is-the-worst-screen.

[46] *See* CamStudio, http://camstudio.org.

[47] 2015 Reply Comment of International Documentary Association et al. Docket No. 2014-07 at 10; *See* CamStudio Video/Screen Capture FREE., http://camstudio.org/ (last visited Apr. 30, 2015); *see also When good software goes bad: the sad saga of camstudio*, One More Tech, https://onemoretech.wordpress.com/2014/04/01/when-good-software-goes-bad-the-sadsaga-of- camstudio/ (discussing malware concerns in the operation of screen capture software such as

Figure 1 (continued)

Screen Capture Software (vendor)	Compatible with?					Notes
	Mac OS X 10.10	Mac OS X 10.9	Mac OS X 10.8	Mac OS X 10.7	Wind ows 7, 8, 8.1	
Jing (TechSmith)	Yes	Yes	Yes	Yes	Yes	Jing is basic screen capture software intended for short, fast communication.[48]
Screencast-O-Matic	Yes	Yes	Yes	Yes	Yes	Screencast-O-Matic, like Jing, is clearly advertised as a basic capture tool not capable of capturing high quality video.[49]

Figure 2:
Existing HD eBooks

Title	Size (GB)	Platform	Notes
Beginner Blues Guitar Solos with Audio & Video	0.91	iBooks	Advertised as a "multi-touch e-book that will teach you two great blues solos" with "note by note" instructions and demos on more than fifty-three minutes of HD video.[50]
Finding Frogfish: Masters of Disguise	0.18	iBooks	Advertised as "a visual exploration discovering one of the most amazing fish in the sea, frogfish!" and containing "award winning video."[51]
Kids Sea Camp SeaLife Camera Week	0.27	iBooks	Advertised as an "interactive book" about a "family adventure" that allows readers to "learn about PADI Seal Team Missions, Advanced Diving, and go scuba diving with sting rays, turtles, shipwrecks and more" through "high definition video."[52]
Embodied Mindfulness	0.76	iBooks	Advertised as "a comprehensive teaching guide for school teachers and parents which incorporate[s] high definition video" around mindfulness practices.[53]

CamStudio) (last visited Apr. 30, 2015).

[48] *See* Jing, *supra* note 11; *see also Jing: 5 Minute Recording Limit*, TechSmith (Mar. 13, 2013 2:15 PM), https://support.techsmith.com/hc/en-us/articles/203733698-Jing-5-minute-recording-limit (stating that Jing "is intended for short, fast communication; not so much for long tutorials or presentations").

[49] *See* Screencast-O-Matic, *supra* note 11 (advertising the program as a tool for teachers, students, "how to-ers," and "YouTubers;" note that all examples provided are basic computer tutorial-type videos).

[50] Jody Worrell, *Beginner Blues Guitar Solos with Audio & Video*, iTunes Preview (May 21, 2015), https://itunes.apple.com/us/book/beginner-blues-guitar-solos/id997497973 (last visited June 16. 2015).

[51] Annie Crawley, *Finding Frogfish: Masters of Disguise*, iTunes Preview (Sept. 12, 2012), https://itunes.apple.com/us/book/finding-frogfish/id561648691 (last visited Jun. 16, 2015); *see also* http://www.anniecrawley.com/blog/finding-frogfish-enhanced-ebook-ipad/ ("Created and narrated by Annie Crawley, specifically to utilize the technology of combining photos, *high definition video*, and a book wrapped up into an experience." (emphasis added)).

[52] Annie Crawley, *Kids Sea Camp SeaLife Camera Week*, iTunes Preview (Nov. 24, 2012), https://itunes.apple.com/us/book/kids-sea-camp-sealife-camera/id581717006? (last visited June 16, 2015).

[53] Anne-Marie Charest, *Embodied Mindfulness*, iTunes Preview (Aug. 10, 2014), https://itunes.apple.com/us/book/id908912796 (last visited June 22, 2015).

Fig. 2 (continued)

Title	Size (GB)	Platform	Notes
Miniature Painting	1.15	iBooks	Advertised as a "book about painting miniatures" including "high definition video tutorials."[54]
A Photographic Guide to the Birds of Hawaii: Forest Birds	0.41	iBooks	Advertised as an "enhanced e-book . . . featur[ing] a collection of high-definition video and audio resources as well as up-close images of Hawai'i's spectacular bird inhabitants in Hawai'i's forest regions. "[55]

Figure 3:
File size limitations of major e-book platforms

Platform	File size limitation (GB)	Notes
iBooks[56]	2	Limit to publish using iBooks authoring software; not a firm limit.
Kindle[57]	0.65	
Nook	Unknown	At least 0.61GB[58]

Figure 4:
Storage limitations across major e-readers

E-Reader	Storage (GB)	Notes
iPad Air 2[59]	128	
Kindle Fire HD[60]	32	
Samsung Galaxy Tab 4 Nook 7.0[61]	32*	*With external memory card.

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[54] R. Kaple, *Miniature Painting*, iTunes (Feb. 16, 2012), https://itunes.apple.com/us/book/miniature-painting/id503281153 (last visited June 22, 2015).

[55] Jim Denny, *A Photographic Guide to the Birds of Hawaii: Forest Birds*, iTunes (July 31, 2014), https://itunes.apple.com/us/book/photographic-guide-to-birds/id904456304 (last visited June 16, 2015).

[56] *See Optimizing Performance in Your iBooks Author Books, supra* note 33.

[57] *Amazon Kindle Publishing Guidelines: How to Make Books Available for the Kindle Platform* (2015), *available at* https://kindlegen.s3.amazonaws.com/AmazonKindlePublishingGuidelines.pdf (last visited June 22, 2015).

[58] E-books with large file size exist on the Nook store, including a 0.61GB workout e-book. *See, e.g.*, James C. Radcliffe & Robert Farentinos*, High Powered Plyometrics*, Barnes&Noble, http://www.barnesandnoble.com/w/high-powered-plyometrics-2nd-edition-james-c-radcliffe/1121062940?ean=9781492509974 (last visited June 22, 2015).

[59] *Buy Your iPad Air 2*, Apple Store, http://store.apple.com/us/buy-ipad/ipad-air-2 (last visited June 18, 2015).

[60] *Kindle Fire HD 8.9"*, Amazon, http://www.amazon.com/kindle-fire-HD-9-INCH/DP/B008GFRE5A (last visited June 22, 2015).

[61] *Samsung Galaxy Tab 4 Nook 10.1*, Barnes&Noble, http://www.barnesandnoble.com/u/samsung-galaxy-tab-4-nook-10-inch-tablet/379004300 (last visited June 22, 2015).