SAVE TIME AND ACHIEVE PAYBACK QUICKLY WITH 6th GENERATION INTEL CORE i5 PROCESSORS

Upgrade your laptop–and have more time to be productive

The Dell® Latitude™ 14 5000 Series (E5470) powered by a 6th generation Intel®Core™ i5 processor enables users to get more done and delivers fast ROI to IT – all in a smaller, sleeker design*

Dell Latitude E5470

ROI in as little as **7.3 months**†

up to **34**% less time starting up

up to **29**% less time multitasking

up to **18**% less time preparing a video

*versus a Dell Latitude 14 E5430 powered by a 3rd generation Intel Core i5 processor
†based on results with Windows® 10

Providing your employees with the tools to be more productive can mean saving money for your business. At Principled Technologies, we created three productivity-based workflows to see how quickly three Dell Latitude E5470 laptops powered by the latest 6th generation Intel Core i5-6300U processor performed each workflow. The three laptops had identical hardware, but one ran Windows 7, one ran Windows 8.1, and one ran Windows 10. We also performed these workflows on a four-year-old laptop powered by a 3rd generation Intel Core i5-3210M processor running Windows 7. In all three operating system configurations, the new laptops completed productivity tasks more quickly than the older laptop did—up to 34.5 percent more quickly.

Faster performance is always a plus, but how quickly would your business' bottom line benefit from upgrading to new laptops powered by 6th generation Intel Core i5 processors? We used the individual time savings to project how long it would take a business to achieve payback for a single 6th generation Intel Core i5 processor-powered laptop.[1] A company that upgraded to the newer laptop with Windows 10 would achieve payback in 7.3 months, or slightly longer if the newer laptop ran Windows 7 or Windows 8.1.[2]

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[1] The tested configuration of the 6th generation Intel Core i5 processor-based Dell Latitude E5470 had a list price of $1,312.86 USD.
[2] Based on an average worker completing the tasks in our three scenarios four times a day.

HOW TIME SAVED CAN OFFSET THE COST OF A FASTER LAPTOP

With each laptop refresh, your business faces decisions about whether or not to upgrade. Though upgrading does have an up-front cost, upgraded laptops can help your employees realize important productivity savings, which can then translate to financial savings for your business.

We wanted to measure the productivity boost a company could expect when upgrading from an older laptop to a 6th generation Intel Core i5 processor-powered laptop, and how long it would take for this improved productivity to pay back the cost of the new system.

We began by putting together a series of typical office tasks that can make users wait. We then performed the tasks first on an older laptop and then on three new Dell Latitude E5470 laptops powered by an Intel Core i5-6300U processor, each running a different version of Windows.

All three of the 6th generation Intel Core i5 processor-powered laptops were faster for all tasks than the four-year-old laptop running Windows 7. Completing all three scenarios took 14 minutes and 17 seconds on the four-year-old laptop, while it took less than 12 minutes on the new laptop, regardless of operating system (see Figure 1). That's a savings of up to 22.7 percent, which translates to time that employees can spend working on other things.

> A business could see payback for the $1,312.86 investment in the 6th generation Intel Core i5 processor-powered Dell Latitude E5470 with Windows 10 in 7.3 months.

Completing the three scenarios one time

Intel Core i5-6300U w/ Windows 10	11m 2s
Intel Core i5-6300U w/ Windows 8.1	11m 20s
Intel Core i5-6300U w/ Windows 7	11m 52s
Intel Core i5-3210M w/ Windows 7	14m 17s

(less time is better)

up to 22% less time

1 Starting computer and programs
2 Opening/using several applications at one time
3 Preparing a video

Figure 1: The time in minutes:seconds that each of the laptops needed to complete our three test scenarios.

If an employee performed our set of three scenarios four times daily, the time saved would add up to an average of 57 minutes per week, depending on the version of Windows. Using a compensation rate of $38.46 per hour for salary and benefits, we value the time each user gets back at $30.77 to $41.54. Based on those calculations, a business could expect to see payback for the $1,312.86 investment in the 6th generation Intel Core i5 processor-powered Dell Latitude E5470 in 7.3 months with Windows 10, 8.0 months with Windows 8.1, or 9.9 months with Windows 7 (see Figure 2).

	6th generation Intel Core i5 processor-powered Dell Latitude E5470		
	Windows 7	**Windows 8.1**	**Windows 10**
Minutes saved per week when performing our three scenarios four times a day	48.0	58.8	64.8
Value of time saved for user earning $38.46 per hour	$30.77	$37.69	$41.54
Number of months until payback	**9.9**	**8.0**	**7.3**

Figure 2: Months until payback for upgrading our four-year-old laptop to a 6th generation Intel Core i5 processor-powered Dell Latitude E5470 with each of three operating systems we tested, assuming users perform our scenarios four times daily.

Our assumption that a user performs the tasks in our three scenarios—or ones similar to them—four times daily is conservative. The complete set of tasks took from 11 to 14 minutes in our testing; it's easy to imagine employees performing similar sets of tasks more than four times in an eight-hour workday. In that event, a company would yield an even faster return on the cost of replacing the four-year-old laptop with the 6th generation Intel Core i5 processor-powered laptop.

OUR TESTING IN DETAIL

To explore the time savings workers would experience, we developed a series of tests that measured application responsiveness. We grouped them into the following three scenarios:

- Starting computer and programs
- Opening/using several applications at one time
- Preparing a video

These scenarios tested typical tasks in a variety of applications, including common productivity programs such as Microsoft® Word and Excel® and graphic-intensive applications such as Adobe® Photoshop®, Adobe Premiere® Pro, and other tools in Adobe Creative Cloud® 2015. We designed these scenarios to be as consistent as possible on devices that run different versions of Windows.

We then performed the scenarios with four laptops in out-of-the-box configurations:

- One four-year-old Dell Latitude E5430 powered by the Intel Core i5-3210M processor (from the 3rd generation of the Intel Core i5 processor family) running Windows 7

- Three new Dell Latitude E5470 laptops powered by the Intel Core i5-6300U processor (from the 6th generation of the Intel Core i5 processor family), each running one of the following operating systems:
  - Windows 7
  - Windows 8.1
  - Windows 10

For more information on the test systems, see Appendix A. For details on our testing, see Appendix B, and for detailed results, see Appendix C.

Starting computer and programs

Jose, a graphic designer, takes a sip of coffee and turns on his laptop. After it starts, he launches Microsoft Outlook® 2013, where he sees an email from his supervisor requesting changes to an image. Making the changes will require working with two Adobe programs, Photoshop and Illustrator®. He clicks on the two files, launching the applications.

As Figure 3 shows, completing this scenario with any of the laptops powered by the 6th generation Intel Core i5 processor took less time than doing so using the four-year-old laptop—up to 34.5 percent less time.

Starting computer and programs

Intel Core i5-6300U w/ Windows 10	1m 54.9s
Intel Core i5-6300U w/ Windows 8.1	1m 53.7s
Intel Core i5-6300U w/ Windows 7	2m 33.2s
Intel Core i5-3210M w/ Windows 7	2m 53.8s

(less time is better)

1   Power on laptop
2   Launch Outlook 2016
3   Open Photoshop file
4   Open Illustrator file
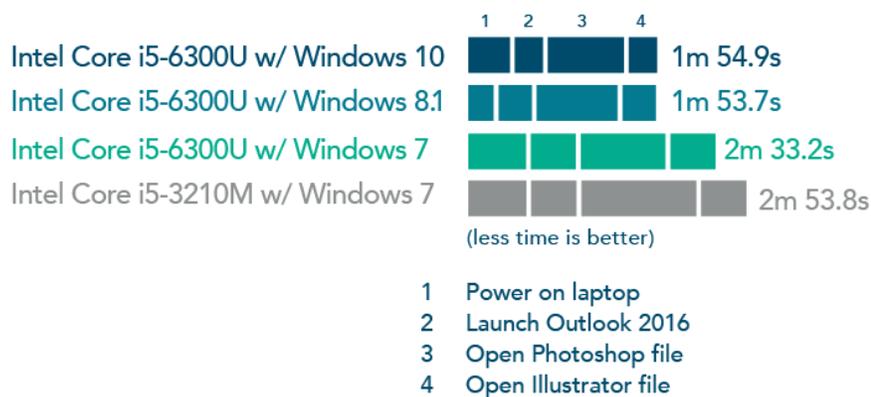
up to **34**% less time starting up

Figure 3: Completing this scenario with the 6th generation Intel Core i5 processor-powered laptops required up to 34.5 percent less time than doing so using the four-year-old system. Lower numbers are better.

Opening multiple applications and files can slow down a system. Jose could save around a minute using the 6th generation Intel Core i5 processor-powered laptops with Windows 8.1 or Windows 10. Being able to open applications more quickly gives him more time to devote to other tasks.

Opening/using several applications at one time

As head of marketing for a software company, Nadia is developing an advertising campaign and wants to run her plans past her VP before going forward. She has a Word file of notes, an Excel file with pricing details, and a PowerPoint® deck of recent social media data, all of which she needs to export into the formats her VP prefers—PDF for the doc and spreadsheet, and video for the slide deck.

As Figure 4 shows, completing this scenario with the laptops powered by 6th generation Intel Core i5 processors saved time compared to doing so with the four-year-old laptop—up to 29.5 percent less time.
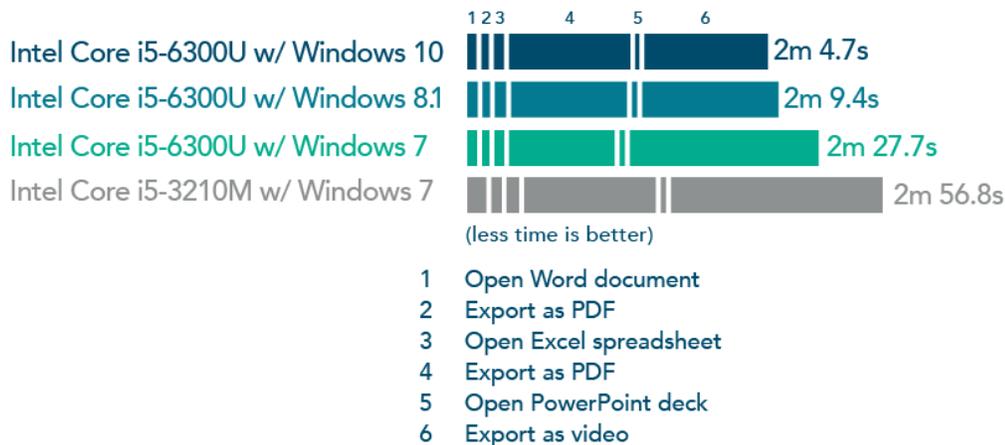

Figure 4: Completing this scenario with the 6th generation Intel Core i5 processor-powered laptops required up to 29.5 percent less time than doing so using the four-year-old system. Lower numbers are better.

You might be surprised how speedy a computer can be when it's running only one program. In the real world, though, many users have several programs open at any given point in the workday. It's important that Nadia's laptop can run programs simultaneously, with as little waiting as possible. She could save 52 seconds using the 6th generation Intel Core i5 processor-powered laptop with Windows 10.

Preparing a video

Samuel is a videographer for an advertising agency. He needs to prepare a video for YouTube®, a process that requires him to open Adobe Premiere Pro, render the video, export it, and then open it using Windows Media® Player to make sure it looks the way it is supposed to.

As Figure 5 shows, completing this scenario with any of the laptops powered by 6th generation Intel Core i5 processors took less time than doing so using the four-year-old laptop—up to 18.7 percent less time.

Preparing a video

	1	2	3	4	
Intel Core i5-6300U w/ Windows 10					7m 2.7s
Intel Core i5-6300U w/ Windows 8.1					7m 17.1s
Intel Core i5-6300U w/ Windows 7					6m 51.5s
Intel Core i5-3210M w/ Windows 7					8m 26.2s

(less time is better)

1 Open Premiere Pro
2 Render video
3 Export for YouTube
4 Open in Windows Media Player

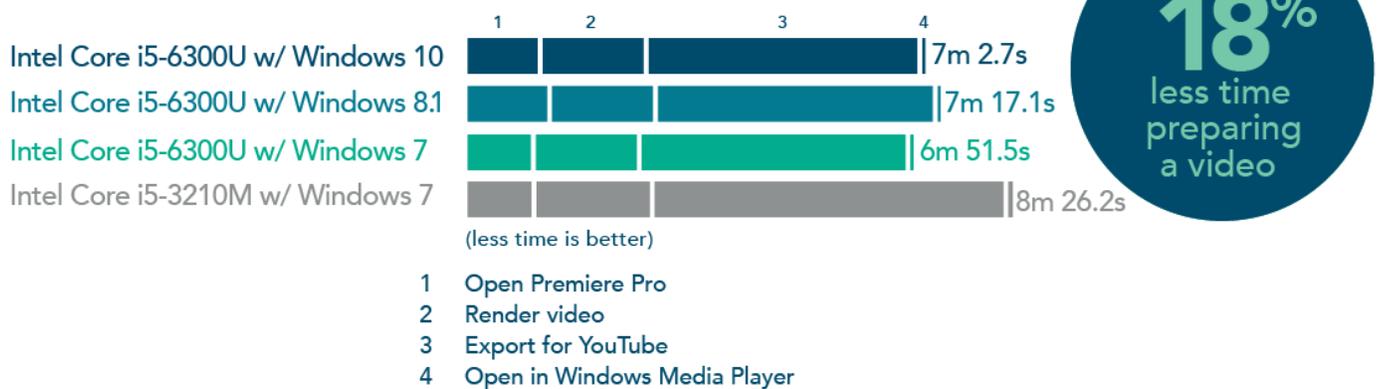up to **18%** less time preparing a video

Figure 5: Completing this scenario with the 6th generation Intel Core i5 processor-powered laptops required up to 18.7 percent less time than doing so using the four-year-old system. Lower numbers are better.

Working with video can tax a system's processor and force workers to wait. Being able to render and export videos faster means Samuel can finish this routine task more quickly and spend more time on creative endeavors.

UNDERSTANDING VARIATION

Your employees probably won't execute a series of tasks identical to those we tested. However, most workloads do include the types of tasks we tested, including opening various applications, opening files, and running simultaneous applications.

Amount of time spent on tasks

For our scenarios, achieving payback depends on how much time the user spends performing these tasks on the four-year-old laptop. Payback would occur once the savings reached 34.1 hours. We calculate this by dividing the $1,312.86 cost of the 6th generation Intel Core i5 processor-powered Dell Latitude E5470 by the average user's hourly compensation (salary + benefits) of $38.46.

As we mentioned earlier, while our payback periods assume that users perform our set of representative tasks four times daily, they could easily perform them more frequently, leading to an even faster return on investment.

Balance of tasks

The balance of tasks that users perform could also affect how quickly your business achieves payback. For example, users who spend more time on the tasks in the "Preparing a video" scenario could see greater performance gains than users who spend more time doing the tasks in the "Opening/using several applications at one time" scenario. If two users both spent one hour performing these types of tasks on the older laptops, but the mix of the tasks differed, the amount of time that upgrading to the 6th generation Intel Core i5 processor-powered Dell Latitude E5470 would save them would also differ. Consequently, the businesses would achieve payback for the new laptops at different rates.

SMALLER AND LIGHTER

In addition to offering performance benefits, the 6th generation Intel Core i5 processor-powered Dell Latitude E5470 has another advantage. Weighing in at only 3.92 pounds, it is 30.0 percent lighter than the Dell Latitude E5430. It is also 31.1 percent smaller—108.1 cubic inches vs. 168.9 cubic inches for the Dell Latitude E5430. Whether your employees are toting their laptops to the coffee shop or just down the hall to a meeting, they will appreciate the convenience that comes with the more streamlined Dell Latitude E5470.

CONCLUSION

Upgrading your employees' laptops to 6th generation Intel Core i5 processor-powered laptops could boost their productivity. We created three business scenarios to compare a four-year-old laptop running Windows 7 to 6th generation Intel Core i5 processor-powered Dell Latitude E5470 laptops running Windows 7, Windows 8.1, and Windows 10. Regardless of the version of Windows, the 6th generation Intel Core i5 processor-powered laptops completed the group of three tasks in less time.

For a worker who performs these tasks four times daily, these productivity savings could pay back the cost of the newer laptop in as little as 7.3 months with Windows 10, and slightly longer with the other versions of Windows. With these advantages, upgrading to a laptop with a 6th generation Intel Core i5 processor can meet the needs of your employees and your budget.

APPENDIX A – DETAILED SYSTEM INFORMATION

Figure 6 presents detailed information on the systems we tested.

System	Dell Latitude E5430	Dell Latitude E5470
Processor		
Vendor	Intel	Intel
Model number	Core i5 3210M	Core i5 6300U
Core frequency	2.5-3.1GHz (Max Turbo)	2.4-3.0GHz (Max Turbo)
Number of cores	4	4
Cache	3MB L3	3MB L3
Memory		
Amount	4 GB (2 × 2 GB)	4 GB (1 × 4 GB)
Type	DDR3	DDR4
Speed (MHz)	1,333	2,133
Storage		
Amount (GB)	500	500
Type	SATA HDD 7200 RPM	SATA HDD 7200 RPM
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 7 Professional x64	Windows 7 Professional x64 Windows 8.1 Professional Windows 10
Build number	7601	Windows 7: 7601 Windows 8.1: 9600 Windows 10: 10586
Service Pack	1	Windows 7: 1 Windows 8.1: N/A Windows 10: N/A
Integrated graphics		
Vendor	Intel	Intel
Model number	HD Graphics 4000	HD Graphics 520
Connectivity/expansion		
Wired internet	Broadcom® NetXtreme® 57xx	Intel Ethernet Connection I219-LM
Wireless internet	Dell Wireless 1504 802.11b/g/n	Intel Dual Band Wireless-AC 8260
Optical drive	Integrated DVD±RW	N/A
Bluetooth	N/A	4.1
USB	1 × 2.0, 1 × 3.0/eSATA, 1 × 3.0	3 × 3.0
Video	1 × HDMI, 1 × VGA	1 × HDMI, 1 × VGA
Other	SC, SD™ card	SC, SD card
Display		
Type	LED Anti-Glare backlight	HD Anti-Glare LCD
Size (inches)	14	14
Resolution	1366 × 768	1366 × 768
Touchscreen	No	No

System	Dell Latitude E5430	Dell Latitude E5470
Battery		
Type	9-cell Extended Lithium-Ion	3-cell Lithium Polymer with ExpressCharge™
Rated capacity (Wh)	97	47
Dimensions[3]		
Height (inches)	1.2	0.9
Width (inches)	13.8	13.2
Depth (inches)	10.2	9.1
Volume (cubic inches)	168.9	108.1
Weight (lbs.)	5.6	3.9

Figure 6: System configuration information for the test systems.

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[3] The Dell Latitude E5430 we tested utilized an optional upgrade from the standard 4-cell 40WHr battery to a 9-cell 97WHr Lithium-Ion battery. With the 4-cell 40WHr battery, the laptop is both lighter and smaller.

APPENDIX B – HOW WE TESTED

Prior to conducting the workflows, we stored all test documents in a folder named Folder_to_zip and copied the folder to each laptop via USB flash dive. We removed the Adobe Premiere Pro video file and the Adobe Illustrator file from the folder and placed them on the desktop.

We repeated each set of timed steps as necessary to acquire three consecutive times that had a variance of 5 percent or less. We recorded the median of these three times.

Setting up the Windows 7 laptops

1. Power on the laptop.
2. Select the country and language, then click Next.
3. When prompted for a user name, type `user` and click Next.
4. When prompted for a password, click Next.
5. Accept the license terms, then click Next.
6. Click Use recommended settings.
7. Select (UTC-05:00) Eastern Time (US & Canada), and click Next.

Setting up the Windows 8.1 laptops

1. Power on the laptop.
2. Select (UTC-05:00) Eastern Time (US & Canada), and click Next.
3. Click I accept.
4. Click Next.
5. When prompted for a computer name, type `pc`, and click Next.
6. Select the appropriate Internet connection, and click Next.
7. Click Use express settings.
8. Click Create a new account.
9. Click Sign in without a Microsoft account.
10. Click Finish.
11. When prompted for a user name, type `user`, and click Finish.
12. After the applications finish installing, click Not right now.

Setting up the Windows 10 laptops

1. Power on the laptop.
2. Verify the country, language, and keyboard layout.
3. Select the time zone, and click Next.
4. Click Accept.
5. Select the Internet connection, and click Next.
6. Click Use Express settings.
7. Enter a user name, and click Next.
8. Click Next.

Preparing the Windows 7 laptops for testing

Updating Windows 7
1. From Windows Search, type `Windows Update`, and press Enter.
2. To install all of the important updates, click Install.
3. After installation is complete, click Restart now.

Turning off Automatic updates
1. From Windows Search, type `Windows Update`, and press Enter.
2. Click Change settings.
3. Select Never check for updates (not recommended).
4. Close the window.

Turning off User Account Control notifications
1. In Windows Search, type `User Account Control`.
2. Select Change User Account Control settings, and press Enter.
3. Move the slider bar to Never notify.
4. Close the window.

Turning off Screen saver
1. In Windows Search, type `Screen saver`.
2. Select Change screen saver, and press Enter.
3. Ensure that the drop-down box says None.
4. Close the window.

Setting Turn off the display to Never
1. In Windows Search, type `Power options`, and press Enter.
2. Next to the active power plan, click Change plan settings.
3. Change every setting to Never.
4. Slide both plan brightness sliders completely to the right, and click Save changes.
5. Close the window.

Turning off Action Center alerts
1. In Windows Search, type `Action center`, and press Enter.
2. Click Change Action Center settings.
3. Uncheck every box, and click OK.
4. Close the window.

Capturing a backup image
1. Plug in a Windows PE USB disk, or insert optical media.
2. Plug in a target disk to store the image.
3. Start the laptop.
4. Press F12 to enter the one-time boot menu.
5. Select the Windows PE media, and press Enter.
6. Identify the system drive (C:\, D:\, etc.).

7. Identify the target drive (D:\, E:\, etc.).

8. In the CMD window, type

   ```
   dism /capture-image /capturedir:c:\ /imagefile=d:\NAME.wim /name:NAME
   ```
   (c:\ is the system drive, d:\ is the target drive, and NAME is the name of the file)

9. After the image has been captured, type `exit`, and press Enter.

Preparing the Windows 8.1 laptops for testing

Updating Windows 8.1

1. From Windows Search, type `Windows Update`, and click Check for updates.

2. Click Check now.

3. Click View Details.

4. Click Install.

5. After the updates install, restart the laptop.

Turning off Automatic updates

1. From Windows Search, type `Windows Update`, and click Windows Update settings.

2. Click Choose how updates get installed.

3. Select Never check for updates (not recommended).

4. Uncheck all boxes, and click Apply.

5. Close the window.

Turning off User Account Control notifications

1. In Windows Search, type `User Account Control`.

2. Click Change User Account Control settings.

3. Move the slider bar to Never notify, and click OK.

4. Click Yes.

Turning off screen saver

1. In Windows Search, type `Screen saver`.

2. Click Change screen saver.

3. Ensure that the drop-down box says None.

4. Close the window.

Setting Turn off the display to Never

1. In Windows Search, type `Power options`, and click Power options.

2. Next to the active power plan, click Change plan settings.

3. Change every setting to Never.

4. Slide both plan brightness sliders completely to the right, and click Save changes.

5. Close the window.

Turning off Action Center alerts

1. In Windows Search, type `Action center`, and click Action center.

2. Click Change Action Center settings.

3. Uncheck every box, and click OK.

4. Close the window.

Capturing a backup image

1. Plug in an external USB hard drive for the image.
2. Double-click Dell Backup and Recovery.
3. Click Next.
4. Select the external hard drive, and click Continue.
5. Click Yes.
6. Click Agree & Continue.
7. Click Yes.
8. Click OK.
9. Click Next.
10. Click Skip.
11. Click Finish.
12. Close Dell Backup and Recovery.
13. Eject the media.
14. Restart the laptop.

Preparing the Windows 10 laptops for testing

Updating Windows 10

1. From Windows Search, type `Windows Update`, and click Check for updates.
2. Click Check for updates.
3. After the updates install, restart the laptop.

Limiting Automatic updates

1. From Windows Search, type `Windows Update`, and click Windows Update settings.
2. Click Advanced options.
3. Select Notify to schedule restart.
4. Check Defer upgrades.
5. Click Choose how updates are delivered.
6. Turn off Updates from more than one place.

Turning off User Account Control notifications

1. In Windows Search, type `User Account Control`.
2. Click Change User Account Control settings.
3. Move the slider bar to Never notify, and click OK.
4. Click Yes.

Turning off screen saver

1. In Windows Search, type `Screen saver`.
2. Click Change screen saver.
3. Ensure that the drop-down box says None.
4. Close window.

Setting Turn off the display to Never

1. In Windows Search, type `Power options`, and click Power options.
2. Next to the active power plan, click Change plan settings.
3. Change every setting to Never.
4. Slide both plan brightness sliders completely to the right, and click Save changes.
5. Close the window.

Turning off Action Center alerts

1. In Windows Search, type `Notifications & actions`, and click Notifications & actions settings.
2. Turn all notifications off.
3. Close the window.

Capturing a backup image

1. Plug in an external USB hard drive for the image.
2. In Windows Search, type `File History`, and click File History in the Control Panel.
3. Click System Image Backup.
4. Select the external hard drive, and click Next.
5. Click Start backup.
6. After the backup is complete, close the Control Panel.

Installing the programs for testing

Installing Microsoft Office 2016 with a Microsoft Office 365 Online Account

1. Open Internet Explorer®.
2. Navigate to https://login.microsoftonline.com.
3. Enter the email address and password for your account, and click Sign in.
4. Click Install now.
5. Click Run.
6. Click Next.
7. Click Continue.

Setting up Microsoft Outlook 2016

1. Open Outlook 2016.
2. Click Next.
3. Click Next.
4. Enter the name, email address, and password for your account, and click Next.
5. Reenter the email address and password, and check Remember my credentials.
6. Accept the license agreement, and click Finish.
7. Close Outlook 2016.

Installing Adobe Creative Cloud Suite

1. Open Internet Explorer.
2. Navigate to www.adobe.com/downloads.
3. Click Sign in.

4. Enter the email address and password for your Adobe ID, and click Sign in.

5. Click Photoshop CC for the free trial download.

6. For My skill level with Photoshop, select Beginner.

7. After Creative Cloud Installer begins to download, click Run.

8. After Creative Cloud installs, enter the Adobe ID email address and password, and then click Sign in.

9. Click Continue.

10. Under Find Additional Apps, click Try for Lightroom®, Illustrator, and Premiere Pro.

11. Close Internet Explorer.

12. As the program downloads complete, click Start Trial.

13. Close Photoshop.

14. Close Lightroom.

15. Close Illustrator.

16. Close Premiere Pro.

17. Close the Creative Cloud installer.

Installing QuickTime®

1. Open Internet Explorer.

2. Navigate to https://www.apple.com/quicktime/download/.

3. Uncheck Keep me up to date….

4. Click Download Now.

5. Click Run.

6. Click Next.

7. Click Yes.

8. Click Typical.

9. Click Install.

10. Click Finish.

11. Click No Thanks.

12. Close Internet Explorer.

Completing final preparations for testing

For Windows 7

1. From Windows Search, type `msconfig`, and press Enter.

2. Select Startup.

3. Click Disable all.

4. Click Apply.

5. Click OK.

For Windows 8.1 and Windows 10

1. From Windows Search, type `msconfig`, and press Enter.

2. Select Startup.

3. Click the link to go to Task Manager.

4. Select each item, and click Disable.

5. Close the window.

Scenario 1: Starting computer and programs

1. Simultaneously press the power button and start the stopwatch.

2. When the desktop background appears, stop the stopwatch. Record the time.

3. Simultaneously click to open Outlook 2016 and start the stopwatch.

4. When the first window appears, stop the stopwatch. Record the time.

5. Close Outlook 2016.

6. Navigate to open Folder_to_zip.

7. Double-click Lighthouse1.jpg, and start the stopwatch simultaneously with the second click.

8. When the photo appears in the Photoshop window, stop the stopwatch. Record the time.

9. Navigate to the Adobe Illustrator file on the desktop.

10. Double-click LogoFinalDesign.ai, and start stopwatch simultaneously with the second click.

11. When the design appears in the Lightroom window, stop the stopwatch. Record the time.

12. Shut down the laptop.

13. Complete steps 1 through 12 two more times.

Scenario 2: Opening/using several applications at one time

1. Navigate to open Folder_to_zip.

2. Double-click to open Test1.docx, and start the stopwatch simultaneously with the second click.

3. When the document appears, stop the stopwatch. Record the time.

4. Click File, and select Export. Click Create PDF/XPS.

5. Name the file, and uncheck Open file after publishing.

6. Simultaneously click Publish and start the stopwatch.

7. When the progress bar disappears, stop the stopwatch. Record the time.

8. Return to Folder_to_zip.

9. Double-click to open Test1.xlsx, and start the stopwatch simultaneously with the second click.

10. When the document appears, stop the stopwatch. Record the time.

11. Click File, and select Export. Click Create PDF/XPS.

12. Name the file, and uncheck Open file after publishing.

13. Simultaneously click Publish and start the stopwatch.

14. When the progress bar disappears, stop the stopwatch. Record the time.

15. Return to Folder_to_zip.

16. Double-click to open Test1.pptx, and start the stopwatch simultaneously with the second click.

17. When the slide appears, stop the stopwatch. Record the time.

18. Click File, and select Export. Click Create a Video. Use default settings, and click Create Video.

19. Name the file, and save it as type MPEG-4 video.

20. Simultaneously click Publish and start the stopwatch.

21. When the progress bar disappears, stop the stopwatch. Record the time.

22. Close all applications, and restart the laptop.
23. Complete steps 1 through 22 two more times.

Scenario 3: Preparing a video

1. Simultaneously open Adobe Premiere Pro and start the stopwatch.
2. When the menu appears, stop the stopwatch. Record the time.
3. Select New Project.
4. Name the project, and keep the default capture format. Click OK.
5. Click File, and select Import.
6. Navigate to TestMovie.mov, and click Open.
7. Drag the media from the Project tab to the Sequence area.
8. Save the file.
9. Click to select the video file in the Timeline.
10. Click the Effects tab, open the Video Effects folder, open the Color Correction folder, and drag the Color Balance (HLS) effect onto the video file in the Timeline.
11. Click the Effect Controls tab, and open the Color Balance effect.
12. Change the Saturation to -100 (this will make the video black and white), and press Enter.
13. Select the Timeline. There should be a red bar over the video file.
14. Simultaneously press Enter to begin rendering and start the stopwatch.
15. When the loading bar disappears, stop the stopwatch. Record the time.
16. Click File, select Export, and click Media.
17. Choose H.264 for Format, and YouTube 1080p HD for Preset.
18. Simultaneously click Export and start the stopwatch.
19. When the loading bar disappears, stop the stopwatch. Record the time.
20. Close Adobe Premiere Pro. Do not save the file.
21. Navigate to the video exported from Adobe Premiere Pro.
22. Right-click the file, and select Open with.
23. Simultaneously click Windows Media Player and start stopwatch.
24. When the video begins playback in Windows Media Player, stop the stopwatch. Record the time.
25. Close all applications, and restart the laptop.
26. Complete steps 1 and 2, as well as 9 through 25, two more times. Upon repeating the steps, open the existing file rather than creating a new project.

APPENDIX C – DETAILED RESULTS

We used the median time for each task. In addition to the median times for the Windows 10 systems, we averaged those results. Figure 7 shows the detailed results for the "Starting computer and programs" scenario.

Task	Intel Core i5-3210M processor	6th generation Intel Core i5 processor		
	Windows 7	Windows 7	Windows 8.1	Windows 10
Power on laptop	00:38.2	00:38.0	00:16.7	00:27.4
Launch Outlook 2016	00:29.9	00:29.6	00:21.8	00:18.6
Open Photoshop File	01:15.8	00:56.0	00:53.4	00:50.3
Open Illustrator File	00:29.9	00:29.6	00:21.8	00:18.6
Total time for scenario	02:53.8	02:33.2	01:53.7	01:54.9
% less time		11.85%	34.52%	33.89%
Time saved		00:20.6	01:00.1	00:58.9

Figure 7: Times in minutes:seconds for each task in this scenario. Lower numbers are better.

Figure 8 shows the detailed results for the "Opening/using several applications at one time" scenario.

Task	Intel Core i5-3210M processor	6th generation Intel Core i5 processor		
	Windows 7	Windows 7	Windows 8.1	Windows 10
Open Word 2016 File	00:08.6	00:04.4	00:04.6	00:04.1
Export File as PDF	00:04.6	00:03.3	00:03.3	00:03.3
Open Excel 2016 File	00:05.6	00:04.3	00:05.0	00:04.5
Export File as PDF	00:59.7	00:47.8	00:52.5	00:55.0
Open PowerPoint 2016 File	00:02.3	00:02.3	00:02.3	00:01.8
Export file as video	01:36.0	01:25.6	01:01.7	00:56.0
Total time for scenario	02:56.8	02:27.7	02:09.4	02:04.7
% less time		16.46%	26.81%	29.47%
Time saved		00:29.1	00:47.4	00:52.1

Figure 8: Times in minutes:seconds for each task in this scenario. Lower numbers are better.

Figure 9 shows the detailed results for the "Preparing a video" scenario.

Task	Intel Core i5-3210M processor	6th generation Intel Core i5 processor		
	Windows 7	Windows 7	Windows 8.1	Windows 10
Open Premiere Pro	01:00.9	01:00.2	01:15.8	01:06.8
Render video	01:48.1	01:36.4	01:36.4	01:36.4
Export video for YouTube	05:33.3	04:12.0	04:22.5	04:16.8
Open video in Windows Media Player	00:03.9	00:02.9	00:02.4	00:02.7
Total time for scenario	08:26.2	06:51.5	07:17.1	07:02.7
% less time		18.71%	13.65%	16.50%
Time saved		01:34.7	01:09.1	01:23.5

Figure 9: Times in minutes:seconds for each task in this scenario. Lower numbers are better.

ABOUT PRINCIPLED TECHNOLOGIES

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