

When Content Decays, Learning Suffers

Platform Standardization Strengthens Collaboration and Simplifies Management



What's the next challenge that's about to hit your IT infrastructure? You can find it inside students' bags, backpacks, and pockets. You'll see a wide variety of devices and platforms—laptops running different editions of Windows*, Apple's* operating system, and even Google's Chrome OS*. Students and teachers are also bringing the latest Android* and iOS* smartphones as well as popular tablets by Apple* and Samsung*. Of course, every user wants to connect his or her device to your network without a second thought about platform support or security.

There is a name for this state of affairs: like it or not, you are experiencing consumerization. This chaotic environment complicates your job in a wide variety of ways including:

- Consumerization makes it very difficult and costly to meet users' expectations to access content, files, and applications quickly and easily across many devices and operating systems;
- Consumerization makes it very difficult to maintain your service-level agreements (SLAs) with stakeholders;
- Consumerization makes it difficult to protect sensitive data; and
- Consumerization makes it difficult to follow compliance requirements.

If that isn't challenging enough, multi-platform environments are beginning to show another crack that directly effects the teaching and learning experience and impedes effective learning: **content decay**.

Applications that run on platforms based on Windows, iOS, and Android operating systems are not identical. When users view and update content on a platform based on a different operating system than the one used to create it, the content often displays incorrectly. If you make changes and comments based on content that does not display correctly, the content deteriorates further, and you have content decay.

The Pitfalls of Content Decay

In a multi-platform environment, learning opportunities can suffer because of content decay, leading to misunderstandings that can hamper communication, productivity, and learning. Students want to be sure that their teachers see their work accurately, and they don't want their grades to suffer because the document they submitted displays incorrectly on the teacher's device.

For most teachers and schools, Microsoft Office* is still the gold-standard in terms of word processing, spreadsheets, and presentation creation. However, for schools using tablets based on the Apple iOS* and Google Android* operating systems, Microsoft Office is not available as a native app, which can cause schools to look for alternates that allow their students to read and modify Office files. As schools deploy more devices to support achievement on more rigorous standards, students and educators cannot afford to have learning suffer because the document they are using displays information incorrectly.

The Impact of Content Decay on Learning

The increasing adoption of technology-dependent teaching models such as the “flipping the classroom” and Bring Your Own Device (BYOD) initiatives have added more work onto both the teacher’s and the IT coordinator’s plates. For teachers who are “flipping their classroom” they are now responsible for finding (or creating) content that supports their curricular objectives and integrating it into their school’s learning management system, student web portal, or their own home-grown website. The flipped classroom model, where in-class time is spent on projects, activities, and responding to student questions and traditional lecture and knowledge-acquisition is done at home using technology, is dependent on three things:

- Teachers have the time to create high-quality, scaffolded lessons where the content and research is delivered through the Internet;
- Students have access to the Internet (either at home, at school, or elsewhere); and
- Students have access to device where they can both access the content assigned to them by the teacher and complete the assigned task(s).

For many students (and teachers, as well), these dependencies mean they have to use different devices with different operating systems and applications than the ones they use in school. Even in many one to one school environments where every student has access to a device, teachers are expected to create content on a device that isn’t the same as the student devices. For instance, a teacher may have a laptop with one set of applications and students have tablets with a different set of applications. Of course, this use-case isn’t unique to just flipped classrooms. Schools that support BYOD initiatives are encountering similar issues as are schools who have adopted different technologies incrementally; buying some desktop computers one year, laptops the next, and even tablets or eReaders a year later.

All this variety has resulted in a lack of platform standardization that is impacting the ability of students and teachers to collaborate and manage their work. These changes in the process of how schools are adopting and integrating technology into the classroom has resulted in teachers and students having to spend more time moving files and assignments from one device to another - struggling with all the inconsistencies, issues, and accessibility issues of content that has decayed across their various devices.

They are less able to collaborate because files in one format can’t be accessed from one device to another and they have to spend time re-editing files that were already complete because a different application doesn’t display the file correctly. Similarly, teachers have had to modify their expectations of student work and their scoring guides and rubrics because content that may have looked fine and been complete on one device is lost during the transfer to another.

Multiple Platforms Lead to Content Decay

Incompatibilities between different platforms can cause content to display incorrectly, which leads to content decay. What follows are a variety of examples of how content decays when its accessed across different devices and applications.



WORD PROCESSING PLATFORM INCOMPATIBILITY

With the incompatibilities in word processing programs on different platforms you can easily lose document version control.

- Inability to track changes
- Inability to view comments
- Missing content
- Vertical text not supported
- Inability to import a document
- Faulty text wrap

SPREADSHEET PLATFORM INCOMPATIBILITY

Incompatibilities between spreadsheet programs can lead to calculation errors, graphical misrepresentations, and loss of valuable data analysis capabilities.

- Unsupported formulas removed or changed
- Conversion of pivot tables to regular tables
- Macros do not run
- Unsupported chart formats

PRESENTATION PLATFORM INCOMPATIBILITY

Slide presentations can become compromised when they are moved between platforms, which can cause loss of valuable content and functionality.

- Can't access or change slide masters
- Loss of animations
- Loss of chart data
- Unplayable audio

Microsoft Word* Documents

Here are some examples of content decay that show how text can be misrepresented and how a peer's or teacher's feedback can be lost with a Microsoft Word* document created on a Windows 8 device with Office 2013* and displayed on devices with operating systems other than Windows. Examples of this include comments not displaying, substantial formatting errors, misplaced images, missing images, text wrap around not working correctly, missing page numbers, image padding not displaying correctly, missing footnotes, and missing titles and other information.

Windows device with Microsoft Word*:

The original Word document created on a Windows device includes:

- Teacher comments in right margin
- Formatting changes (spacing, spelling, and so on) indicated in left margin (red pipes)
- Footnote with hanging indent
- Footer content including page number

Which Battery Is Better?

My project was to determine which AA battery maintains its voltage for the longest period of time in low, medium, and high current drain devices. Materials that were used were a CD player and a CD (low drain device), Three identical flashlights (medium drain device), Camera flash (high drain device), AA size Duracell and Energizer batteries, AA size of a "heavy duty" (non-alkaline) Panasonic battery, voltmeter, battery holder, and kitchen timer. Each battery was numbered and each battery's voltage was recorded using the voltmeter. Batteries were placed into one of the devices and turned on. Device was allowed to run thirty minutes and voltage was measured again. This was repeated until battery was at 0.9 volts or device stopped. These trials were conducted for each brand of battery in each experimental group. The Energizer maintained its voltage (dependent variable) for approximately a 3% longer period of time (independent variable) than Duracell in a low current drain device. For a medium drain device, the Energizer maintained its voltage for approximately 10% longer than Duracell. For a high drain device, the Energizer maintained its voltage for approximately 29% longer than Duracell. Basically, the Energizer performs with increasing superiority, the higher the current drain of the device. The heavy-duty non-alkaline batteries do not maintain their voltage as long as either alkaline battery at any level of current drain. My hypothesis was that Energizer would last the longest in all of the devices tested. My results do support my hypothesis.



Star & Bar
You are using two spaces after a period when there should only be one.

Research

Batteries come in many shapes and sizes. Some are no larger than a pill while others are too heavy to lift, but most batteries have one thing in common—they store chemical energy and change it into electrical energy. The cell is the basic unit that produces electricity. A battery has 2 or more cells, but people often use the word battery when talking about a single cell, too, like a dry cell. A dime-sized battery as a watch is a cell. Cells act like pumps to force electrons to flow along conductors.

"The electrical force of a cell or battery is called its electromotive force (emf). This force, which makes electrons flow around a circuit, is measured in units called volts (v). Each kind of cell has a particular emf. A dry cell, for example, has an emf of 1.5 volts."¹

¹ Booth, Steven A. "High-Drain Alkaline AA-Batteries." *Popular Electronics* 62 (January 1999): 58.

Katie Davis
Battery Research
March 17, 2013

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iPad with Apple iWork Pages*:

Displayed on an iPad with Apple iWork Pages*:

- No comments
- Text does not wrap around images
- Image not right-aligned
- Fonts replaced by Apple iWork Pages fonts (different from source fonts)
- Page number not displaying

Android device with OfficeSuite Pro*:

On an Android device with OfficeSuite Pro*:

- Teacher comments using tracked changes not displayed; the commented area is highlighted in pink with no explanation
- Formatting track changes not displaying (updated spelling and spacing noted in the left margin of the source file)
- Footer formatting not displaying correctly
- Image padding (left and bottom) not displaying correctly
- Text wrap of image incorrect (line showing above)

Which Battery Is Better?



My project was to determine which AA battery maintains its voltage for the longest period of time in low, medium, and high current drain devices. Materials that were used were a CD player and a CD (low drain device), Three identical flashlights (medium drain device), Camera flash (high drain device), AA size Duracell and Energizer batteries, AA size of a "heavy duty" (non-alkaline) Panasonic battery, voltmeter, battery holder, and kitchen timer. Each battery was numbered and each battery's voltage was recorded using the voltmeter. Batteries were placed into one of the devices and turned on. Device was allowed to run thirty minutes and voltage was measured again. This was repeated until battery was at 0.9 volts or device stopped. Three trials were conducted for each brand of battery in each experimental group. The Energizer maintained its voltage (dependent variable) for approximately a 3% longer period of time (independent variable) than Duracell in a low current drain device. For a medium drain device, the Energizer maintained its voltage for approximately 10% longer than Duracell. For a high drain device, the Energizer maintained its voltage for approximately 29% longer than Duracell. Basically, the Energizer performs with increasing superiority, the higher the current drain of the device. The heavy-duty non-alkaline batteries do not maintain their voltage as long as either alkaline battery at any level of current drain. My hypothesis was that Energizer would last the longest in all of the devices tested. My results do support my hypothesis.

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"The electrical force of a cell or battery is called its electromotive force (emf). This force, which makes electrons flow around a circuit, is measured in units called volts (v.) Each

Katie Davis Battery Research March 17, 2013

Which Battery Is Better?



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Katie Davis Battery Research March 17, 2013

Android device with Kingsoft Office*:

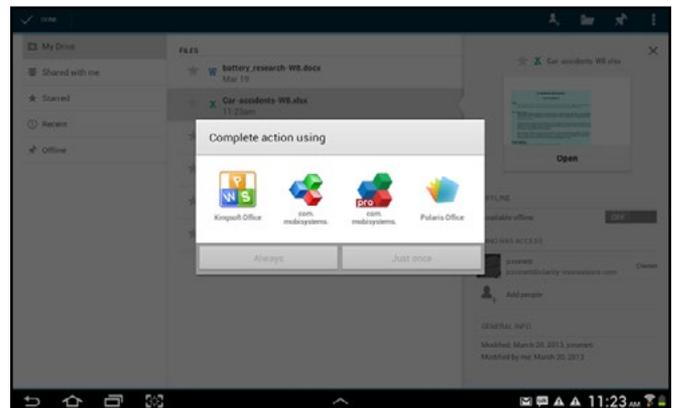
On an Android device with Kingsoft Office*:

- Teacher comments and tracked changes elements (formatting changes noted in left margin of source file) do not display
- Image padding (left and bottom) not displaying as text is too close to image
- Image drop shadow not displaying
- Footnote not displaying
- Page number not displaying



Android device with Google Docs*:

On an Android device with Google Docs*, there is no way to open this file. The file could be opened with Kingsoft Office or OfficeSuite Pro. The file could be viewed but not edited in the Google Chrome* browser.



In addition to the problems illustrated, tracked changes made in a Word document on a Windows device might not appear when viewed on other devices. This could create misunderstanding between students and teachers or cause severe consequences for district personnel working on legal contracts, instructional materials, and community communications. With the current focus on ensuring students meet more rigorous English Language Arts standards, having the ability for educators and students to collaborate on edits is a critical feature for devices supporting work in this content area.

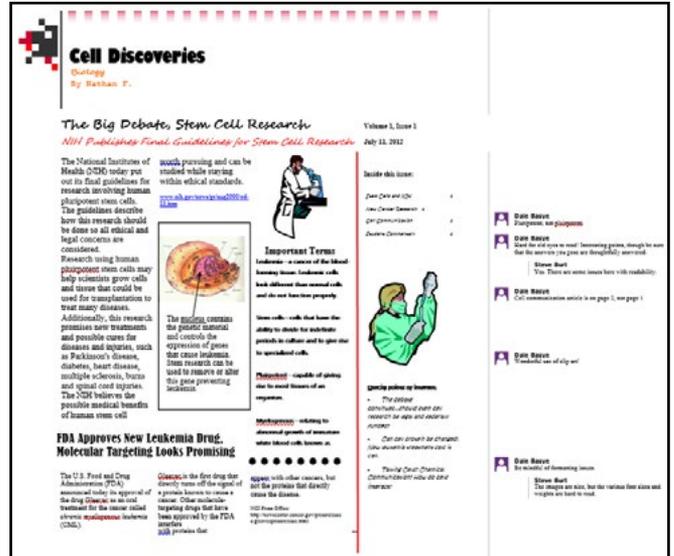
Microsoft Word* Documents Sample 2

Here's a second sample of content decay for a Microsoft Word* document created on a Windows device and displayed on devices with operating systems other than Windows.

Windows device with Microsoft Word*:

The original Word document created on a Windows device includes:

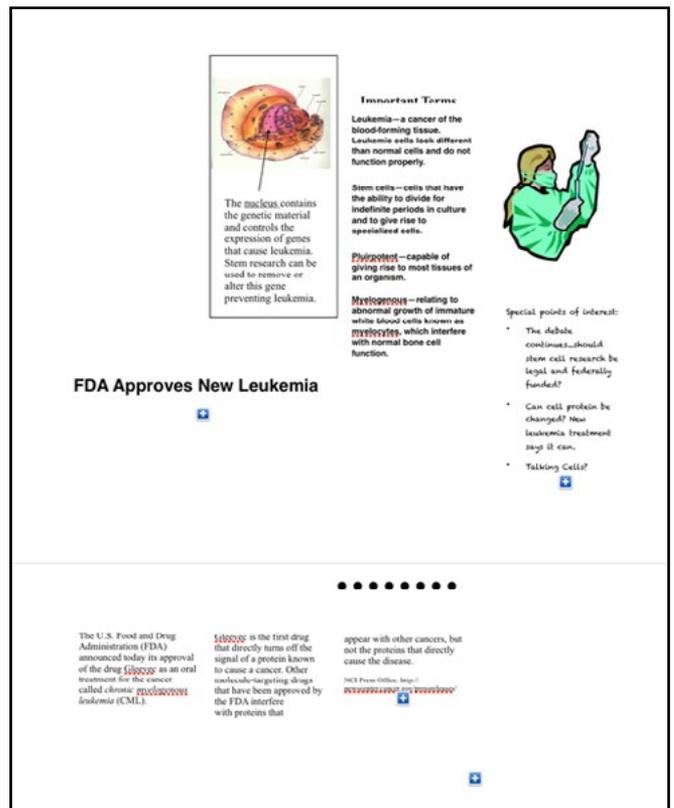
- Teacher comments in right margin (included threaded comments)
- Text displayed in various fonts, colors, and styles
- Text boxes wrap around various image elements
- Text content is displayed in columns that line up horizontally and vertically



iPad with Apple iWork Pages*:

Displayed on an iPad with Apple iWork Pages*:

- Title, name, class, and graphic not displaying at all
- Comments and other track changes elements not displaying
- Content has been split across two pages
- Many of the images including the header graphic and the scientist at a microscope are not displaying
- Majority of the text is not displaying (including all of column 1)
- Font styles, sizes, and colors are not displaying correctly
- Red line between columns 3 and 4 not displaying
- Many of the text elements have been converted to abridged text boxes (as indicated by the blue box with a plus sign), which indicate that there is some additional content that can be displayed



Android device with OfficeSuite Pro*:

On an Android device with OfficeSuite Pro*:

- Title of newsletter completely obscured by class and student name
- Comments and tracked changes elements not displaying
- Supra title of article 1 not displaying
- Image text wrap not working: some images are behind text and others have been re-positioned)
- Text boxes aligned incorrectly
- Some text is obscured by repositioning of elements
- Image display order not correct (some in front, some behind text)
- Columns not aligning correctly

Biology
By Nathan F.

NIH Publishes Final Guidelines for Stem Cell Research

Institutes of Health (NIH) today put out its final guidelines for research involving human pluripotent stem cells. The guidelines describe how this research should be done ethically and legal concerns are considered. Research using human pluripotent stem cells may help scientists grow and tissue that can be used for transplantation. Additionally, this research promises new treatments and can be studied while staying within ethical standards.

Important Terms

Leukemia—a cancer of the blood-forming tissue. Leukemic cells look different than normal cells and do not function properly.

Stem cells—cells that have the ability to divide for indefinite periods in culture and to give rise to specialized cells.

Pluripotent—capable of giving rise to most tissues of an organism.

Myelogenous—relating to abnormal growth of immature white blood cells known as myelocytes, which interfere with normal bone cell function.

FDA Approves New Leukemia Drug.

The U.S. Food and Drug Administration (FDA) announced today its approval of the drug Gleevec as an oral treatment for the cancer called chronic myelogenous leukemia (CML).

Gleevec is the first drug that directly turns off the signal of a protein known to cause a cancer. Other molecule-targeting drugs that have been approved by the FDA interfere with proteins that appear with other cancers, but not the proteins that directly cause the disease.

NCI Press Office:
<http://newscenter.cancer.gov/press/releases/gleevec approves/gleevec.html>

Volume 1, Issue 1
July 11, 2012

Inside this issue:

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Student Commentary	1

Special points of interest:

- The debate continues...should stem cell research be legal and federally funded?
- Can cell protein be changed? New leukemia treatment says it can.
- Talking Cells? Chemical Communication? How do cells interact?

Android device with Kingsoft Office*:

On an Android device with Kingsoft Office*:

- Title unreadable as class/name obscures the newsletter title
- Font sizes and styles not displaying correctly
- Callout box in center overlaps text above it (blue hyperlink)
- Text in column 1 above "FDA Approves" not displaying correctly
- Additional spacing around bottom headline (that covers text above)
- Extra padding/spacing in content at bottom of page
- Comments and track changes elements do display (though not shown in this image)

Biology
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The Big Debate, Stem Cell Research

NIH Publishes Final Guidelines for Stem Cell Research

The National Institutes of Health (NIH) today put out its final guidelines for research involving human pluripotent stem cells. The guidelines describe how this research should be done so all ethical and legal concerns are considered. Research using human pluripotent stem cells may help scientists grow cells and tissue that could be used for transplantation to treat many diseases. Additionally, this research promises new treatments and possible cures for

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www.nih.gov/news/sep09/09092009.pdf.235fm

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NCI Press Office:
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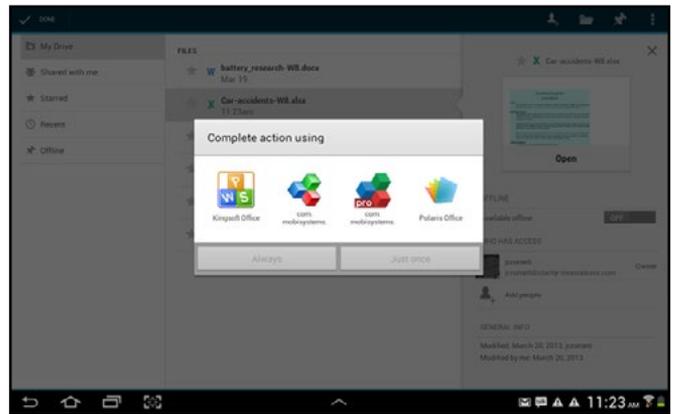
Stem Cell and NIH	1
New Cancer Research	1
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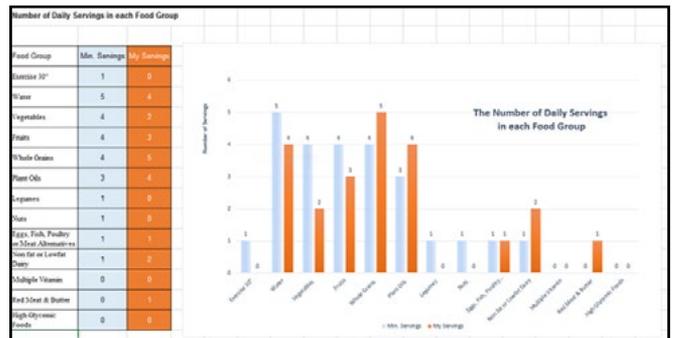
Microsoft Excel* Documents

Microsoft Excel* spreadsheets created on a Windows 8 device with Office 2013 can also suffer from content decay when viewed with other devices with operating systems other than Windows. Examples of this include charts not displaying correctly or missing altogether, slider elements missing, formulas not working correctly resulting in incorrect results being displayed, comments not displaying, and in some cases even the inability to open the file.

Windows device with Microsoft Excel*:

Original graphs created with Excel on a Windows device:

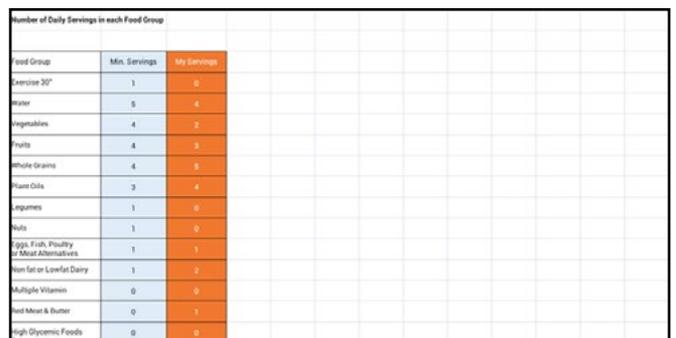
- Data table on left displays minimum food servings and "my servings"
- Chart on the right displays the table data in a simple to understand bar chart



iPad with Apple iWork Numbers*:

In the same graphs displayed on an iPad with Apple iWork Numbers*:

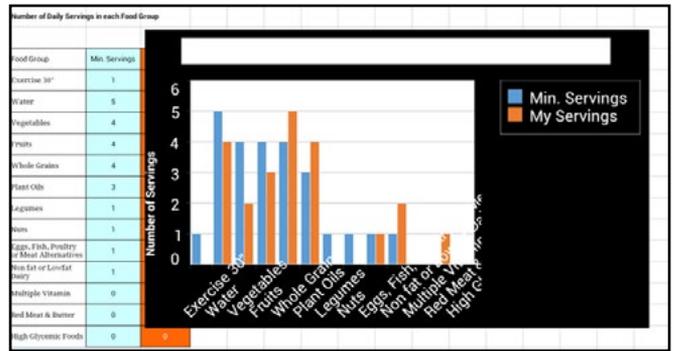
- Chart is missing so assignment is incomplete and student will have to recreate based on the data table in the spreadsheet
- Cell formatting and spacing not preserved in the data table



Android device with OfficeSuite Pro*:

When the same graphs are displayed on an Android device with OfficeSuite Pro*:

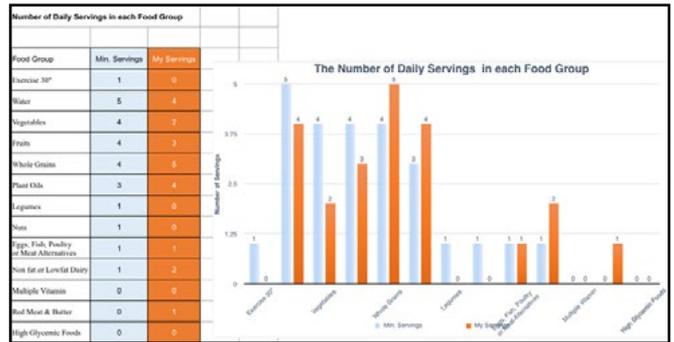
- Chart overlaps and obscures the “My servings” column
- Chart background color is black
- Chart title is missing or unreadable
- X-axis labels are hard to read, and in the incorrect color and font



Android device with Kingsoft Office*:

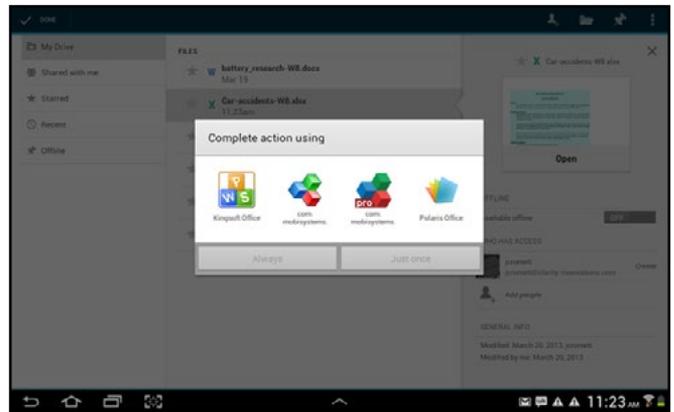
When the same graphs are displayed on an Android device with Kingsoft Office*:

- Small formatting issues with the x-axis labels and the legend
- Chart title not displayed in a text-wrapped cell
- Cell spacing not consistent with source
- Chart overlaps some of the data table cells



Android device with Google Sheets*:

On an Android device with Google Sheets*, there is no way to open this file. The file could be opened with Kingsoft Office or OfficeSuite Pro. The file could be viewed but not edited in the Google Chrome* browser.



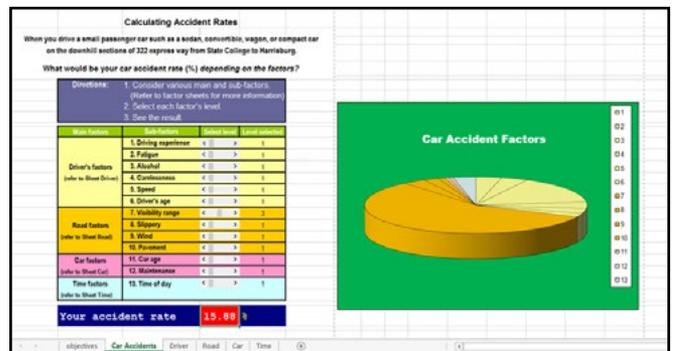
Microsoft Excel* Documents Sample 2

Here’s a second sample of content decay for Microsoft Excel* documents.

Windows device with Microsoft Excel*:

Original graphs created with Excel on a Windows device:

- Data table on left includes slider elements that the user can adjust
- Chart on right auto-refreshes based on adjustment of slider
- Chart is displayed in 3D with colors corresponding to the data table
- Table includes comments added to cells

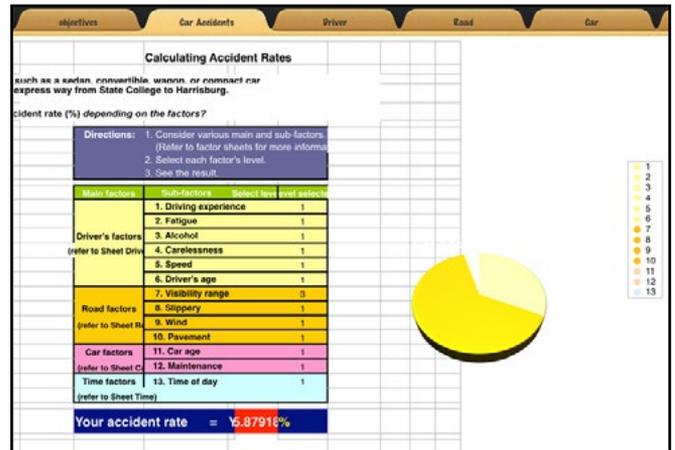


When Content Decays, Learning Suffers

iPad with Apple iWork Numbers*:

In the same graphs displayed on an iPad with Apple iWork Numbers*:

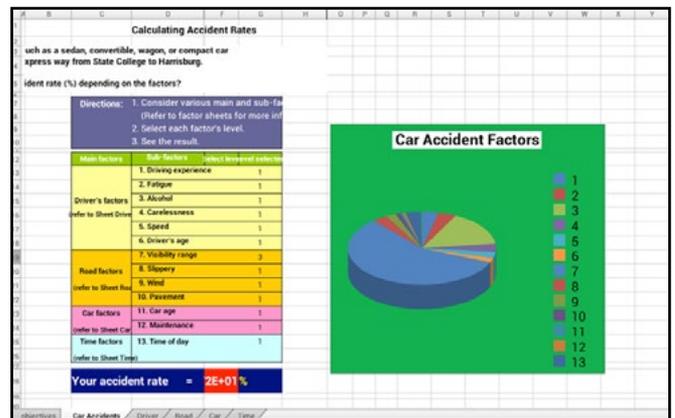
- Slider elements in table on left are not displayed so the primary means of interacting with this spreadsheet is broken
- Chart no longer displays colors associated with the data elements in the table correctly as they are too difficult to determine the difference between light yellow and gray
- Accident rate not displaying correctly (5.8% instead of 15.8%) so the summary/answer is wrong
- Cells' comments not displayed or available



Android device with OfficeSuite Pro*:

When the same graphs are displayed on an Android device with OfficeSuite Pro*:

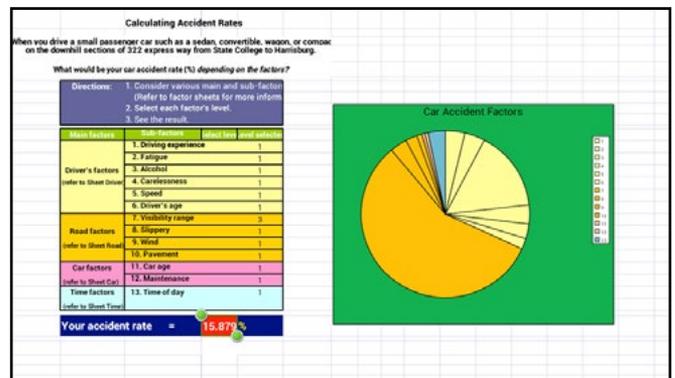
- Slider elements in table on left are not displayed so the primary means of interacting with this spreadsheet is broken
- Chart no longer displays colors associated with the data elements in the table on the left (it has been assigned random colors) so it doesn't have the same visual impact
- Display of accident rate not working correctly
- Cells' comments not displayed or available



Android device with Kingsoft Office*:

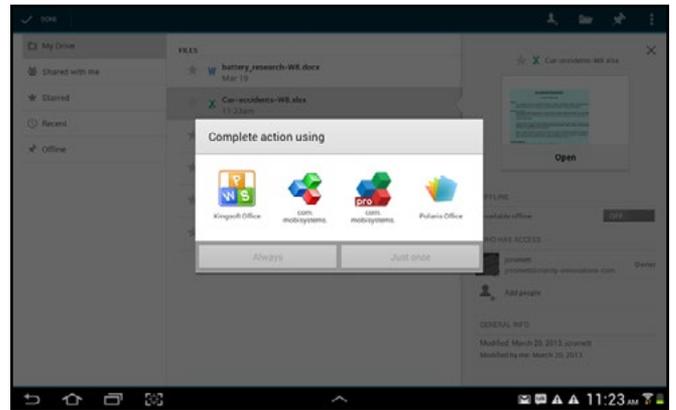
When the same graphs are displayed on an Android device with Kingsoft Office*:

- Slider elements in table on left are not displayed so the primary means of interacting with this spreadsheet is broken
- Chart is displayed in 2D
- Cells' comments not displayed or available



Android device with Google Sheets*:

On an Android device with Google Sheets*, there is no way to open this file. The file could be opened with Kingsoft Office or OfficeSuite Pro. The file could be viewed but not edited in the Google Chrome* browser.



Microsoft PowerPoint* Documents

Microsoft PowerPoint* presentations created on a Windows 8 device with Office 2013 can also suffer from content decay when viewed with other devices with operating systems other than Windows. Examples of this include inaccurate colors, loss of embedded videos, obscured text, image effects missing, missing text and graphics, comments not displaying, and in some cases even the inability to open the file.

Windows device with Microsoft PowerPoint*:

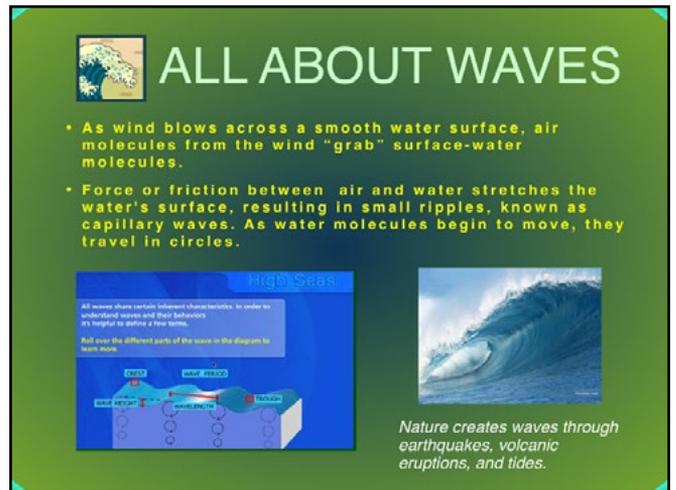
Here's an example of a graph originally created on a Windows device in PowerPoint. It includes a simple slide with a title, gradient background, text, images, and an embedded video that plays when the user clicks the controls. It also includes comments from the teacher using track changes on the right.



iPad with Apple iWork Keynote*:

When the same graph is displayed on an iPad with Apple iWork Keynote*:

- Video player controls and embedded video are removed so the user can't play the video they created and embedded in the slide
- Tracked changes comments from the teacher have been removed and are not accessible
- Background colors have been changed to a radial blue-to-green background not matching the source
- Font styles have been replaced with a default



When Content Decays, Learning Suffers

Android device with OfficeSuite Pro*:

When displayed on an Android device with OfficeSuite Pro*:

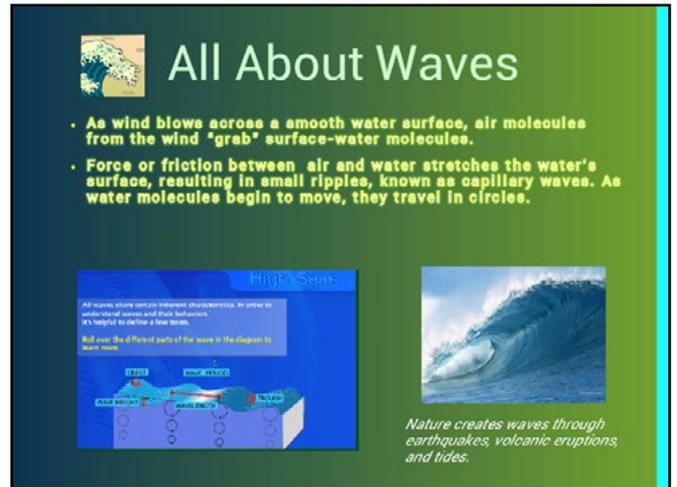
- All the text has been removed and is inaccessible, rendering the slide unusable without significant work
- Video player controls and embedded video are removed so the user can't play the video they created and embedded in this slide
- The background color gradient has been replaced with a dark blue, making it more difficult to read
- Tracked changes comments from the teacher have been removed and are not accessible



Android device with Kingsoft Office*:

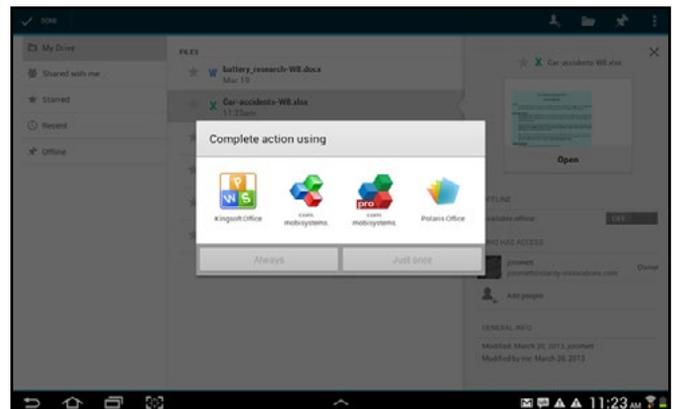
When displayed on an Android device with Kingsoft Office:

- Video player controls and embedded video are removed so the user can't play the video they created and embedded in this slide
- The background color gradient has been replaced with a strange blue to green gradient and a light blue bar shows up on the right
- Tracked changes comments from the teacher do not display and appear to be lost
- Font styles have been replaced and don't match the source



Android device with Google Slides*:

On an Android device with Google Slides*, there is no way to open this file. The file could be opened with Kingsoft Office or OfficeSuite Pro. The file could be viewed but not edited in the Google Chrome* browser.



Microsoft PowerPoint* Documents Sample 2

Here's a second sample of content decay for Microsoft PowerPoint* documents.

Windows device with Microsoft PowerPoint*:

Original slide created with PowerPoint on a Windows device:

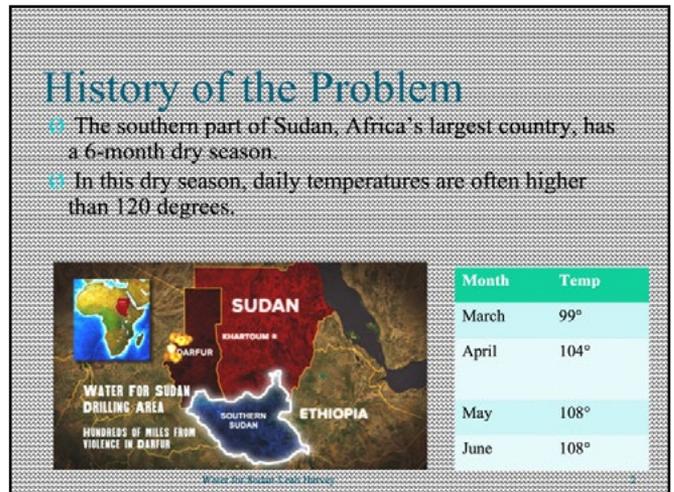
- Varied font styles and size
- Track changes comments on right
- Images displayed with drop shadow and transformation
- Bullet images (arrows)



iPad with Apple iWork Keynote*:

When the same graph is displayed on an iPad with Apple iWork Keynote*:

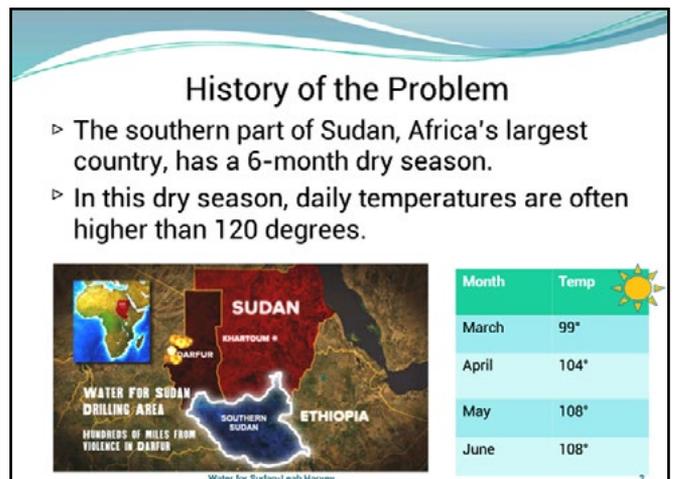
- Background displays unusual "herringbone" effect making the slide look broken and much harder to read
- Font style not displaying like source
- Bullet shape replaced with a nearly illegible bullet
- Image drop shadow and transform not displaying at all
- Sun graphic not displaying in table on right
- Tracked changes comments not displaying or accessible



Android device with OfficeSuite Pro*:

When displayed on an Android device with OfficeSuite Pro*:

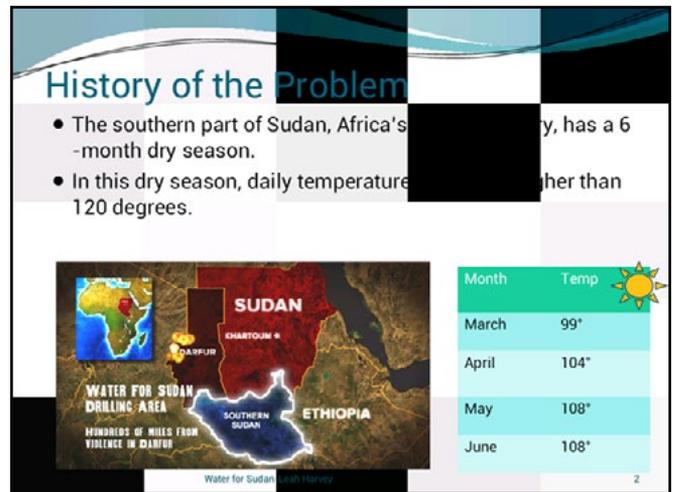
- Font style and color not displaying like source
- Bullet shape replaced with simple triangle
- Image drop shadow and transform not displaying at all
- Tracked changes comments not displaying or accessible



Android device with Kingsoft Office*:

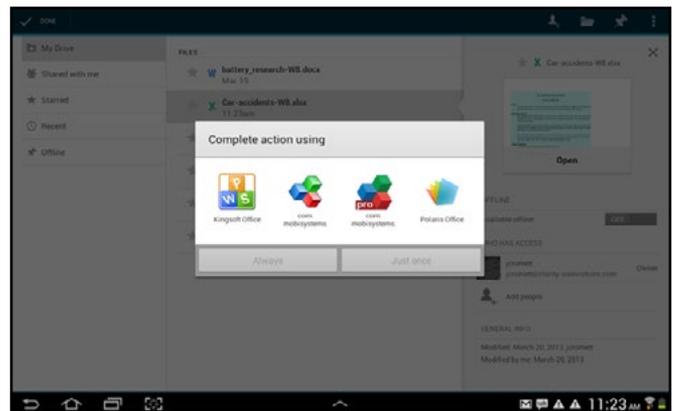
When displayed on an Android device with Kingsoft Office:

- Background displays unusual “cubing” effect
- Text is obscured by errors with background
- Font style and size changed
- Bullets display as default (not arrows)
- Track changes comments not displaying
- Image drop shadow and transform not displaying



Android device with Google Slides*:

On an Android device with Google Slides*, there is no way to open this file. The file could be opened with Kingsoft Office or OfficeSuite Pro. The file could be viewed but not edited in the Google Chrome* browser.



Why Does Content Decay Happen?

Basically there are few standards for cross-platform compatibility for displaying content. Most systems are proprietary and applications do their best to interpret or create the document format of the source or destination.

Avoid Content Decay by Standardizing

Consumerization has led to a rich variety of devices on several different popular platforms, and each of those platforms offers an attractive choice of devices. Because of the lack of standards for displaying content, content decay is likely to continue to confound effective collaboration across different platforms.

You can avoid content decay in your schools and classrooms by leading your users to choose devices from a standard platform based on a single operating system that offers the rich features they want.

Strengthen Collaboration and Simplify IT Management

While PDF files allow you to share and view documents correctly, they do not make collaboration easy. By standardizing your IT environment on a platform based on the same operating system you can minimize content decay and strengthen collaboration. An IT environment with devices running on a standard platform is much easier to manage and will also

reduce service requests to address incorrectly displayed content. You want your users to be able to choose devices that fit their work style because when they do, they can be more productive and satisfied. But to avoid the harm that content decay can do to collaboration, you need to steer your users to devices that run on a common platform. Platform standardization is one key strategy to successfully embrace and harness consumerization to your organization's benefit, simplifying IT management and strengthening learning and collaboration.

SCREEN CAPTURES

Devices used: Microsoft Surface Pro*, ASUS Q200*, Apple iPad*, Samsung Galaxy Tab 2 10.1*

Microsoft Surface Pro:

- Intel® Core™ i5 processor
- Windows 8 Pro*
- Microsoft Office 2013*

ASUS Q200:

- Intel® Core™ i3 processor
- Windows 8 Pro
- Microsoft Office 2013

Apple iPad:

- Apple iOS* 6.1.3
- Apple iWork Pages* 1.7.2
- Apple iWork Keynote* 1.7.2
- Apple iWork Numbers* 1.7.2

Samsung Galaxy Tab 2 10.1:

- Android* 4.1.1
- Mobisystems Officesuite Pro* 7.0.1186
- Kingsoft Office* 5.3.4.137444
- Google Drive* (Google Docs*, Google Slides*, Google Sheets*)