
Recycle Bin
Desktop
Workshop
Photo
Calibration & Inkjet Profiling in a Colour Management Workflow
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8:18 AM
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Calibration & Inkjet Printer Profiling in a Colour Management Workflow

I'm no expert, so my explanations are relatively non-technical. I come to where I'm at now from struggling to get better outputs (prints, web and projection) and trying to match them with what I create and see on my monitor.

Rule 1: Shoot RAW

14-bit Raw if available over 12-bit. *Caveat: See note under Rule 4.*

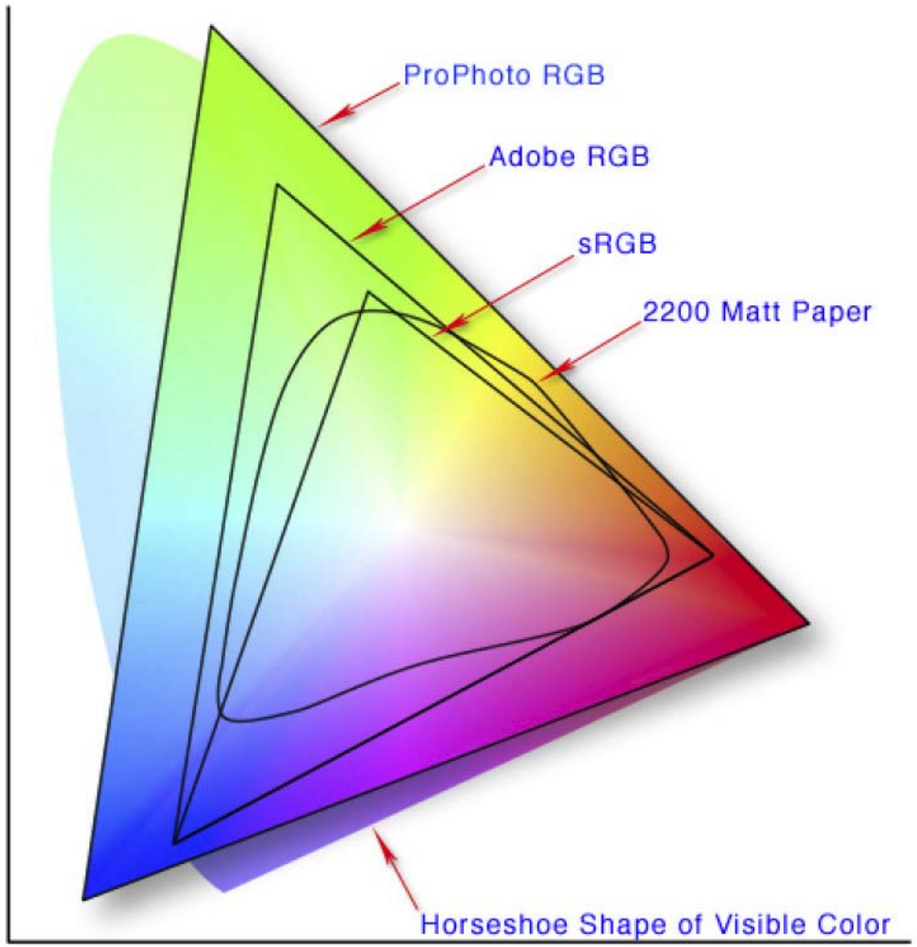
Rule 2: Set camera to Auto White Balance

Unless you need to create a series of images with an identical white balance setting (such as shots to merge into a panorama) your camera can probably do a better job than you can setting an appropriate white balance. If you need more consistency or accuracy, carry and shoot a gray card or equivalent, or better, a ColorChecker. Note that images to be merged can be adjusted & synchronized in Lightroom (LR) or Camera Raw (CR), and more precisely if shot in RAW. Photoshop (PS) also blends images merged to panorama.

You can adjust White Balance in LR or CR. This can also be done in PS using picker tools in Levels or Curves, or a White Balance Adjustment.

Rule 3: Choose the widest-gamut colour space available to you.

Select ProPhoto RGB in CR Preferences and select ProPhoto RGB in PS Color Settings.



The complete range of colours found within a colour space is called its "gamut". Colours that cannot be produced in a colour space are said to be "out of gamut". ProPhoto RGB colour space has a large colour space covering most colours visible to the human eye, and a few colours beyond our vision. The gamut of sRGB colour space, which most modern monitors can match, is smaller than ProPhoto and Adobe RGB. Many colours within ProPhoto are outside the gamuts of smaller spaces. When outputting ProPhoto images to the web or to print, the colours that are outside the gamut of smaller spaces needed must be dropped in some way. This is called "rendering intent" (see Rules 9 & 10).

Rule 4: Choose the greatest bit-depth available to you.

That means 16 bits/channel over 8 bits/channel
Bit depth: The number of gradations of colour a pixel can represent

8 bit (2^8) - 256 values per RGB channel = 16.7m colours
16 bit (2^{16}) - 65,536 shades of grey

If you edit with ProPhoto RGB, you must choose 16-bit to avoid banding. Lightroom opens RAW files in 16-bit ProPhoto RGB by default.

Note: If you never intend to make high-quality prints your images, and you can't afford a faster computer and more memory for larger files, 8-bit sRGB will do. So will shooting Jpeg if your exposures are always tack on and you want to do as little digital editing as possible.

Rule 5: Reduce the Brightness of your Monitor.

To simulate the look of a print, reduce brightness (and perhaps contrast) of your display. This only helps for prints. Do some test printing to get a reasonable luminance match. Work from a brighter monitor when editing for projection and the web.

You can adjust the brightness of many laptop displays by holding down the Fn key and pressing the up and down arrow keys. I calibrate my laptop display, but I don't rely on it for critical image editing.

Rule 6: Calibrate your Monitor.

I use X-rite's ColorMunki. More on that later. . .

Rule 7: Remove bright and distracting colours from your workspace and around it.

Set the background around an image to neutral grey. Remove objects with distracting colours from your desk. Low neutral light in the room helps. Avoid direct light and reflections on your monitor(s). A monitor hood would help.

Rule 8: Create a profile for any photo paper you don't already have a good profile for.

I use X-rite's ColorMunki for this. More on that later. . .

Rule 9: Softproof your images with Photoshop's Proof Setup

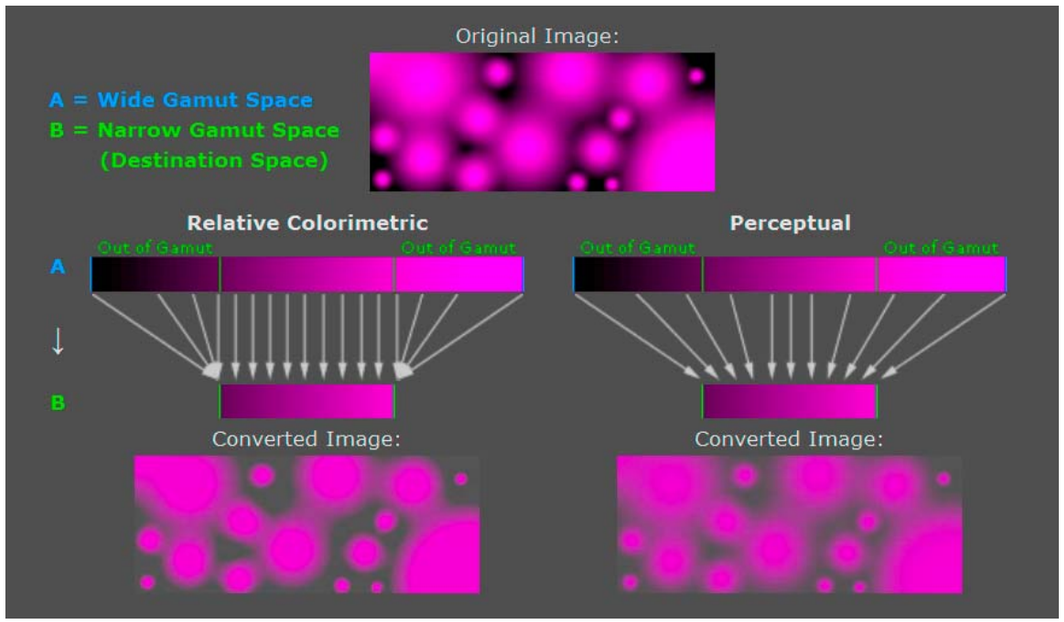
You may want to read Rule 10 and then come back to this rule.

Softproofing only works if there is a reasonable match between monitor & print output. Calibration, and profiled printer/paper choices, are necessary.

- Go to View>Proof Setup>Custom.
- If this option, as well as Proof Colors and Gamut Warning, is not showing, go to Edit>Menus>View and turn them on.
- Choose the profile that matches your printer and the paper you are printing on.
- Preserve RGB Numbers: Leave unchecked
- Black Point Compensation: Check √
- Rendering Intent: Perceptual or Relative Colormetric (These are the two intents that work best with photographs) - Go back and forth to see which looks better.
- Turn Gamut Warning on and off (Ctrl+Shift+Y) to see what areas are outside the gamut of your selected profile. Zoom in to better judge colours in out-of-gamut areas.
- Turn Preview on & off. You can turn Proof Colors on and/or off (Ctrl+Y) while editing.
- If no areas are out of gamut, choose Relative Colormetric. Or if out-of-gamut areas look OK to you, you could also choose Relative Colormetric.
- Otherwise, choose Perceptual or edit (by de-saturating, for example) so all areas are in gamut.

Rule 10: Choose the best Rendering Intent for Printing

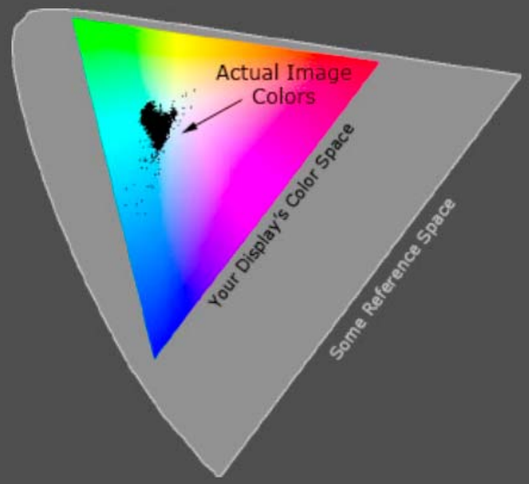
The colour space of your printer will have a smaller gamut than the colour space you are editing your image in, which for me is ProPhoto RGB. See the graphic below.



For photographic work, the choice is usually between Perceptual and Relative Colormetric. If the Gamut Warning shows out-of-gamut colours that you do not want clipped, choose Perceptual. If there are no out-of-gamut colours, Relative Colormetric may work best (see graphic below). Put another way, the more saturated colours in an image, the greater likelihood that Perceptual will create a more balanced result.

One must take the range of image colors present into account; just because an image is defined by a large color space does not mean that it actually utilizes all of those extreme colors. If the destination color space fully encompasses the image's colors (despite being smaller than the original space), then relative colorimetric will yield a more accurate result.

Example Image:



The above image barely utilizes the gamut of your computer display device, which is actually typical of many photographic images. If one were to convert the above image into a destination space which had less saturated reds and greens, this would not place any image colors outside the destination space. For such cases, relative colorimetric would yield more accurate results. This is because perceptual intent compresses the entire color gamut — regardless of whether these colors are actually utilized.

Rule 11: When Printing, make PS/LR Manage Colours. Turn Printer Colour Management Off.

- Turn Printer Colour Management Off
  Epson: ICM - Off (No Color Management) checked √
- Max dpi
- Proper paper profile selected

PS Print dialogue:

- Color Handling: Photoshop Manages Colours
- Printer Profile: matching printer and paper
- Rendering Intent: Perceptual or Relative
- Black Point Compensation checked √

Rule 12: Evaluate your prints with a daylight-balanced lamp.

Rule 13: If you are unhappy with the way LR or CR Render Raw Images, Profile your Camera.

Use ColorChecker Passport with provided software. More on that later. . .

Rule 14: For projected and web images, convert Jpegs to sRGB and Embed the Color Profile.

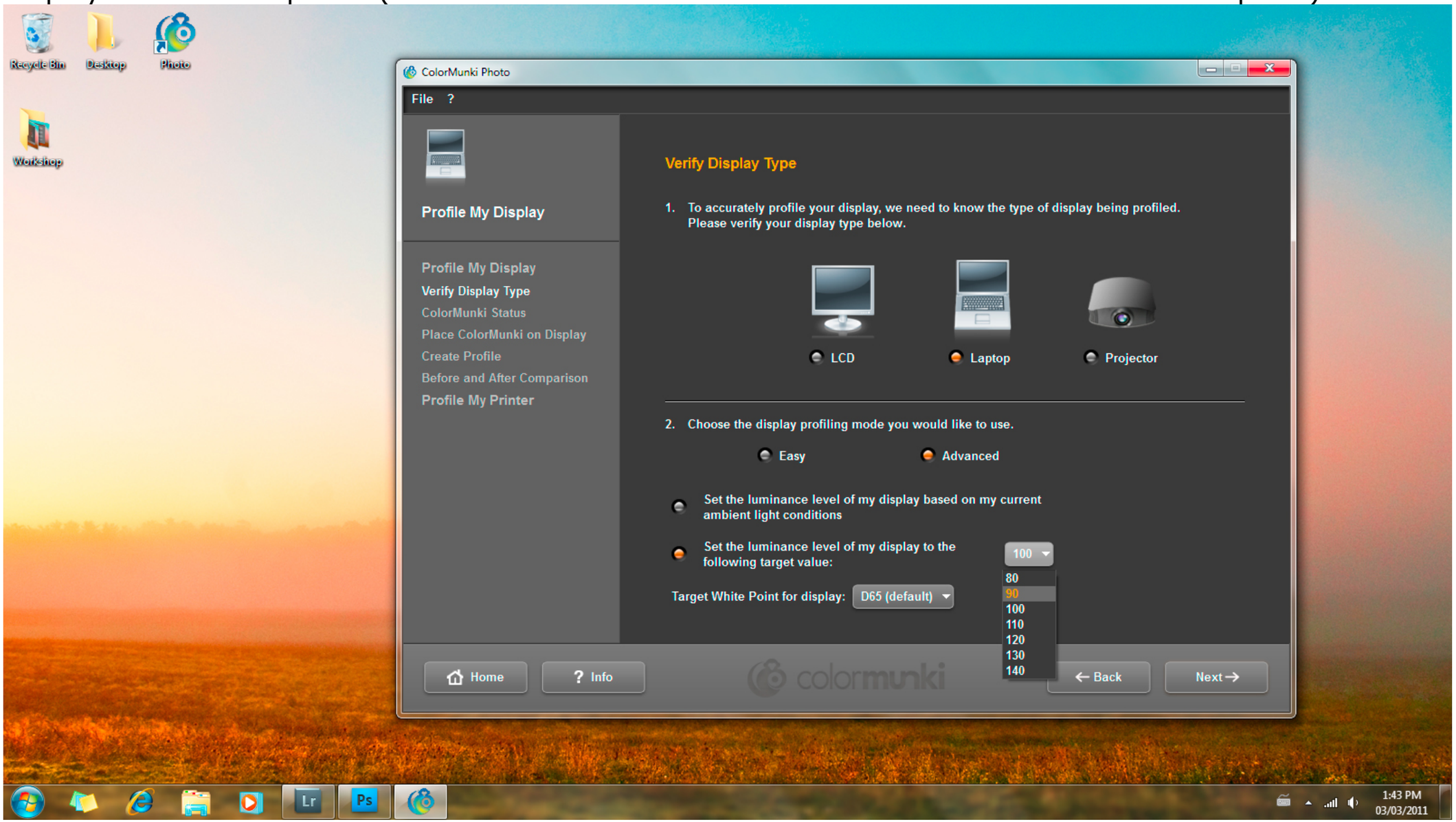
If working in PS with 16-bit files, you need to convert the Image Mode to 8-bit before saving as a Jpeg.

Calibrating your Monitor(s) & Printer Profiling with ColorMunki

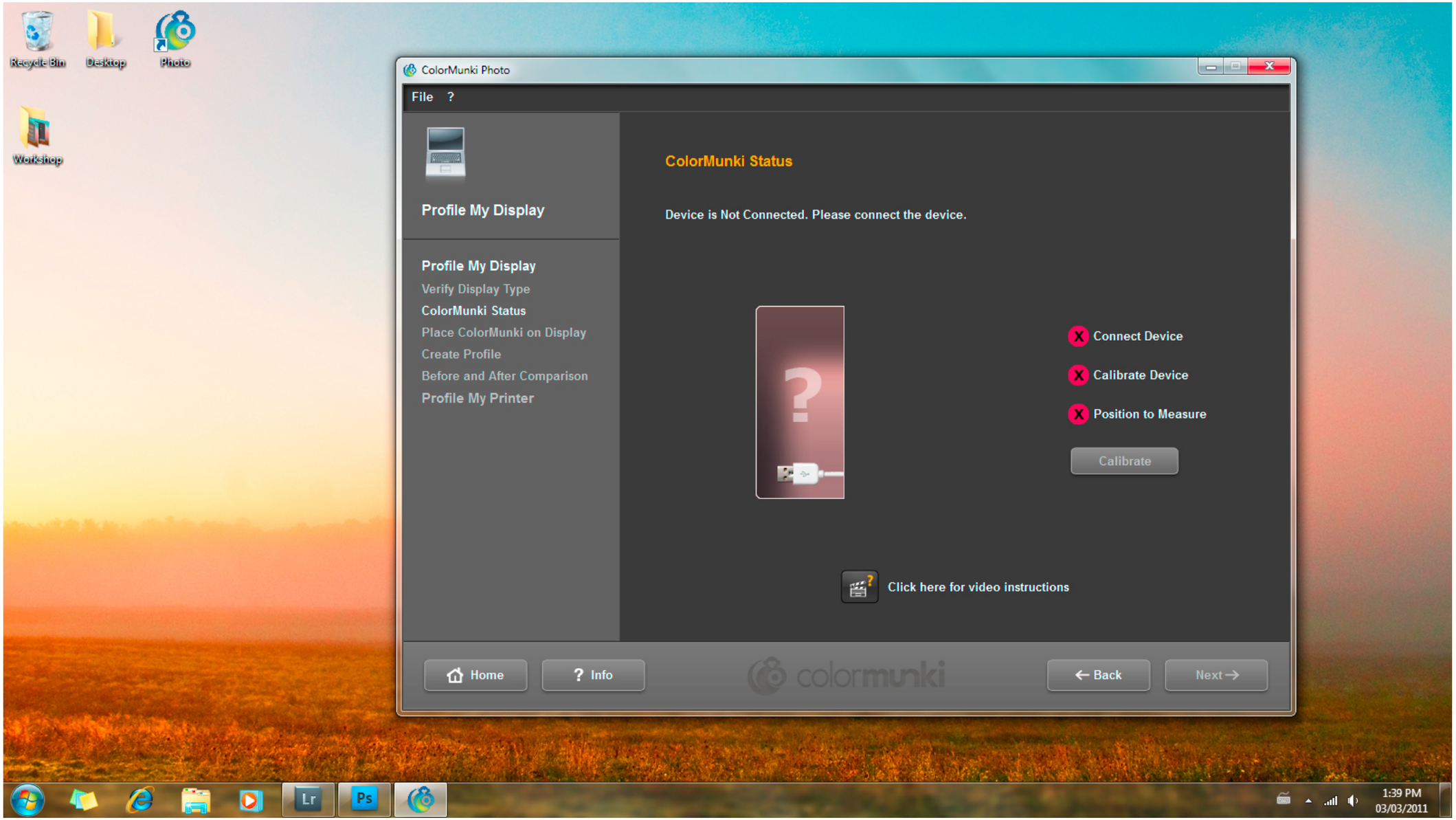
(I preformed the operations shown on my laptop)

Open ColorMunki Photo

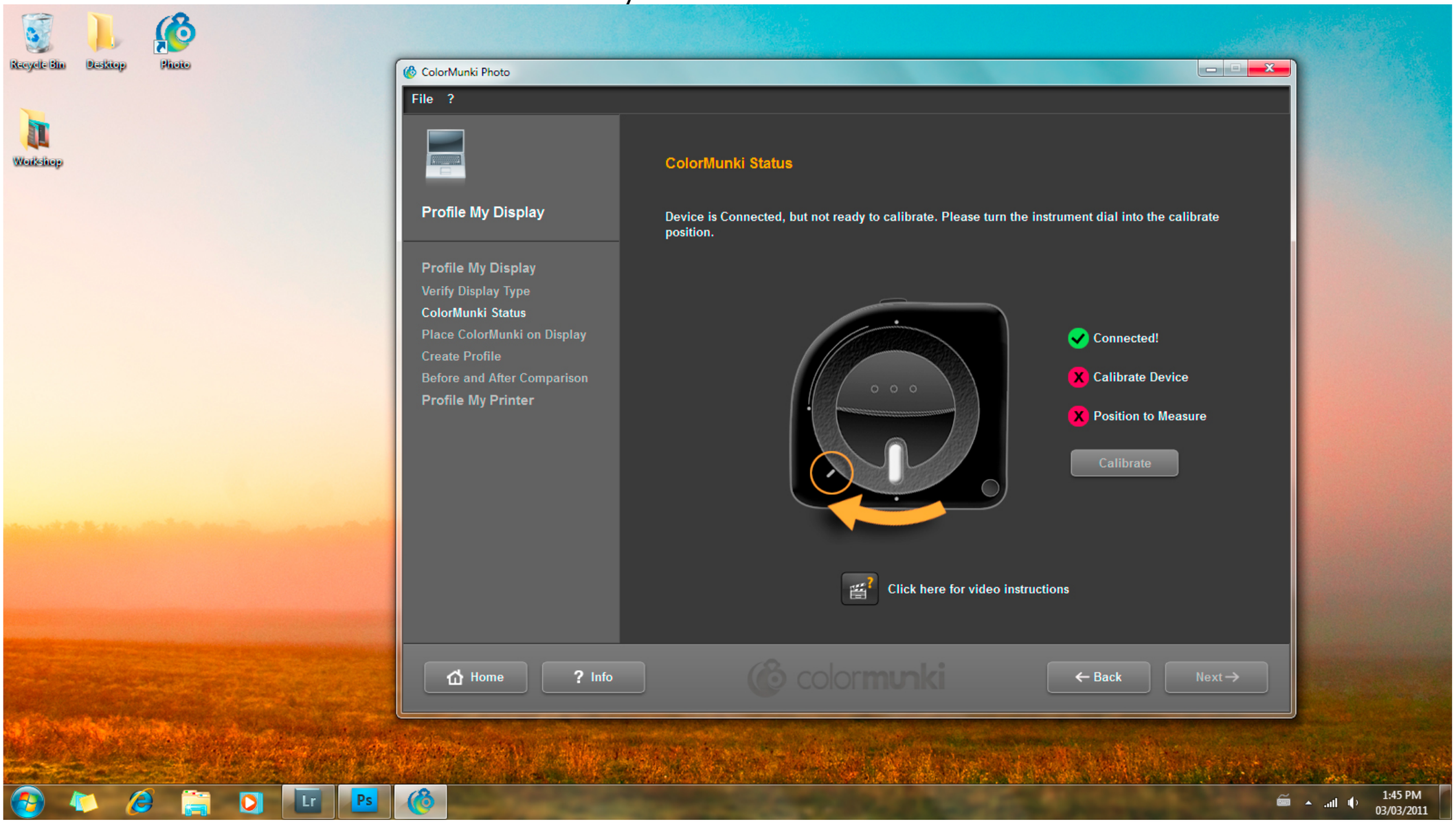
Display Calibration Options (ColorMunki can calibrate two monitors if connected to the computer)



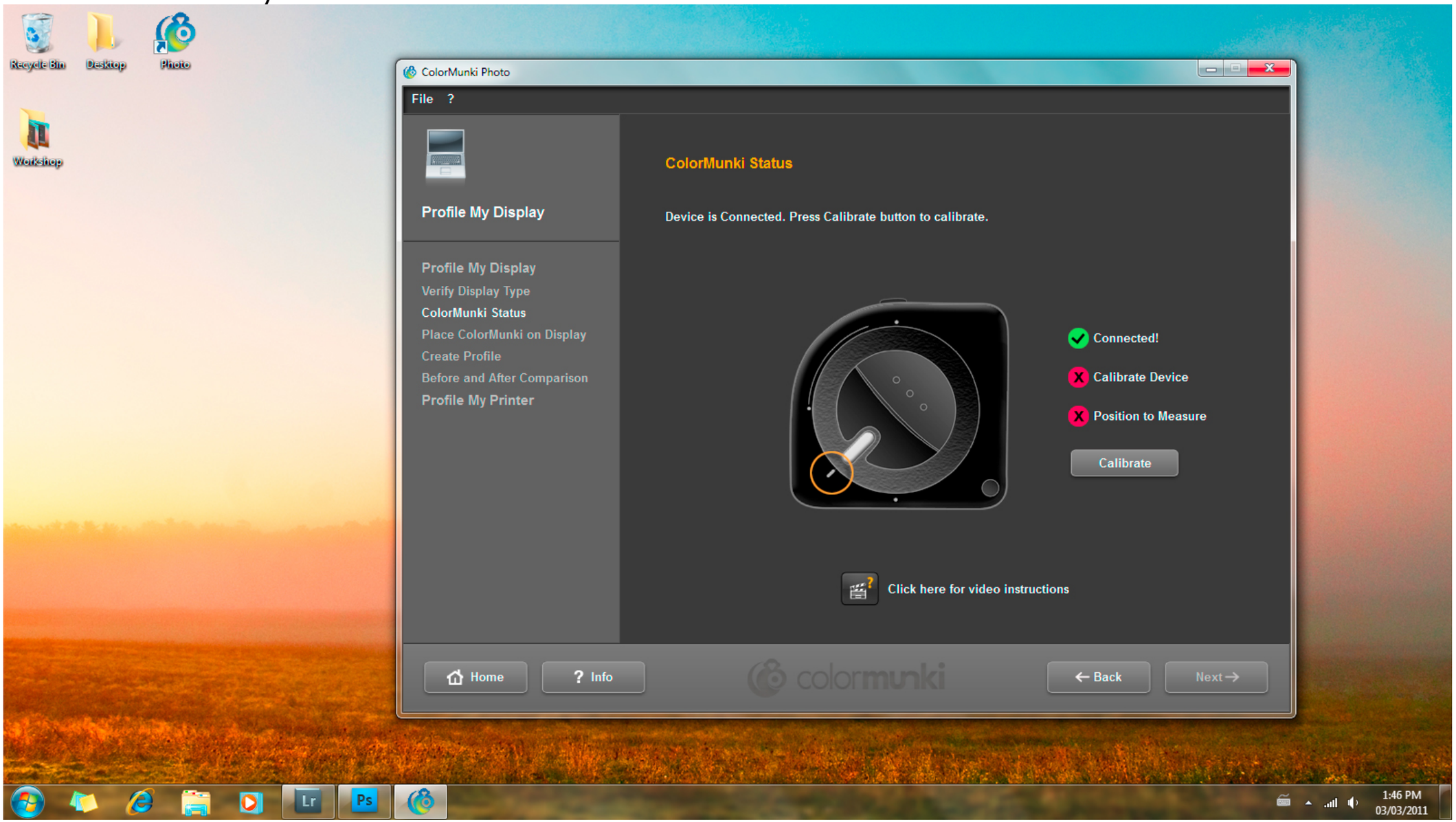
ColorMunki Device is Not Connected



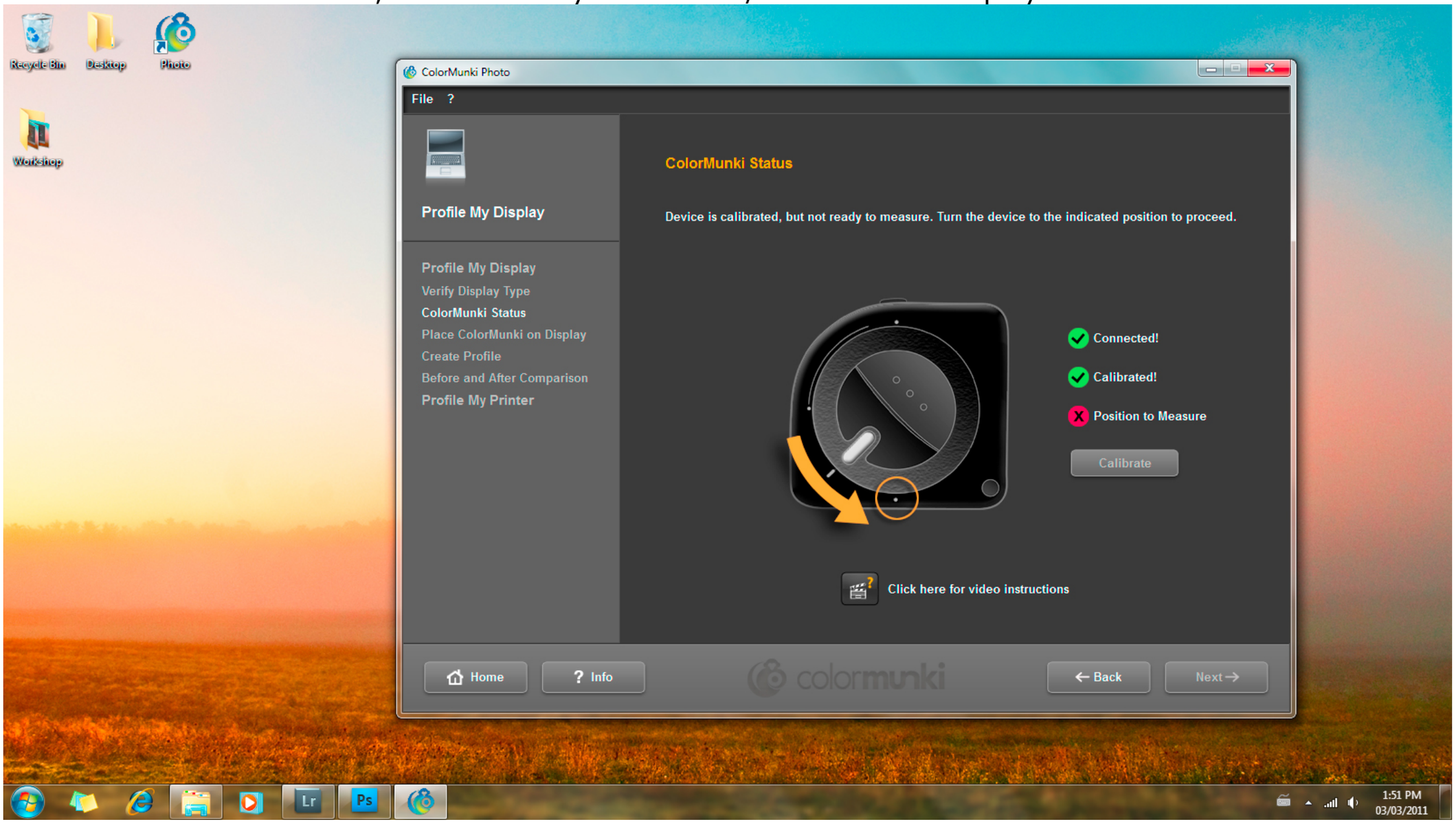
ColorMunki Device is Connected but Not Ready to Calibrate



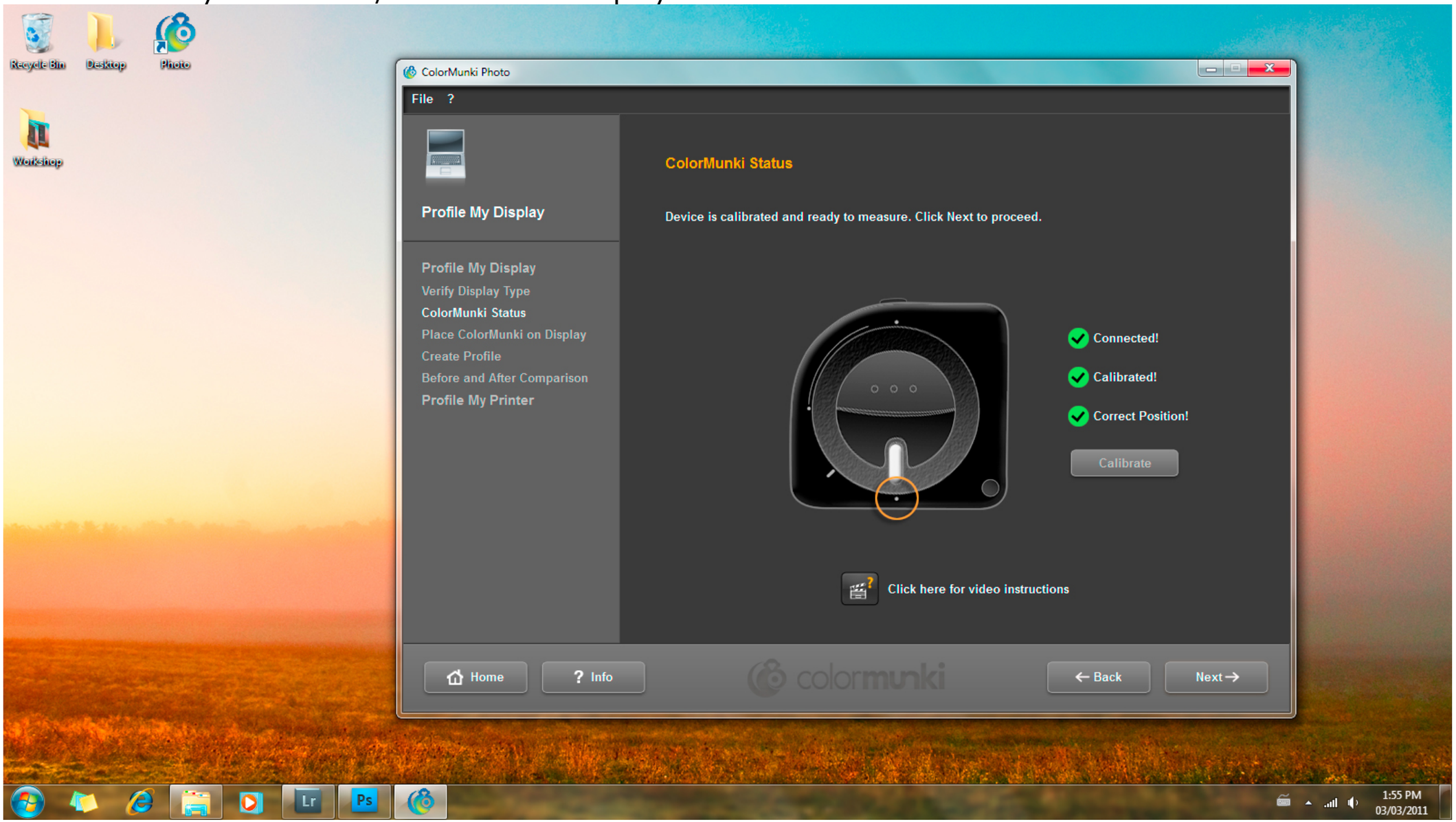
ColorMunki is Ready to Calibrate Itself



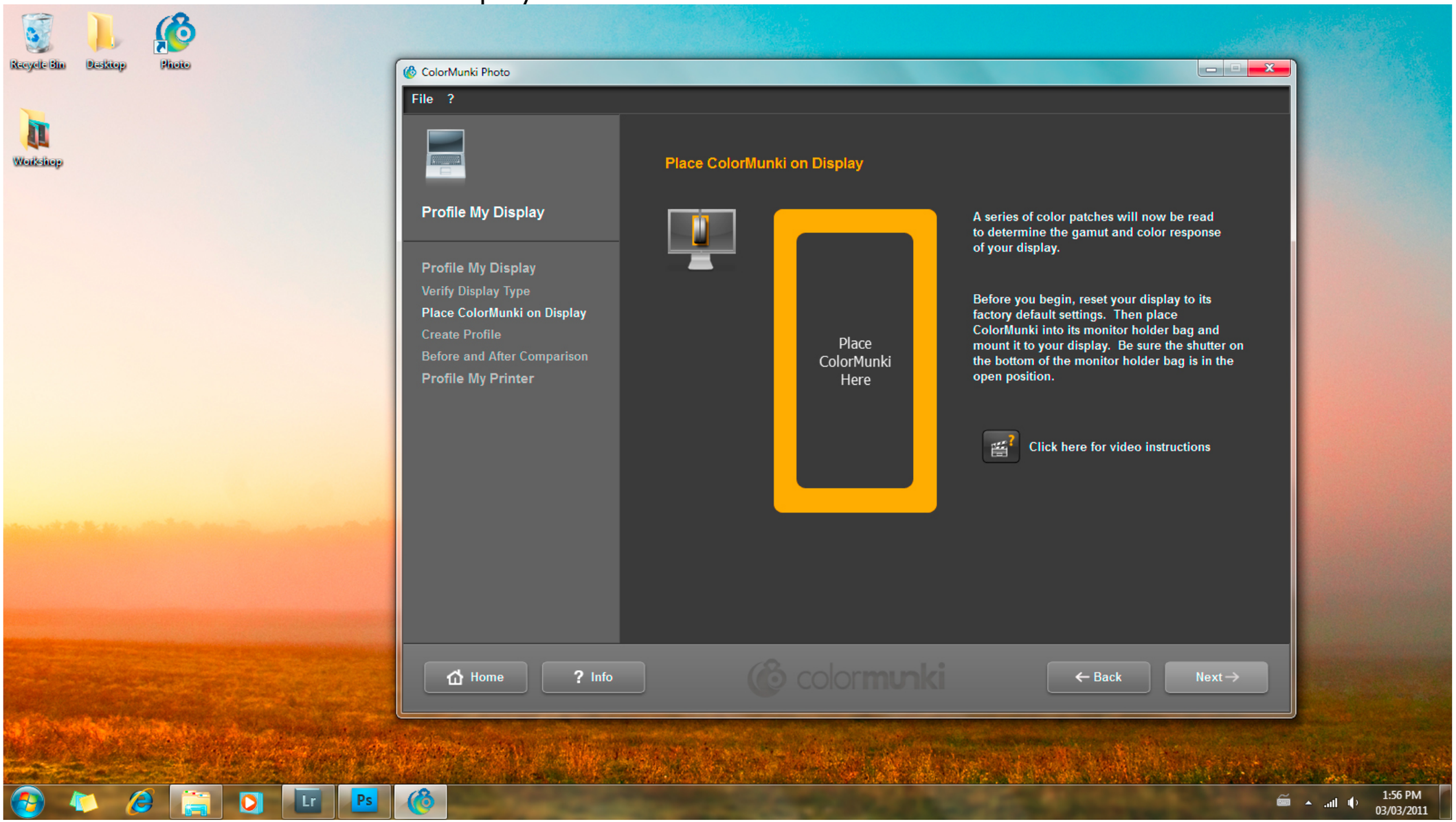
Device has Calibrated Itself, but Not Ready to Measure/Calibrate the Display



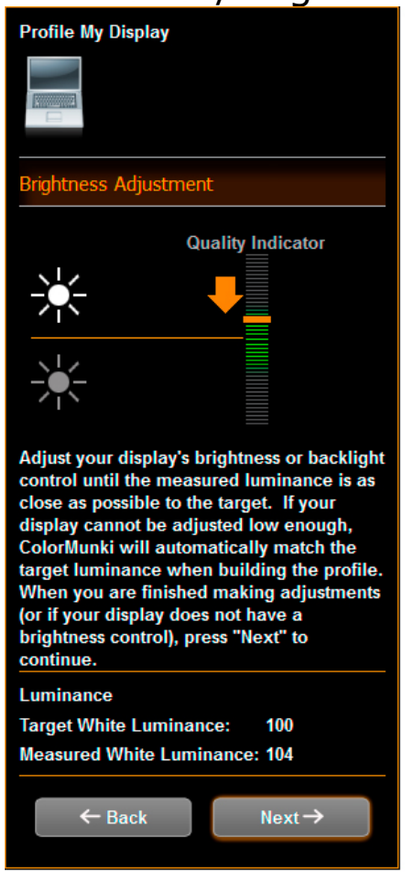
Device is Ready to Measure/Calibrate the Display



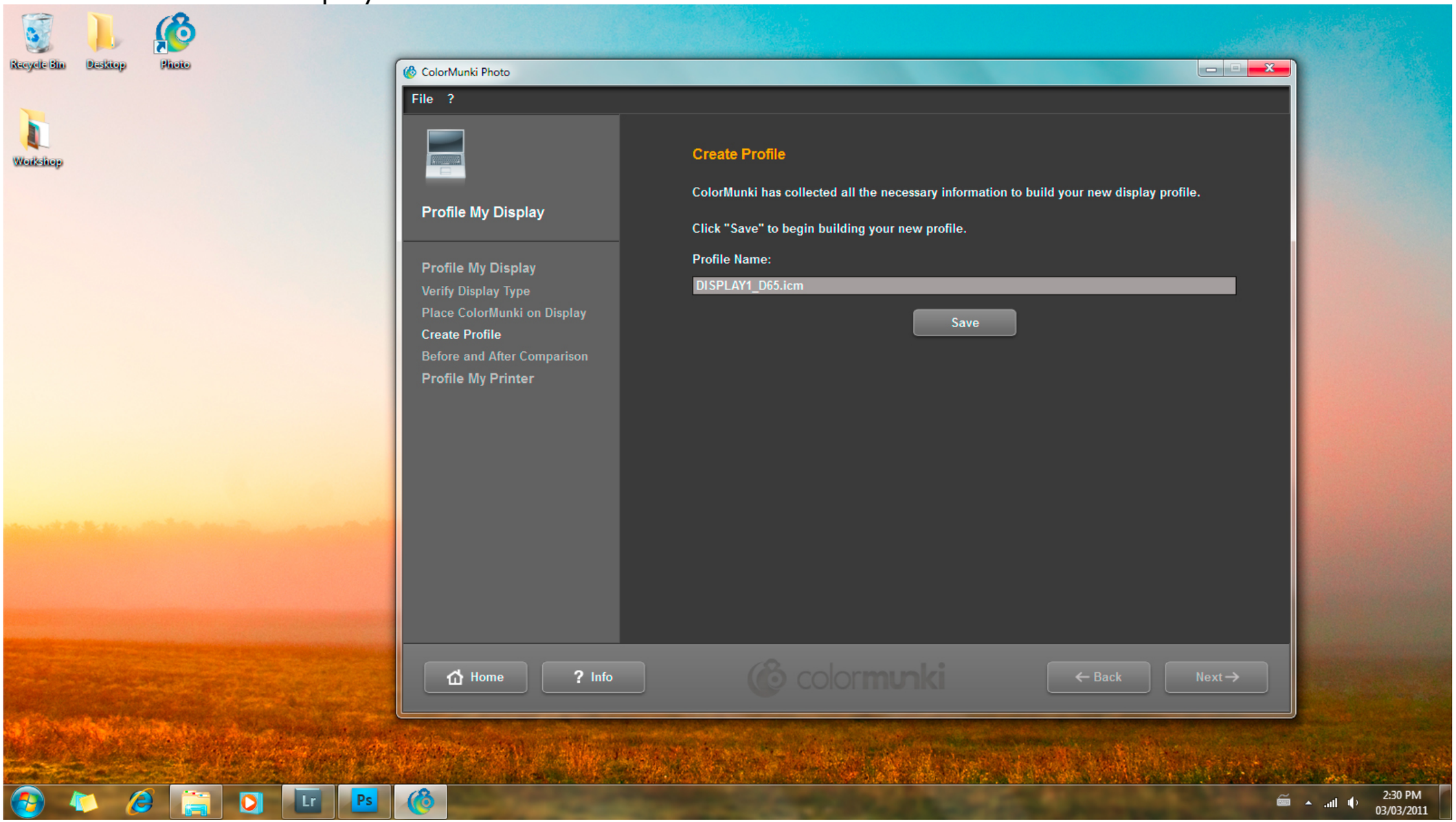
Place ColorMunki Device on the Display



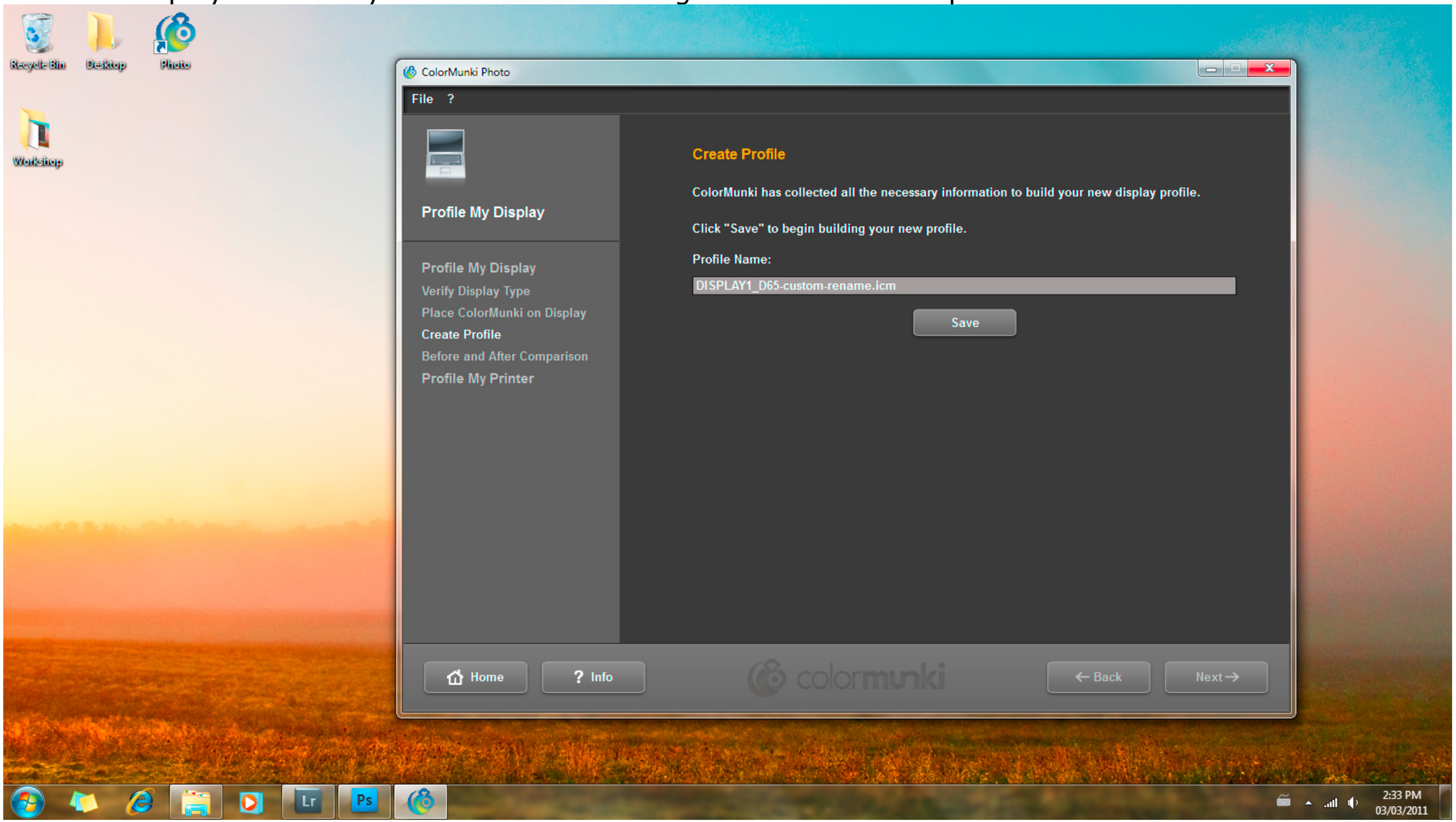
Luminance/Brightness Measured First, Then Colours. Fn + Arrow Keys to adjust brightness on Laptop



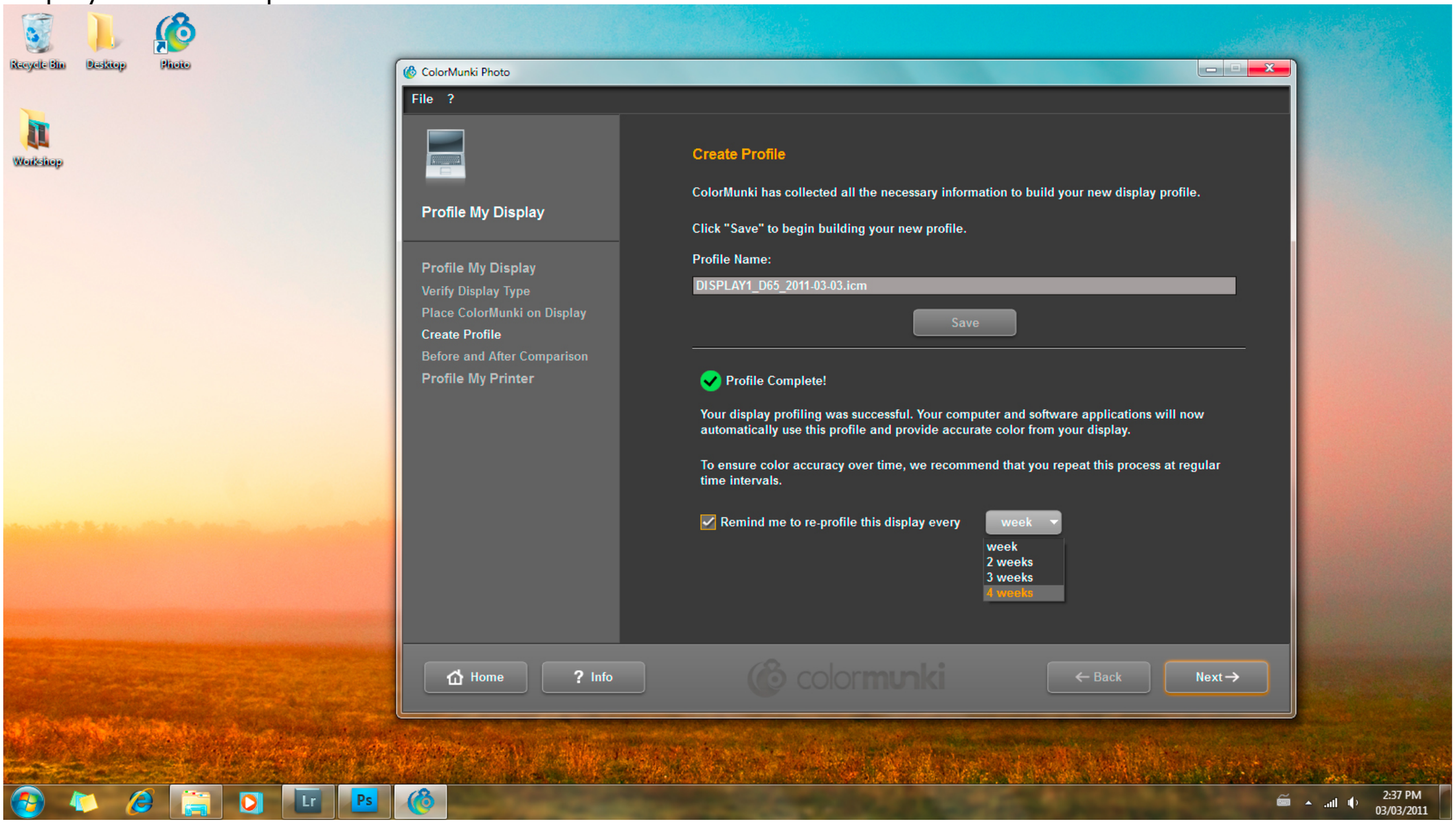
Name and Save the Display Profile



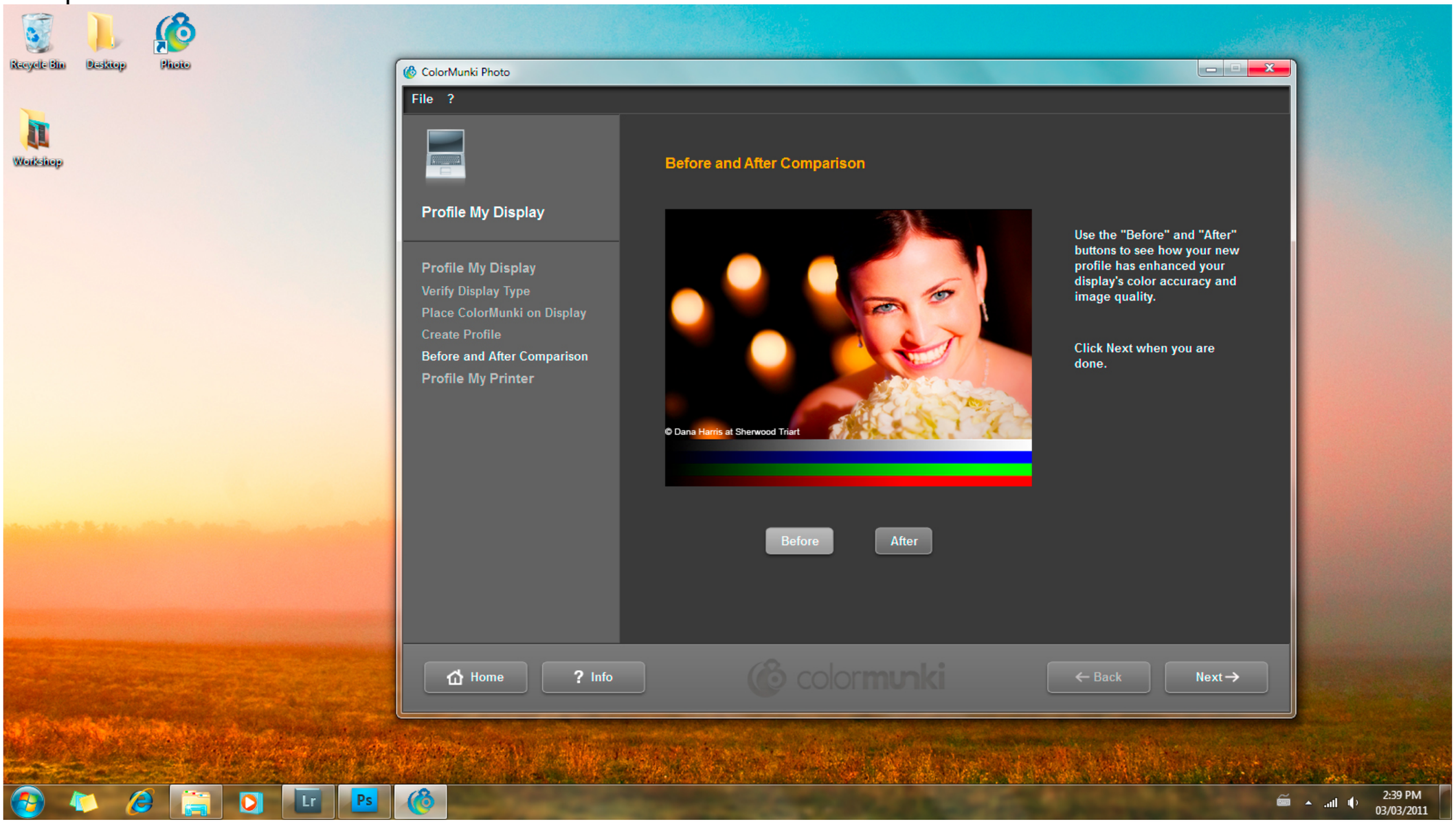
Name of Display Profile May Be Renamed – Adding the Date for Example



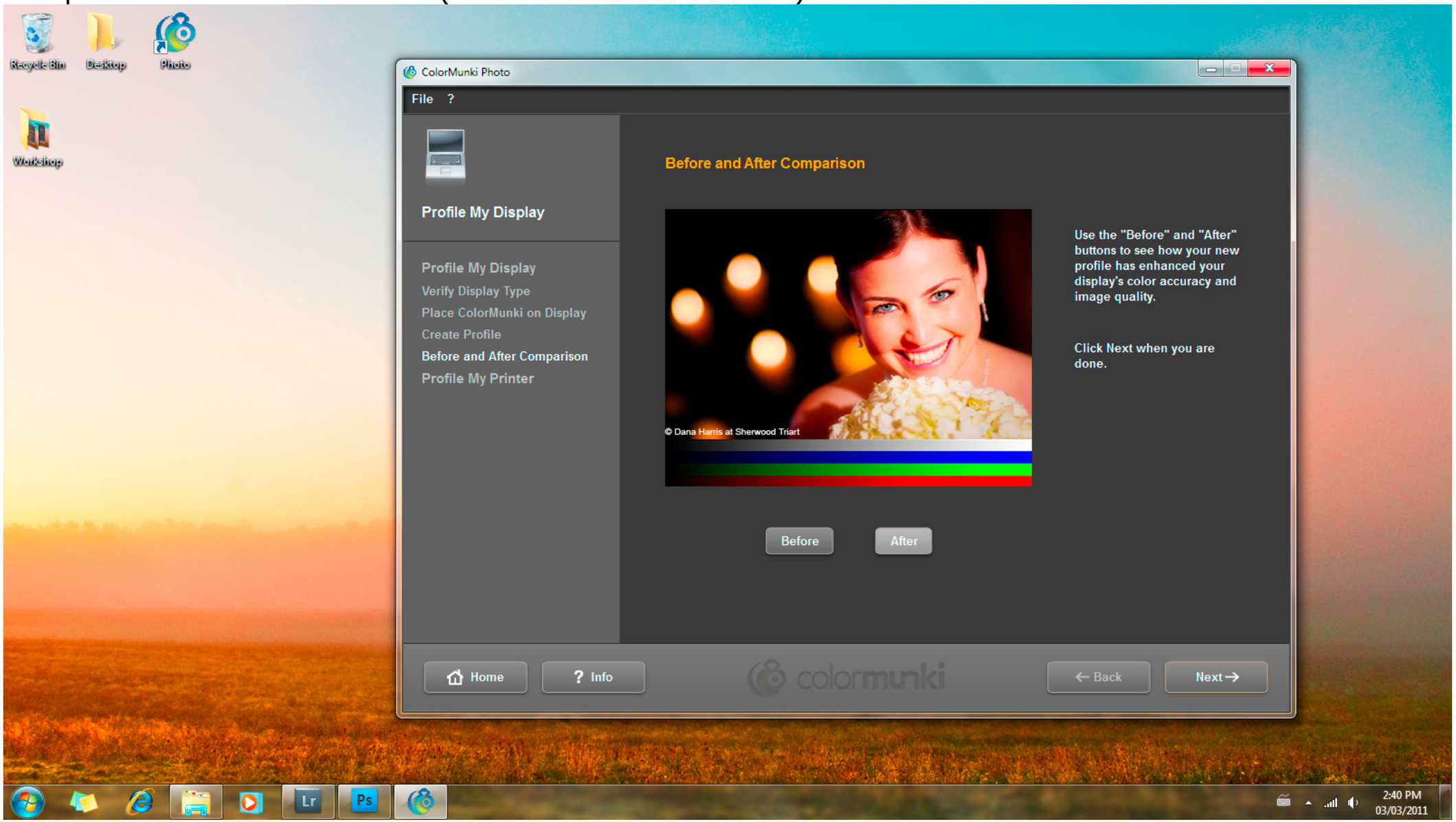
Display Profile Completed. Set Reminder to Recalibrate



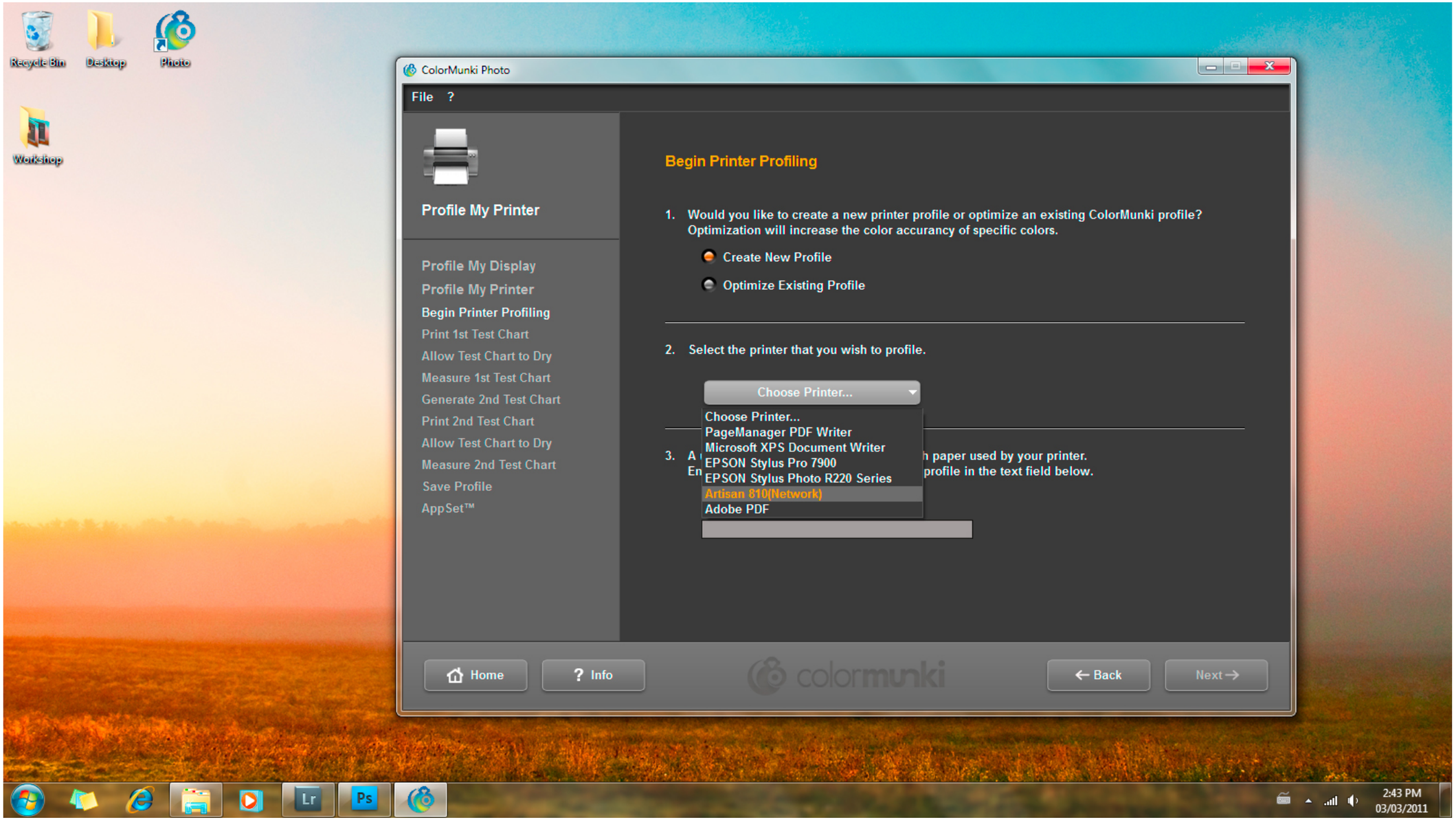
Compare Results – This is Before



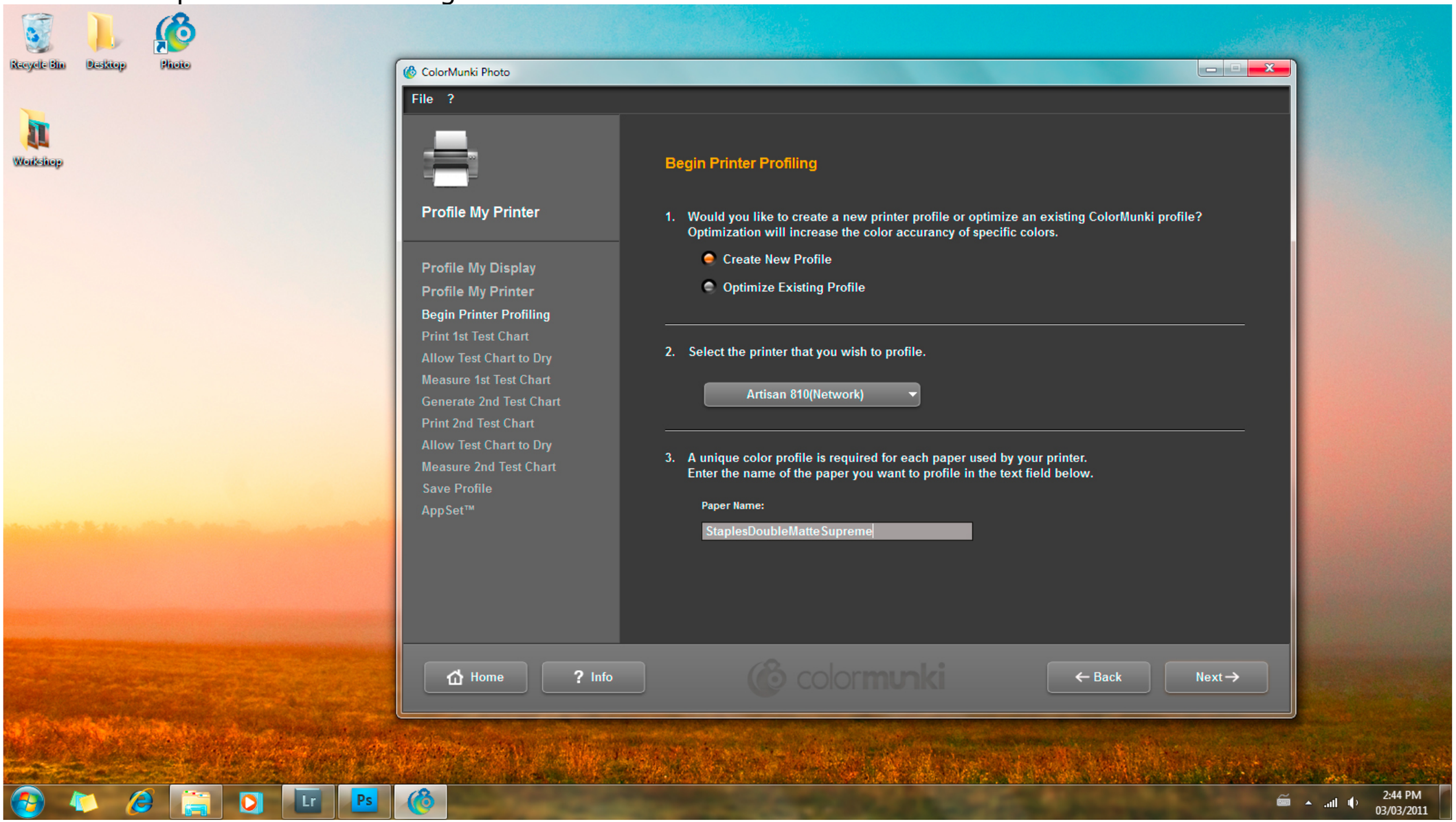
Compare Results – This is After (Not much difference here)



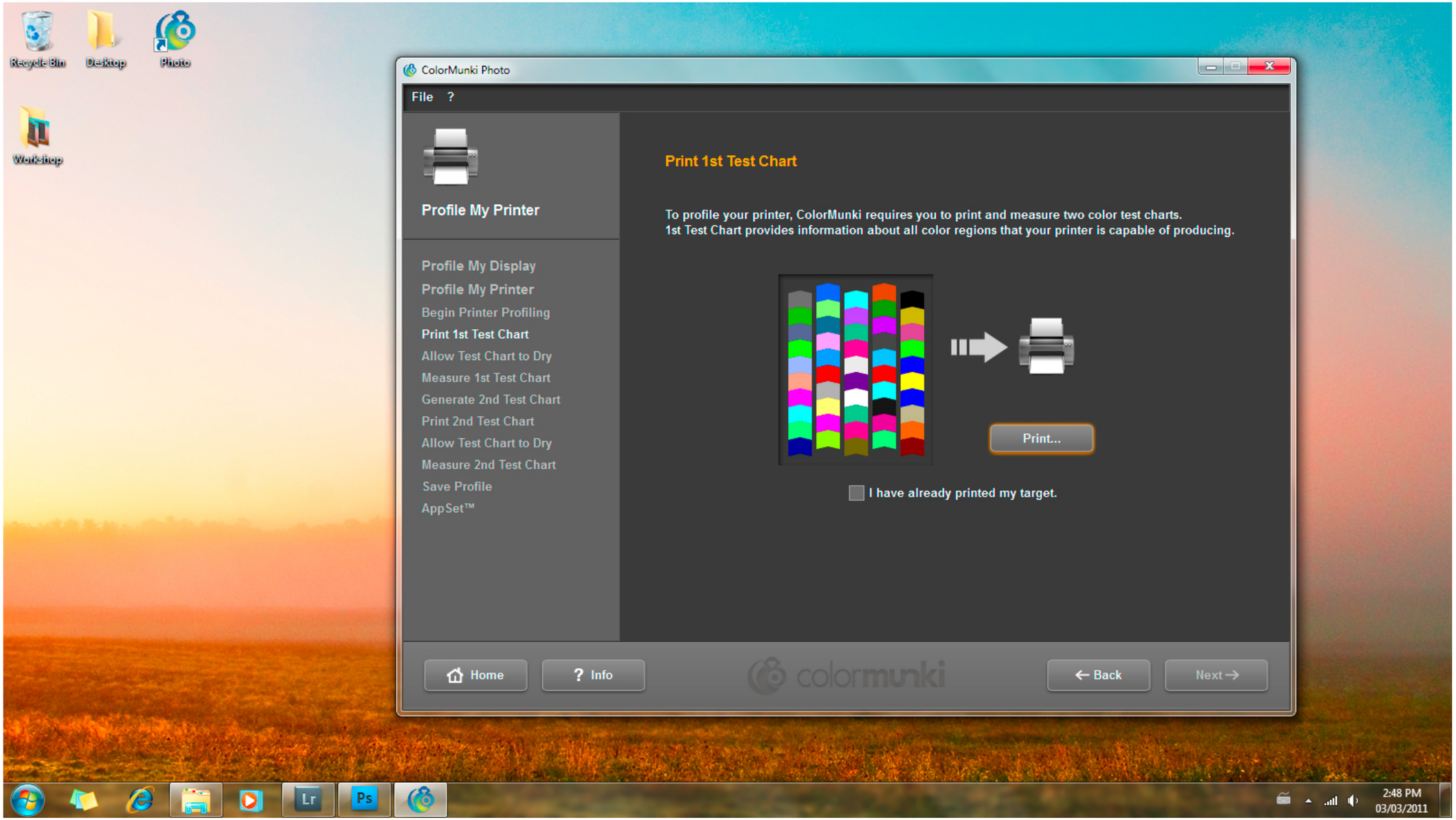
Now Choose the Printer to be Profiled



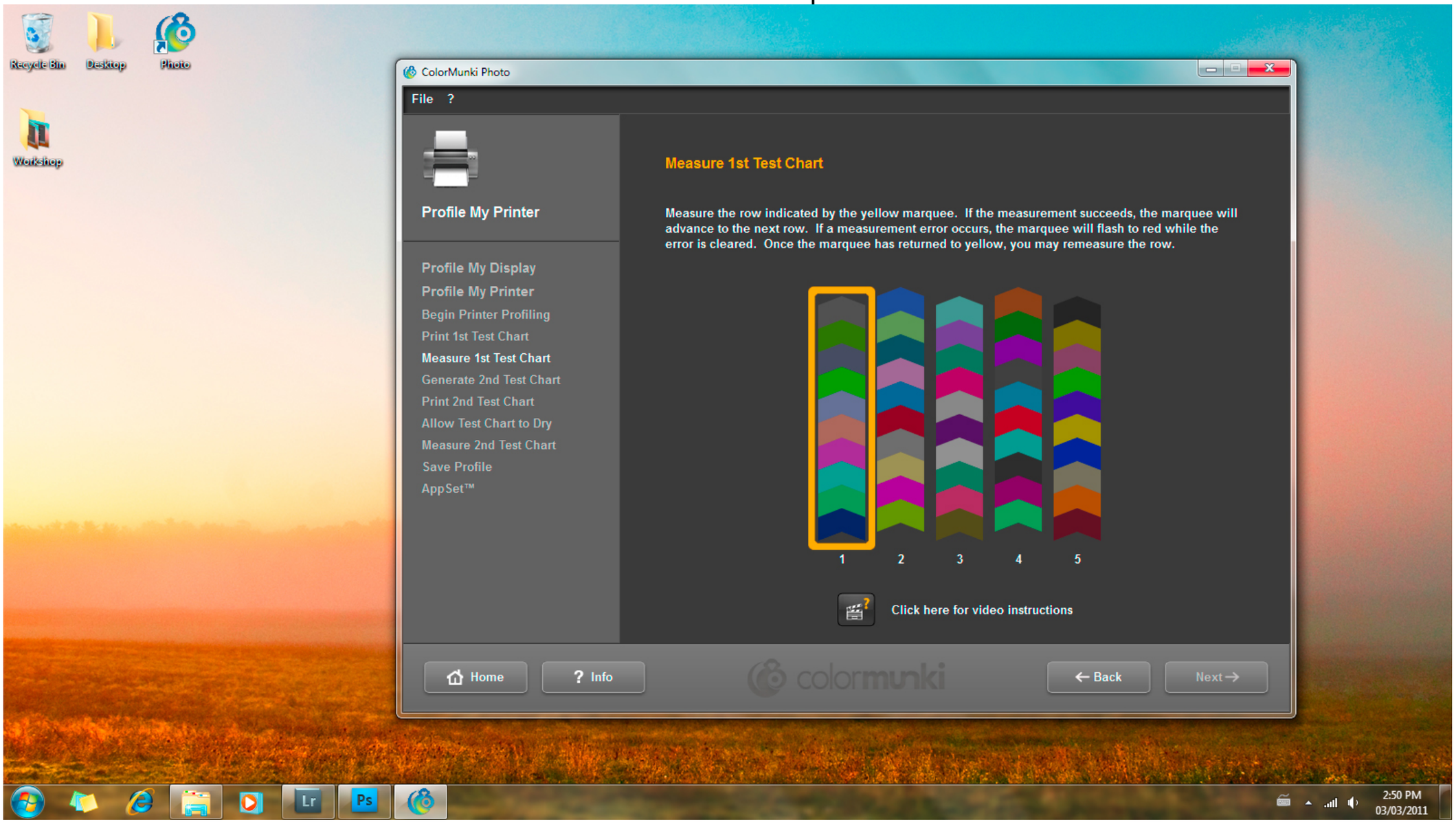
Name the Paper You are Creating the Profile For



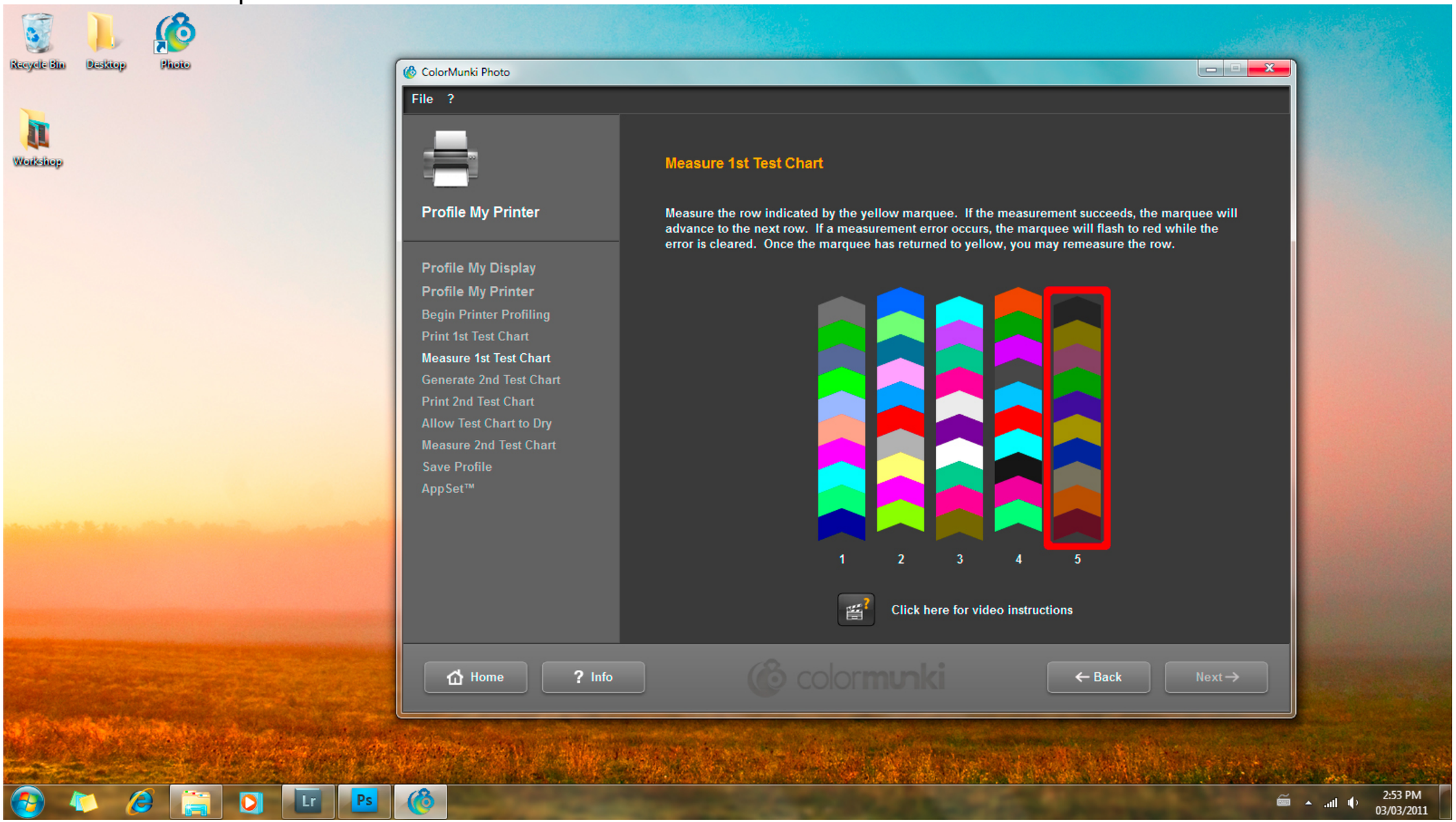
Print the First Test Chart



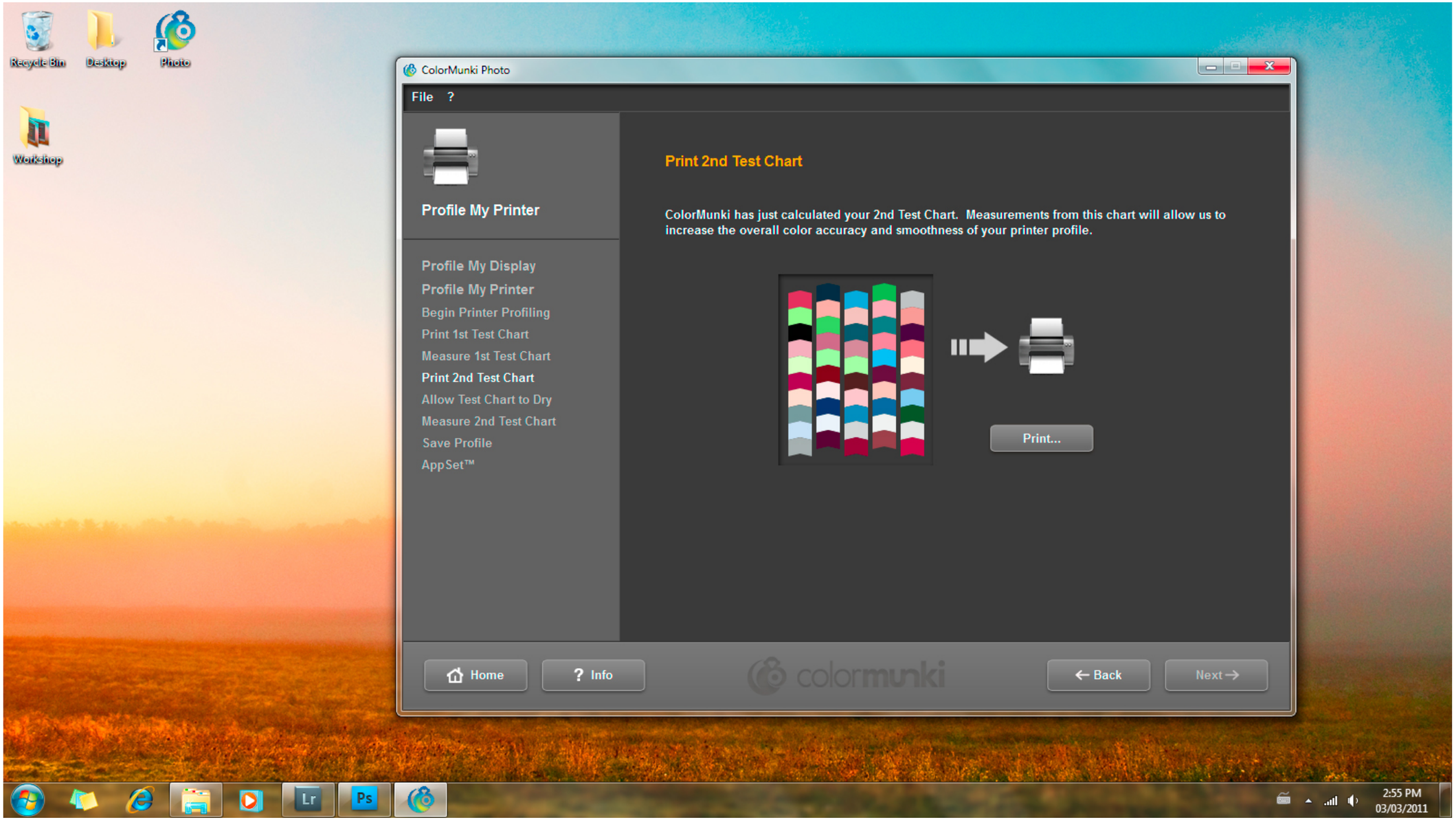
Measure the First Test Chart with the ColorMunki – One strip at a time



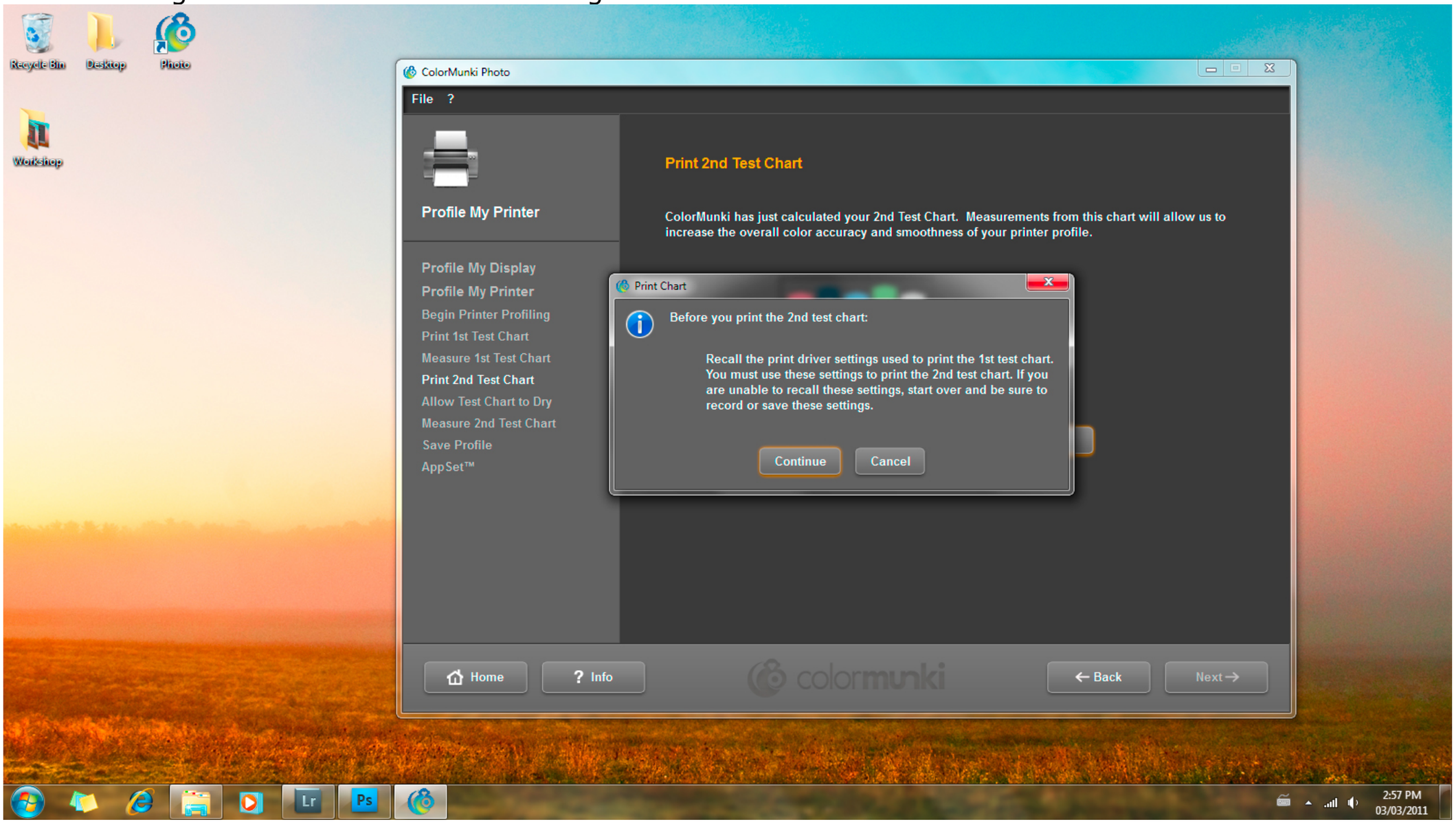
Remeasure a Strip if an Error Occurs



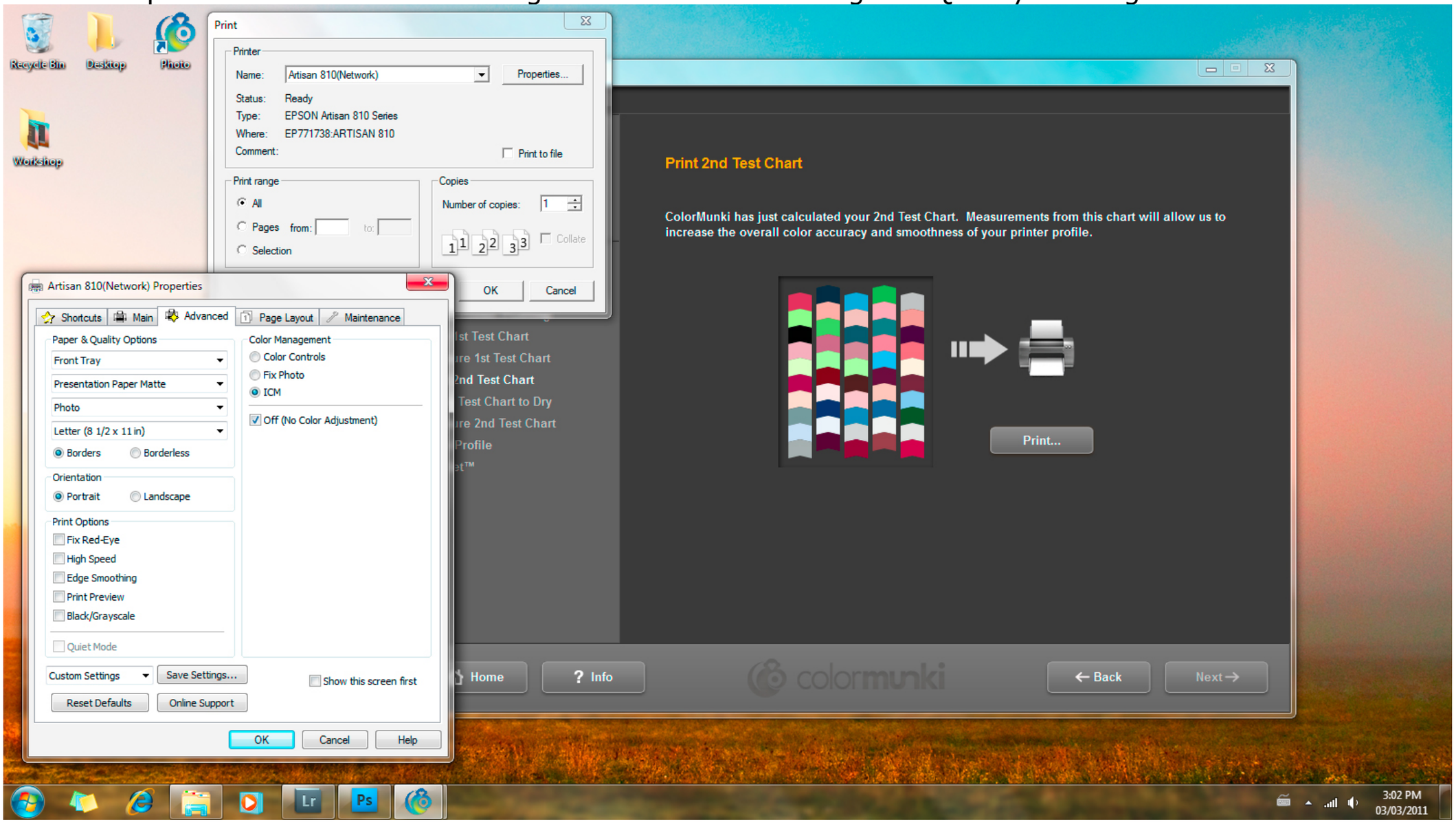
ColorMunki Creates a Second Test Chart to Print



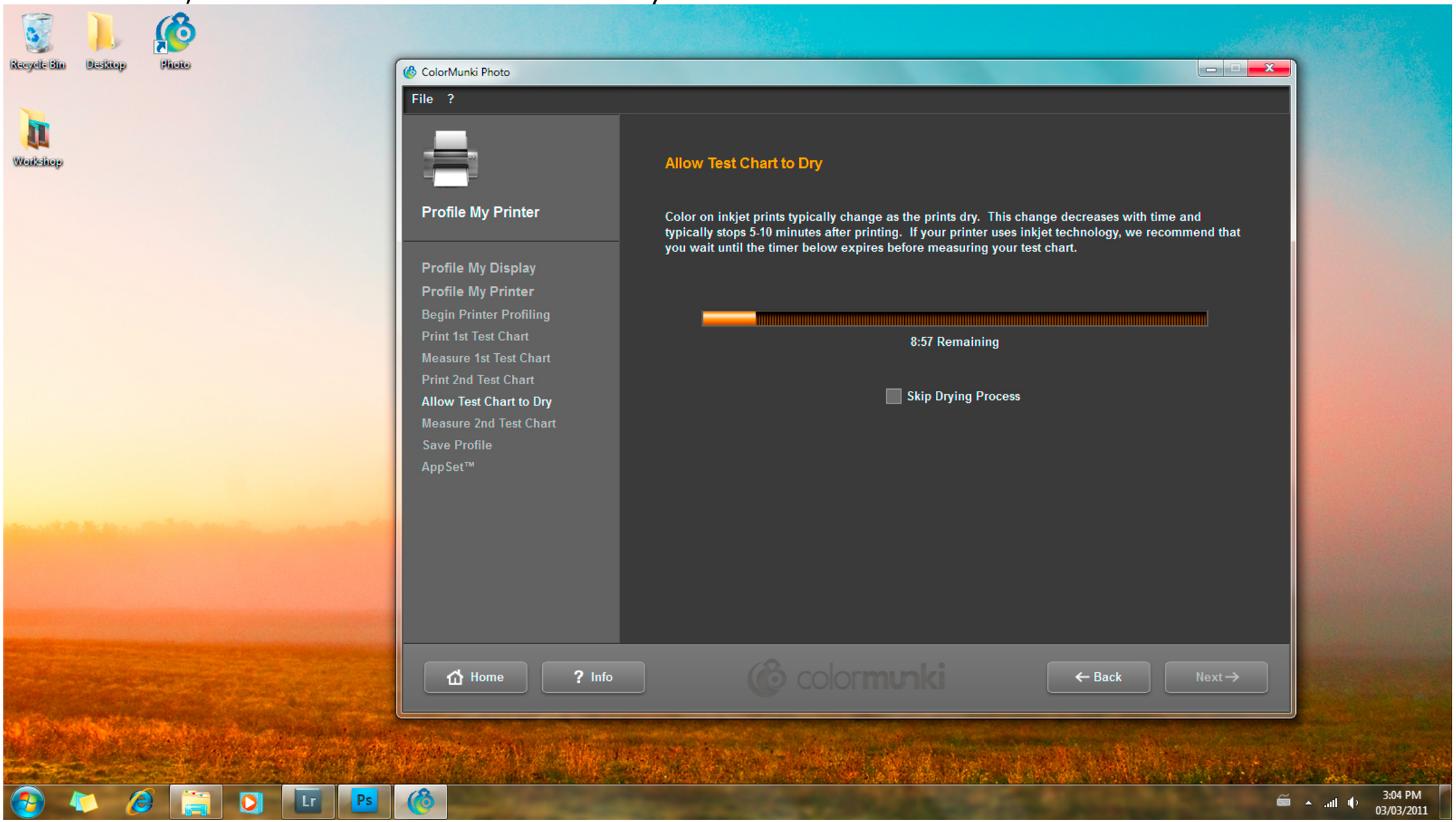
Print Warning: Use the Same Printer Settings



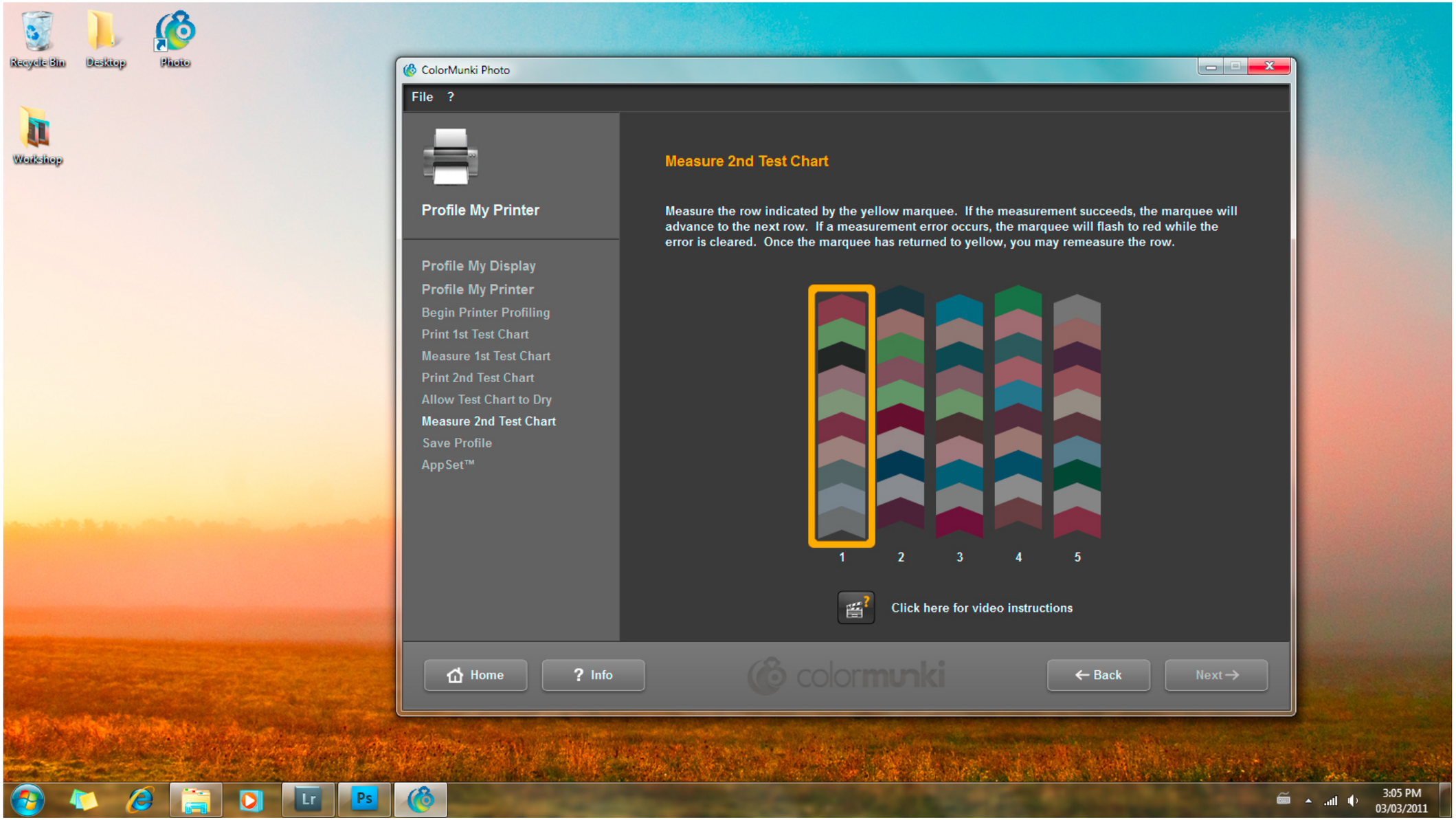
Printer Properties – Printer Color Management Turned Off & Highest Quality Printing



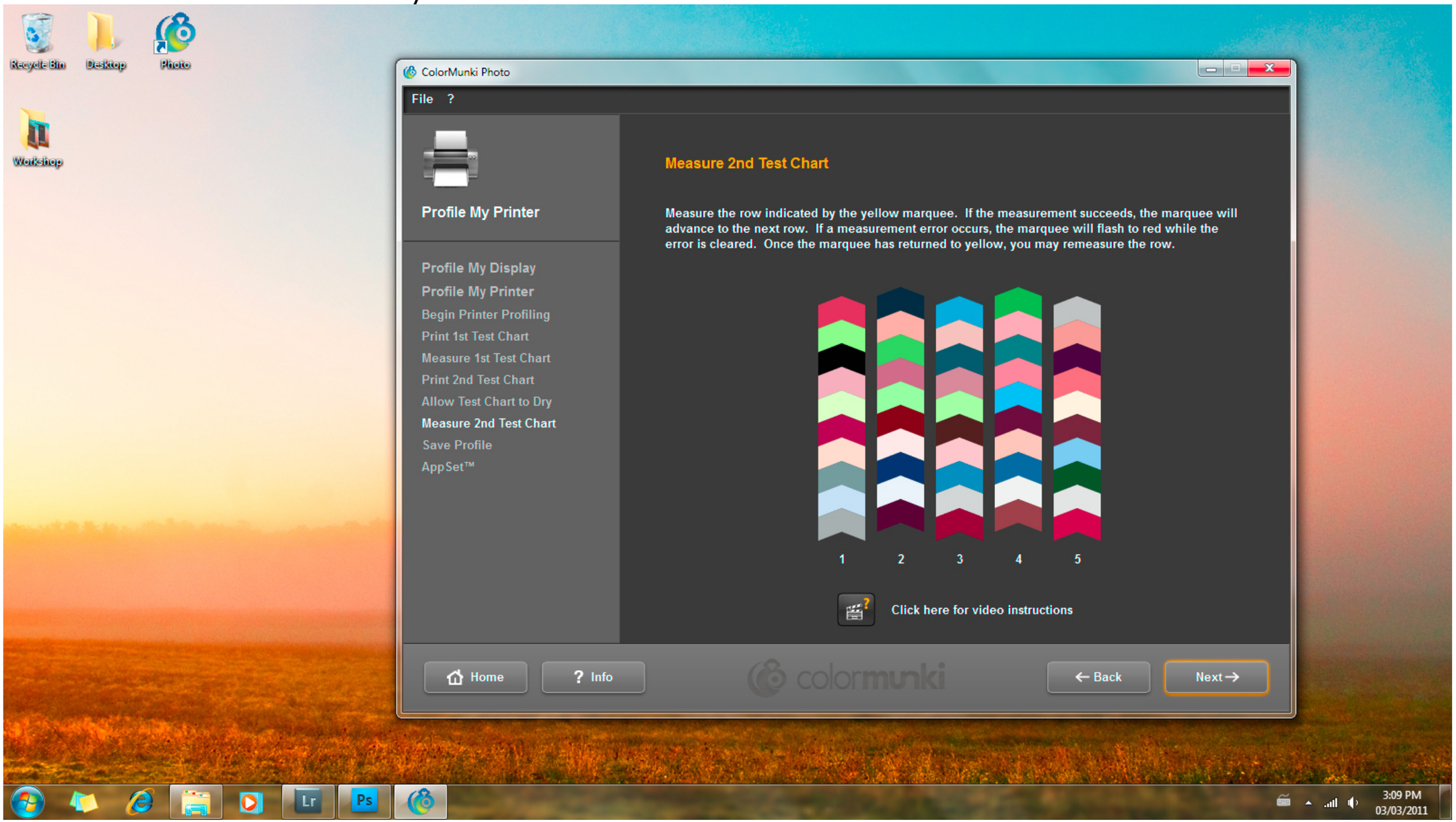
When Printed, Time is Given for the Chart to Dry



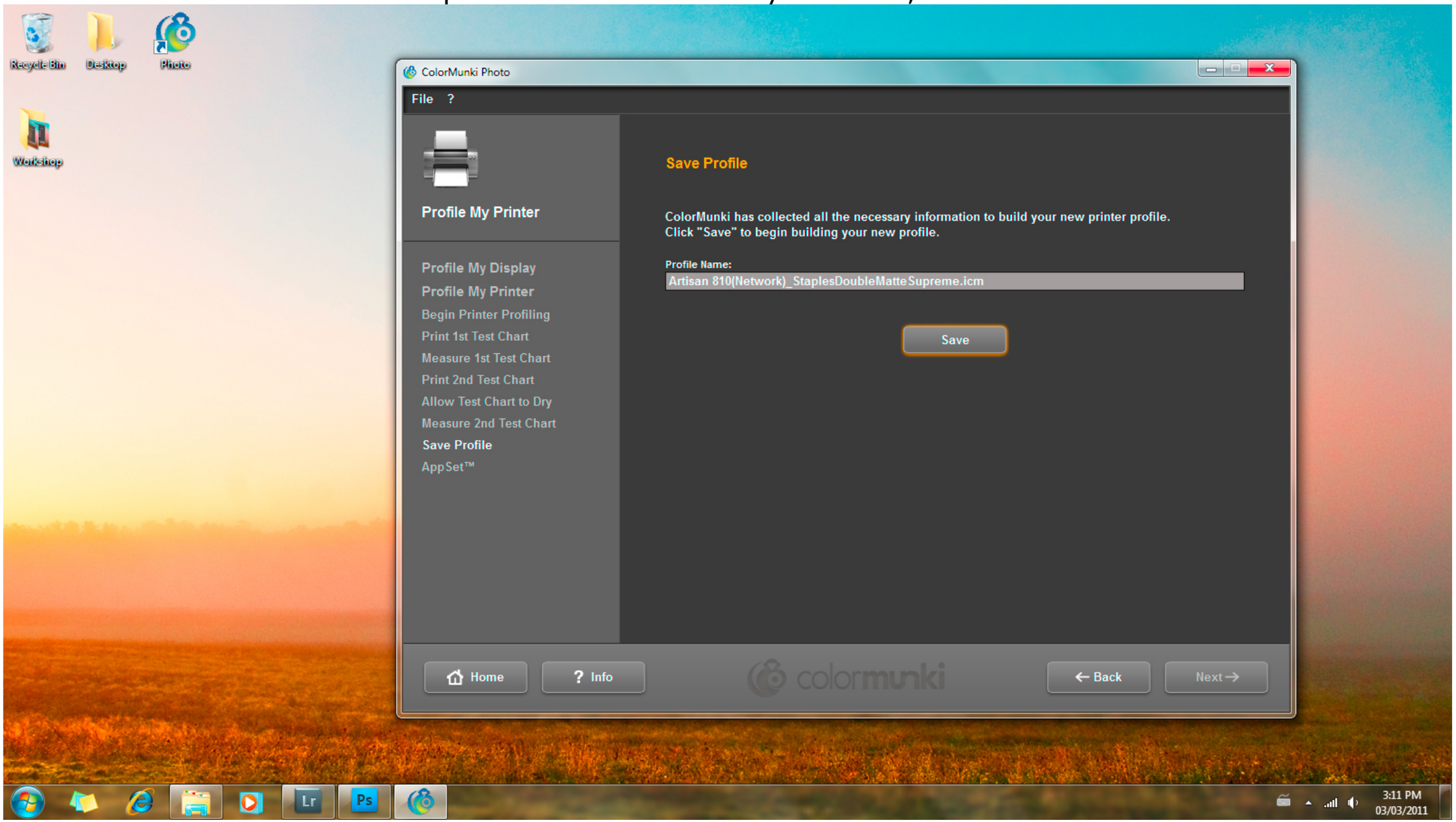
Measure the Second Test Chart



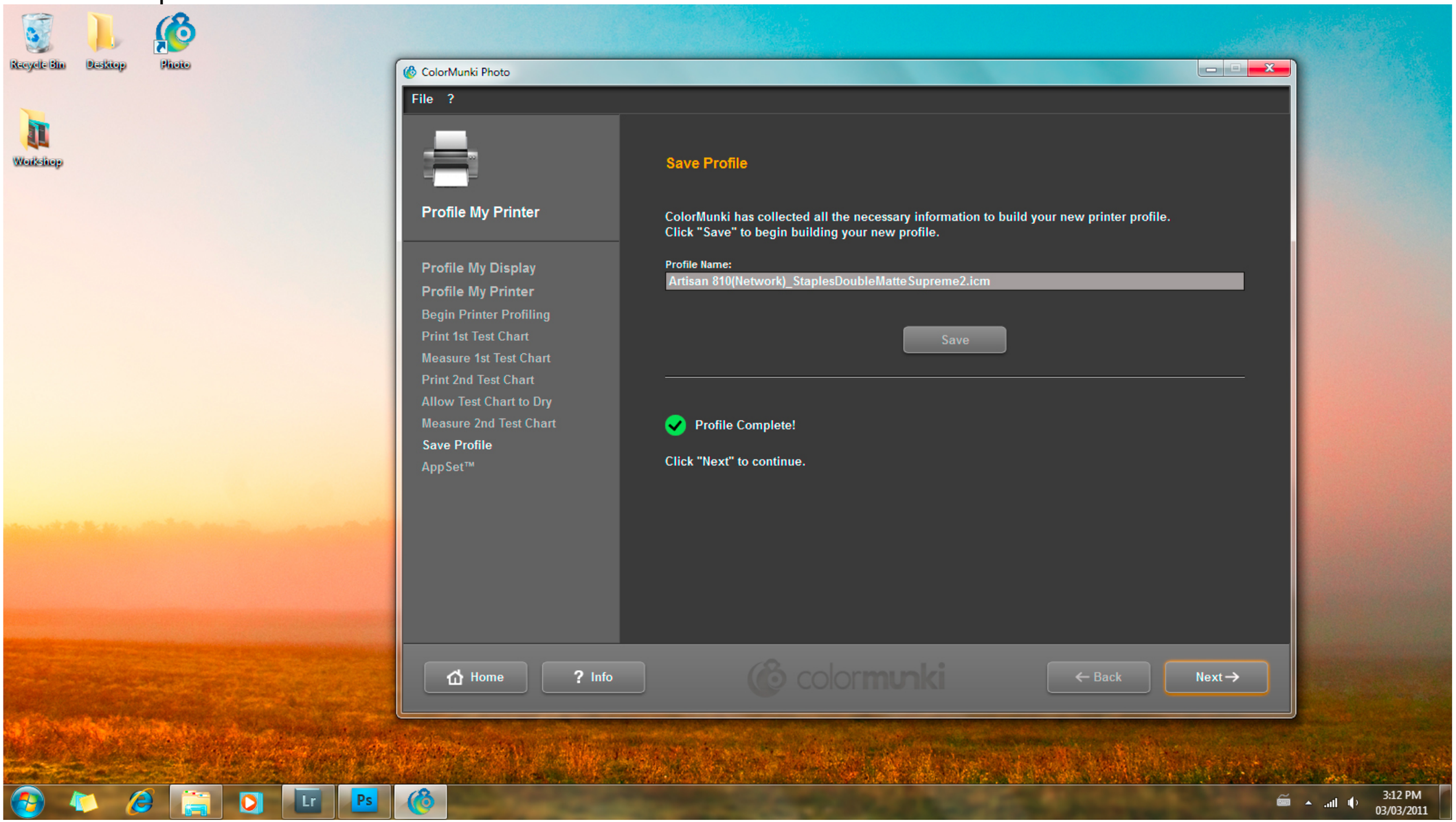
Second Test Chart Successfully Measured



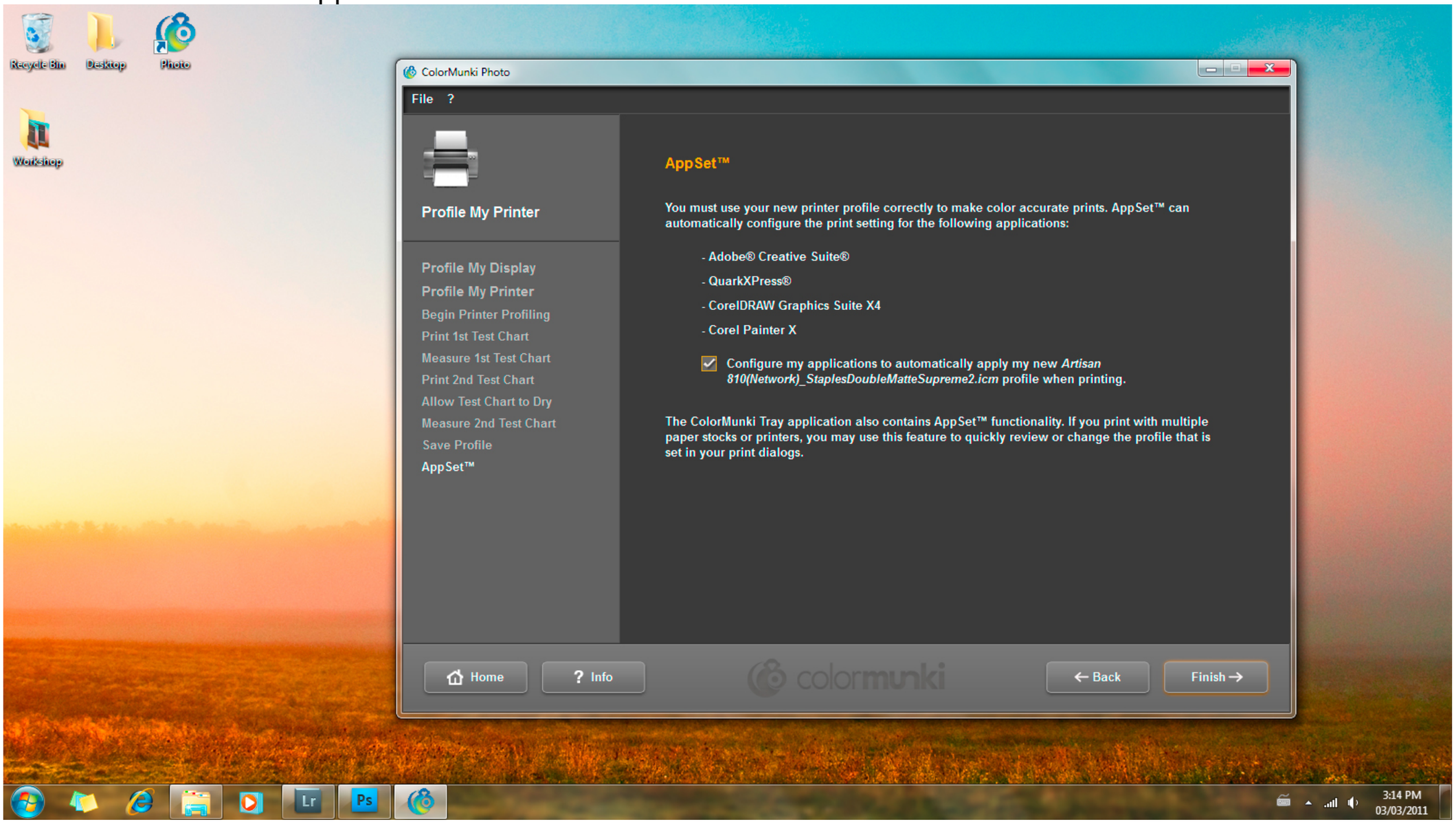
Save Printer Profile. Printer & Paper Names Automatically Included, but the Profile Name can be Edited



Profile Completed



Profile Is Available to Applications – New Profile can be set as the Default Profile



ColorMunki Available for Other Tasks

Camera Calibration with ColorChecker Passport:

- Shoot the ColorChecker Passport
- Camera calibration: Create camera profile
- Restart LR and apply camera profile just created under Camera Calibration. Then synch all other images with the same shooting/light conditions.

Online Resources:

luminous-landscape.com/tutorials/prophoto-rgb.shtml
http://www.xritephoto.com/ph_product_overview.aspx?id=1115
blurb.com/resources/color_management
ronbigelow.com/articles/white/white_balance.htm
photoshop-tutorials-plus.com/8-bit-and-16-bit.html
adobe.com/digitalimag/pdfs/color_managed_raw_workflow.pdf
dpbestflow.org/color/color-management-overview
color.org/index.xalter (International Color Consortium)
zuberphotographics.com/content/digital/color-management.htm
cambridgeincolour.com/tutorials/color-space-conversion.htm

Notes re ICC and ICM files

.icc (International Color Consortium) is interchangeable with .icm (Image Color Management - an alternate extension to .icc promoted by Microsoft)

Location of ICC and/or ICM profiles are:

Mac OS X
/Users/username/Library/ColorSync/Profiles

Windows 7
\Windows\system32\spool\drivers\color

Location of camera profiles (Windows 7):

\Users\(username)\AppData\Roaming\Adobe\CameraRaw\CameraProfiles

Thanks to Peter Steeper and Eric Boutilier-Brown for insights into colour management gained previously, though any errors or omissions here are mine alone.

By: ***Colin Campbell***
For: *Photographic Guild of Nova Scotia Digital Imaging Workshop – 05 March 2011*