ODS EPUB: SAS® Output at Hand

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ABSTRACT

A new addition to SAS® 9.4 is the Output Delivery System (ODS) Electronic-Publications (EPUB) destination. ODS EPUB can be used to create SAS® output files for various e-readers on both smart phones (e.g. Samsung Galaxy™, Apple iPhone®) and tablets (e.g. Apple iPad®, and Amazon Kindle™). In this paper we will be discussing how to create SAS® output that can be taken with you on these devices and look at a few different procedures and customization options available to create e-publication files.

SAS® ON THE GO

More and more offices are using mobile devices such as smartphones or tablets for sharing information and doing work. Some of us probably have bosses or coworkers that use mobile devices more than their work computer. These colleagues would be much happier if they never had to use a desktop computer and could access important reports and data driven documentation through their mobile devices. Customers who would prefer their output in various forms could also benefit from the flexibility of accessing their mobile devices. So what options exist to meet the needs of our customers and colleagues?

Other ODS options can work. ODS PDF can create quality PDFs which can be resized for tablets. ODS RTF and tagset.ExcelXP can be read by Office and third party software on tablets as well. However, these file types are not built specifically for these devices so formatting or sizing can cause issues.

In SAS® 9.4 we have two new options, ODS EPUB and ODS EPUB3. These outputs create files that are designed to work with the most popular e-book software on Apple devices (iBooks®) and the format, in theory, should be able to be read on other types of devices as long as it can read an EPUB file.

To display ODS EPUB and ODS EPUB3 in a working fashion an example e-book was created. This e-book highlights SAS® output using PROC REPORT, PROC LOGISTIC, PROC ODSTEXT, and multimedia files. The latter are explained further in-depth later in this paper. The dataset used in this e-book example was originally created for our previous poster at MWSUG 2013 over PROC REPORT. This dataset consists of fabricated hospital data with a few notable fictional doctors in which we take no credit in creating.

A LITTLE BACKGROUND ON .EPUB

The EPUB format is the official standard for the International Digital Publishing Forum (IDPF), which is a global trade organization dedicated to the development and promotion of electronic publishing and content consumption (International Digital Publishing Forum). At the time of writing this paper, Version 3.0 is the current version. Version 3.0 includes support for audio and video content, embedded metadata, DRM support, reflowable and resizable text, and CSS styling which can be taken advantage of in SAS®. It is also considered an "open" format.

One may ask "Why not just create a PDF, since they can be read on most devices and share many commonalities?" Our response is that EPUB has some distinct advantages over PDFs including: higher levels of user interactivity (such as interactive footnotes and embedded multimedia), easier to change font size and type to fit individual reader's specification, and an emphasis on accessibility e.g. EPUB files support document readers for the visually impaired (where embedded text in images to describe what is shown in the document).

HOW CAN IT BE USED?

ODS EPUB is not an ODS output that you can just interchange with other popular outputs available. One cannot just switch out ODS PDF code with ODS EPUB code and expect it to work. Like many ODS types, there are some specific details that need to be understood in order to use it correctly.

At the basic level, getting started with ODS EPUB is relatively simple. This is especially true for those with experience with other ODS output types. The basic ODS EPUB syntax includes:

```
ODS EPUB file= "<Location and filename>" <OPTIONS>;
    <Desired e-book output code>;
ODS EPUB close;
```

To get the most out of your EPUB file other options should be explored. Some of these include:

`style=<ODS style>`
Specifies specific style to use. Note that not all standard ODS styles work with EPUB, some experimentation is recommended.

`title= " "`
Specifies the title of the e-book. The default is "SAS Output."

`newchapter=`
Specifies when a new chapter is created. Options include BYGROUP, PROC, PAGE, OUTPUT, NOW, NONE.

`options(<suboptions>)`
Allows for specified sub options, which include the following:

`contents= " "`
Specifies whether a table of contents is created. The default is "ON" the other options are YES, NO or OFF.

`cover_image= "<filename>"`
Specifies cover image.

SOME EASY TRICKS AND INTERESTING ADDITIONS

PROC ODSTEXT

A new PROC that can be greatly leveraged with ODS EPUB is PROC ODSTEXT. PROC ODSTEXT is a fantastic alternative to the normal ODS Text option in SAS[®] because it offers some functionality within ODS EPUB. This PROC can create formatted text that fits nicely in an e-book, as well as control page breaks and use variables straight from datasets within it. The major benefits to PROC ODSTEXT are that you can create paragraphs and lists. Sample syntax would look like this:

```
PROC ODSTEXT <OPTIONS>;
      P "<Text Here>";
      list;
      item "First Item of List"  / <OPTIONS: Including ODS style options>;
      item "Second Item of List" / <OPTIONS>;
RUN;
```

A brief explanation of this code:

The command 'P' is for paragraph, so for every paragraph created is started with another P. The command 'List' creates a bulleted list, and 'items' are items included in that said list. The ODS style options can be done in-text using an ODS ESCAPCHAR as well as after the statement following a forward slash. More information on the ODS ESCAPCHAR can be found in through SAS[®] documentation at the following address:
http://support.sas.com/documentation/cdl/en/odsug/61723/HTML/default/viewer.htm#a002233270.htm
Some of the options include PAGEBREAK, which is used to control page breaks, CONTENTS which specifies the name that shows up in the table of contents, and DATA to reference a SAS[®] dataset.

Here is an another example of PROC ODSTEXT with its related output:

```
PROC ODSTEXT contents="";
      P "The following are some ways that ODS EPUB can be used to create SAS
         output. We will be showing different methods through the use of a
         handful of different PROCS.";
      P  "The first example is writing simple text, which you see here...on
         this page.";
      P  "Using PROC ODSTEXT and PROC ODSLIST we can easily write formatted
         paragraph within SAS. Some options can include:";
      list;
            item 'Colors'          / style={color = red};
            item 'Font Weights'   / style={font_weight = bold};
            item 'Font Styles'    / style={font_style = italic};
            item 'Lists...like this one^{noteref I am putting a few of these
                  into the code as a sort of easter egg. Later on I will talk
                  about it a bit}';
run;
```
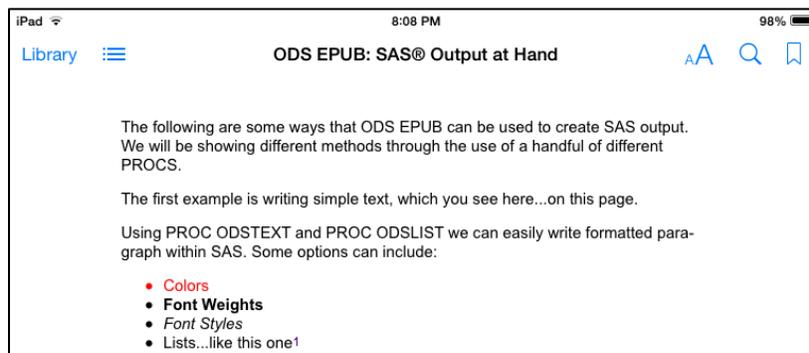

Figure 1. PROC ODSTEXT Results.

NONLINEAR TABLES

At times an outputted table does not fit with the flow of the report or too many tables would clutter the report. To get around this the nonlinear option can be used.

The code is placed as a sub-option for ODS EPUB or ODS EPUB3. A sample of the code is below:

```
ODS EPUB3 options(nonlinear="table");
title1;
ODS PROCLABEL 'Hospital Data by Doctor';
%doc("Dr. Blake Downs");
%doc("Dr. Bob Kelso");
%doc("Dr. Derek Stiles");
/*.. other doctors omitted ..*/
%doc("Dr. Doogie Howser");
%doc("Dr. Gregory House");
```

The %doc() macro creates a specific PROC REPORT for the listed doctor. The nonlinear="table" option specifies that all tables created will be done nonlinear instead if inline. This means that instead of immediately outputting a report for all ten doctors, it will instead create output for each doctor that looks like this:
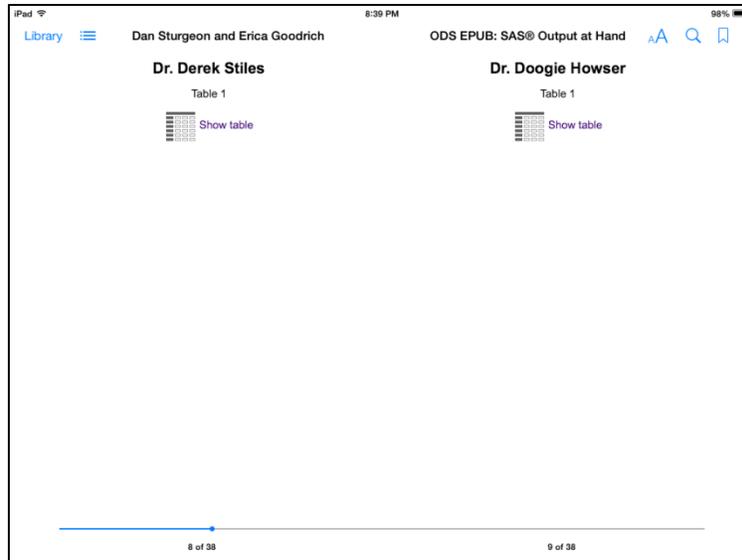
Figure 2. Nonlinear table link

From there, when the "show table" option is tapped, the results are as follows:

PCP	Hospital	Patient	DX	Bill	Paid	Remaining	LOS	Discharge
Dr. Derek Stiles	Caduceus	Iris Bunn	Sprain	$5,744.34	$4,021.04	$1,723.30	5	Discharged/transferred to a federal hospital
		Eldora Hawn	Heart Attack	$15,668.02	$5,640.49	$10,027.53	16	Discharged/Transferred to a psychiatric hospital or psychiatric distinct unit of a hospital
		Hiedi Rakes	Upper Respritory Infection	$12,942.34	$8,283.10	$4,659.24	10	Discharged/transferred to a Critical Access Hospital
		Yuette Gale	Lacerations	$10,127.34	$4,354.76	$5,772.58	17	Discharged/transferred to home under care of a home IV drug therapy provider
		Laurice Kirschbaum	Lupus	$329.34	$329.34	$0.00	6	Discharged to home/self care.
		Logan Ault	Back Pain	$6,700.78	$1,072.12	$5,628.66	12	Discharged to home/self care
		Holly Velasques	H1N1 flu	$10,898.96	$1,852.82	$9,046.14	9	Discharged to home/self care
		Christal Levins	Stroke	$10,198.34	$7,036.85	$3,161.49	17	Discharged/transferred to a nursing facility certified
		Ayako Salls	Heart Attack	$5,160.00	$2,528.40	$2,631.60	19	Discharged to home/self care
		Dionna Crowley	Tendinitis	$6,501.00	$3,640.56	$2,860.44	3	Discharged to home/self care
		Pamala Bordner	H1N1 flu	$11,940.00	$8,596.80	$3,343.20	24	Discharged to home/self care
		Elicia Schmuck	H1N1 flu	$24,894.00	$8,215.02	$16,678.98	9	Discharged to home/self care
				$121,104.46	$55,571.30	$65,533.16		

Figure 3. Nonlinear table results

MULTIMEDIA

The most current version of EPUB, version 3, has some new features that can be taken advantage in SAS® by using ODS EPUB3 instead of ODS EPUB. Some of the added content available for this updated version includes embedded videos and music.

AUDIO: EPUB3 supports MP3, MP4, M4A and WAV formats. Songs can be embedded right into your book within the PROC ODSTEXT code. An example is:

```
P "^{audio \SAS Folder\EPub\DoogieHowserMDtheme.mp3?controls=controls}";
```

The above code embeds a locally saved mp3 file (in this case the theme from the show Doogie Howser, MD) into the e-book. The controls=controls option displays the audio controls.

VIDEO: EPUB3 supports M4V, MP4 and QuickTime video formats. Just like with audio you can embed the video file right in the e-book through your PROC ODSTEXT code.

```
P "^{video \SAS Folder\EPub\DoogieHowserOpening.mp4?controls=controls;
poster=\SAS Folder\EPub\Howser2.jpg;}";
```

The code is basically the same as above, except for the addition of the POSTER= option, which adds an image file that is used as a preview to the video. Without this option it will not function.
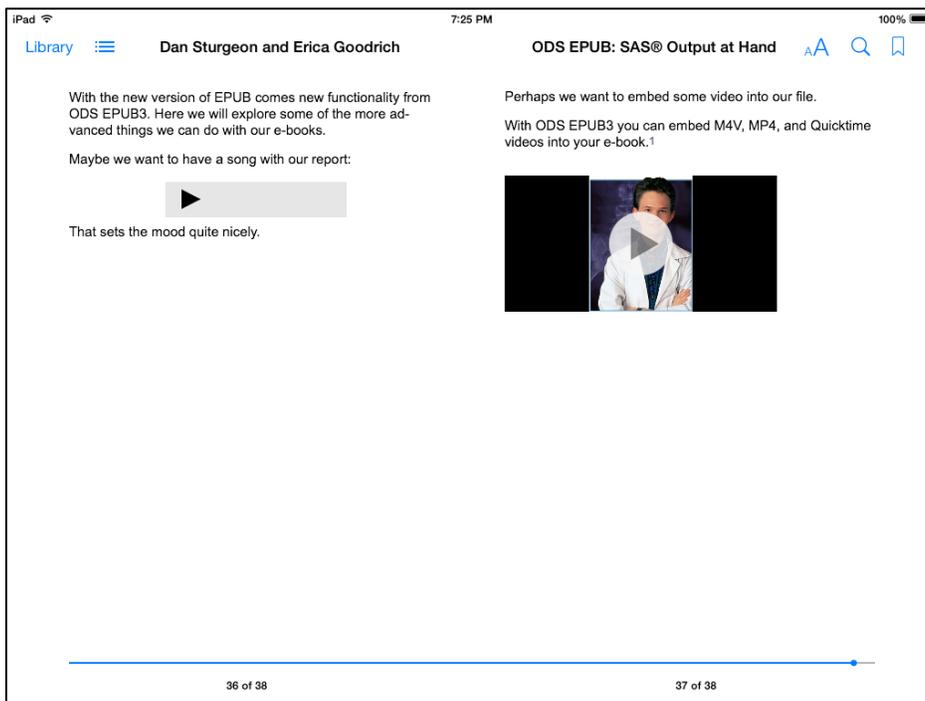

Figure 4. End results of with music and video

It should be noted that when these files are embedded into the e-book the file size of the e-book is also increased. Non local files such as internet content can be used, but the file type must be one of the supported types listed previously. Those files are rare today because of streaming video. Video from sites like YouTube do not work since the file is not the correct type.

WHICH READERS WORK?

According to documentation, ODS EPUB is built specifically for iBooks[®] and we can confirm that it works best with iBooks[®]. As far as Android e-book readers go it can vary.

The following Android apps have been tested using a simple program that runs a PROC REPORT with some special ODS style formatting (journal2), custom coloring, font changes, traffic lighting and two PROC SGPLOT graphs. What we are looking for is if the formatting is recognized and whether the sizing is correct:

App	Worked?	Notes
Aldiko	No	No formatting.
Cool Reader	Somewhat	Keeps formatting. Sizing issues. Could not open some files.
Moon+ Reader	No	No formatting.
MyLibrary	Somewhat	Keeps formatting. Sizing Issues.
Oodles Reader	No	No formatting.
Better World Books Reader	Somewhat	Keeps formatting. Sizing Issues.
Skoob EPUB Reader+	Yes	Very simple e-book reader, but works with small issues.
UB Reader	Somewhat	Keeps formatting. Sizing Issues.
Google Play Books	Yes	Some manual resizing needs to be made. But loaded and keeps formatting. Crashing issues.

Table 1. Android e-book App results

These apps were tested on three different Android devices, ASUS MeMO Pad™ 8. Samsung Galaxy Tab 7.0™, and a Samsung Galaxy S3™.

This is not by any means a complete list of e-book readers available on Android devices, but it provides a good starting point. The majority of readers have issues with displaying the outputs created in SAS®. At the time of publication, the two best results came from the Skoob EPUB Reader+ and Google Play Books. Both still had their own issues including constant crashing. The following output in Figure 5 is from an Android device. This is the same code provided in Figure 3 which was viewed from an Apple device.

Dr. Derek Stiles	Iris Bunn	33	Female	Sprain	$5,744.34	$4,021.04	5	Discharged/transferred to a federal hospital
	Eldora Hawn	37	Female	Heart Attack	$15,668.02	$5,640.49	16	Discharged/ Transferred to a psychiatric hospital or psychiatric distinct unit of a hospital
	Hiedi Rakes	28	Female	Upper Respritory Infection	$12,942.34	$8,283.10	10	Discharged/transferred to a Critical Access Hospital
	Yuette Gale	46	Female	Lacerations	$10,127.34	$4,354.76	17	Discharged/transferred to home under care of a home IV drug therapy provider
	Laurice Kirschbaum	45	Male	Lupus	$329.34	$329.34	6	Discharged to home/ self care.
	Logan Ault	51	Male	Back Pain	$6,700.78	$1,072.12	12	Discharged to home/ self care
	Holly Velasques	54	Female	H1N1 flu	$10,898.96	$1,852.82	9	Discharged to home/ self care
	Christal Levins	78	Female	Stroke	$10,198.34	$7,036.85	17	Discharged/transferred to a nursing facility certified
	Ayako Salls	8	Female	Heart Attack	$5,160.00	$2,528.40	19	Discharged to home/ self care
	Dionna Crowley	44	Female	Tendinitis	$6,501.00	$3,640.56	3	Discharged to home/ self care
	Pamala Bordner	34	Female	H1N1 flu	$11,940.00	$8,596.80	24	Discharged to home/ self care
	Elicia Schmuck	29	Female	H1N1 flu	$24,894.00	$8,215.02	9	Discharged to home/ self care

Figure 5. PROC REPORT output in landscape view as shown on Android device.

CONCLUSION

This paper is meant to give beginners a starting point with ODS EPUB and ODS EPUB3. ODS EPUB is a useful tool in a setting that has a strong Apple integration. At this point, however, seems that its usefulness is somewhat lacking in the Android world. While some readers work with the format, most appear to have issues.

If you are using iBooks® on an iPod® or iPad®, then you can enjoy the full functionality of SAS® on the go. Once you feel like you have mastered the basics we recommend reading David Kelley's paper on the topic as it provides a more advanced perspective on the topic.

Full project code and finished e-book available at http://www2.gvsu.edu/goodrice/PharmaSUG

REFERENCES

INTERNATIONAL DIGITAL PUBLISHING FORUM. <u>ABOUT US</u>. 2014. 6 APRIL 2014

        <HTTP://IDPF.ORG/ABOUT-US>.

ACKNOWLEDGMENTS

RECOMMENDED READING

- Advanced Mobile Reporting with the ODS EPUB3 Destination, David W. Kelley. http://support.sas.com/resources/papers/proceedings14/SAS339-2014.pdf

- EPUB 3 Overview http://www.idpf.org/epub/30/spec/epub30-overview.html

- SAS®9 ODS EPUB Tip Sheet http://support.sas.com/rnd/base/ods/Tipsheet_ods_epub.pdf

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