

The Consumer Knowledge Gap in Digital Photography

Jay Hitchens; Qualex, a Kodak Company; Durham, NC/USA

Abstract

For all the recent advancements in science and technology in the photographic and imaging fields, the general consumer is now expected to have a higher level of knowledge of photography than they were just a decade ago.

While digital cameras at all price points offer greatly improved algorithms and better image quality than just a few years ago, the process of turning a captured image into a print or gift requires more knowledge and involvement on the part of the consumer than ever before. Only eight years ago, virtually all photographic images were captured on film. These could be viewed only by having a lab process and print the photos. Consumers wanting to purchase from the limited assortment of photographic gifts had only to take a print, slide or negative to a drug or camera store, fill out the envelope, give it to the clerk and pick up the item days later.

Contrast that with the growing variety of photo-based products today, and the level of understanding required of the consumer to successfully manage the purchase of one or more of those products. Resolution, aspect ratio, image compression, file format, storage, and back-up are subjects that did not require consumer understanding in 2000. Today, there is a great deal of confusion and inaction on the part of the consumer, a new approach from the industry could increase sales and help get images off the hard drive.

This paper is the culmination of a project by the members of the PMA SPFE Advisory Committee, and offers insights into problems encountered by website and retail photo consumers.

Introduction

While the current advancements in science and technology have created a new and exciting digital era for consumers there is at least one challenge to be met. The general consumer is now expected to maintain a sophisticated level of technical knowledge for making prints or gifts from their digital photographic files. There are many customers who have not achieved this level of competency, and have essentially left the marketplace in frustration. The gap in consumer knowledge means they think it is harder to access quality products, so they either give up or complain. Since this knowledge is assumed by those who work in the industry, there is an additional burden on the providers of photo services to explain why certain customer complaints are unwarranted.

This study will list the most common areas where such confusion lies and indicate the basis for the misunderstandings. The findings result from first hand experience with consumers by the members of the SPFE Advisory Committee. We do not have answers addressing all the problem areas, but continue to search, and invite participation from the industry.

Prints Do Not Match Consumer Expectations

“Why doesn’t my print look like my monitor/memory/original print?” The consumers’ expectations have changed drastically in the past eight years because consumer photography has changed so radically.

In the film era the consumer had only their memory to compare to the prints sold to them by the photo processor. Their memory was the only benchmark, and it was often several days, maybe weeks, that elapsed from the time of the photo until the print was seen.

With a digital camera, the paradigm has changed completely. The consumer can see their image immediately on the camera or cell phone screen, then see it on a computer monitor soon after. There is less time elapsed between capturing the image and viewing it, so the first benchmark for the consumer is the image on the monitor. That view of the image sets their expectation, and it may or may not be accurate.

While exposure and focus were both variables in the film cameras, digital cameras offer many more variables, like those for white balance, which can have a major impact on the look of an image. A consumer who is unaware of the effect of different variables is at risk for capturing images in a way that will not meet expectations.

Comparing a photo to an image on a computer monitor can be misleading. The differences in appearance and the lighting in the room can make the images look very different. Calibration of consumer monitors is non-existent, and not understood nor explained well by the industry. Typically, the tool to calibrate the monitor can equal the cost of the consumer monitor.

Image enhancement applied to an image can improve it greatly. Digital cameras in all price ranges have the ability to correct red-eye, highlight and shadow density, white balance, and exposure. The image is corrected before the consumer ever sees it, even if they are unaware of it.

Most photo printing locations offer image enhancement as part of their standard print capabilities. If the camera has enhanced the image and then the photo finisher also enhances it, colors can be exaggerated or changed significantly. Changes made by a consumer using photo-manipulation software will only exacerbate the problem.

Many websites offer the consumer the ability to turn off image enhancement during printing. This can be a blessing and a curse. For the knowledgeable consumer, this function will lower the potential for dissatisfaction with their final prints. For the average consumer, however, an automated system that reads metadata and reacts accordingly would be more helpful.

Aspect Ratio

Consumers can see something today that they were unable to see when shooting film, a top to bottom, edge to edge view of their image. They can see this before they choose to print the image, and this ability to preview the image has changed their expectations dramatically.

Until recently, the first image the consumer saw was their print, with only the negative as reference. Index prints were rare, and not a great reference when they were provided. If the print cropped off part of someone's head, or cut off people on the ends of a group shot, it was often assumed that was the photographer's fault. Now the consumer can see every pixel of their image, and their expectation is that their prints will look the same as the image on their monitor.

Most digital cameras employ sensors which conform to a 4:3 aspect ratio, so a 4 x 6 print is no longer the ideal size. Some new cameras offer multiple aspect ratios, such as 4:3, 16:9 (fits an HDTV screen), and 3:2 (the best choice for 4x6 prints).

Aspect ratios of Common Print Sizes

Print Width	Print Height	Aspect ratio
5.33	4	4:3
6	4	3:2
7	5	7:5
10	8	5:4
12	8	3:2

The chart above shows there are only a few print sizes that match camera aspect ratios exactly. Most common print sizes do not match sensor aspect ratios, so that some cropping of the original image is unavoidable. The solution for the retailer is to provide an explanation and examples for the consumer and help them make the choice that best suits their needs.

Aspect Ratio Examples



With crop-to-fill, the image is enlarged until it completely fills the print, which causes the ends to be enlarged past the edges of the print. (See crop-to-fill example above.)

When crop-to-fit is chosen, the image is enlarged until 100% of it fits on the print, which often leaves white edges on the sides of standard print sizes.

Submitting an image for printing on the web is a very different consumer experience than using a kiosk in a retail store. Many websites do an excellent job of alerting and explaining this problem to the consumer. Some will show a shadowed area at the ends of the print and allow the image to be moved within the print

borders for best results. Ritz Pix is one example of a web site that explains the problem well.

Image resolution is not well understood

“Why doesn't my 6 MP camera make better prints than my old 3 MP camera?” “Why aren't eight megapixels enough to make a poster?”

Whether viewed on paper or displayed on a computer monitor, the photographic image is made up of very small dots. These dots represent the information that makes up the image (color, brightness, etc.). Picture information is measured as Pixels (Picture Elements) Per Inch (PPI). A pixel is the smallest perceivable portion of an image. The more pixels that are used, the clearer the picture will be (within limits). The more pixels that are used to make up the image, the larger the image file will become.

Computer monitors and camera sensors are measured in pixels. An image that looks good on a monitor (at 72 PPI) may not contain enough information to make a decent 4 x 6 print. It might print well at a postage stamp size, but not for larger print sizes.

The megapixel rating of a digital camera is the maximum that it can capture. So a 6.2 Megapixel camera can capture 6,200,000 pixels (dots) of information if it is set to do so.

The digital camera can be set to capture less than the maximum pixels per image. This is a good way to get more images onto the memory card, but it will also mean that the prints made from those images may not print well at larger sizes. This is not merely the compression of the captured image, but rather that less data is captured by the sensor.

File Sizes at Different Camera Settings (in Megabytes)

Quality Setting	Camera A	Camera B	Camera C
Large	5.58	2.18	5.00
Large -	2.93	1.96	4.40
Medium	3.56	1.11	4.00
Medium -	1.79		3.10
Small	2.27	0.55	2.10
Small -	1.16		1.10

Note that some cameras state quality settings in Megapixels

A rough standard for photographic prints has been that 300 PPI at full size gives the best image quality. Using that standard, an 8x10 print would have 2400 x 3000 pixels or 7,200,000 pixels or 7.2 Megapixels. So a 7 MP camera can make a very high quality 8x10 print if it was set to capture the maximum resolution. Print quality is judged at normal viewing distance, meaning the distance from the eye to the print when held at a comfortable viewing distance (12 to 15 inches).

If an image is to be enlarged, but the number of pixels remains the same, the resolution drops in proportion to the amount of enlargement. An image that produces an excellent 4x6 print may make a fuzzy or speckled 8x12 print. The same quantity of pixels covering the 4 x 6 inch area is now stretched to cover 8 x 12

inch area. By covering four times the area with the same amount of data, the resolution is reduced by fifty percent.

The effect of cropping an image can have a negative effect on the quality of a print. A consumer may crop away three-quarters of the original photo but expected it to make a full size print anyway. Explaining how cropping throws away information so the print cannot be as large can be difficult.

Image Size and Upload Times

Uploading images can create anxiety for a consumer, whether they are uploading from home or on a kiosk in a retail store.

How big is that file – really? The camera model, the camera settings, the content of the picture, and the way the image is saved all have a direct bearing on the size of the file being uploaded. See the chart above – “File Sizes at Different Settings.”

The “Quality Setting” for a camera may also be shown as 6M, 3M, etc to denote the number of megapixels in each level of quality. This will vary by manufacturer and camera model.

Another major factor in file size is the quality setting used to save the image on the computer. This quality setting directly manages the amount of compression applied to the image during the save. Starting with a 5.58 megabyte image, a file was opened in Photo Shop and resaved on the computer at quality settings of 12, 10, 8, 6, 4 and 2, with no other changes to the image.

JPEG Compression When Saving Files

Saved at quality setting	File size in megabytes	Percent of original file size
Original Image	5.58	100%
12	7.69	138%
10	3.34	60%
8	1.86	33%
6	1.30	23%
4	0.85	15%
2	0.63	11%

While saving images as highly compressed (lowered quality) files saves space on the hard drive or CD, the quality of the printed image may be significantly reduced.

Uploading

Even if the consumer saves their file at a reasonable size, how do they gauge the time it may take to upload the file? The following chart is a best case scenario for uploading a 1.5 MB file.

Connection Type	Upload speed - kilobits/sec	Upload time - seconds
Dial up	33k	364
Satellite	56k	214
Cable	128k to 768k	94 to 16
DSL	128k to 256k	94 to 46

Service Time Expectations

Photo imagers have long faced the challenge of meeting consumer expectations regarding service delivery times. Whether it is an order of prints delivered while they are in store, a shipment that is being picked up in store, or a delivery to a business or residence, the problem remains the same. Informing the consumer is critical to meeting this challenge.

The rapid shift to digital photography and more importantly fulfillment from multiple digital sources has made this problem worse. An expanding number of products combined with the consumer’s desire for immediate gratification have put many photo businesses in an awkward position, since it is usually impossible to produce all of the offerings in-store, yet the expectation is “one hour”. To improve this situation, photo imagers must document the processes required to produce products and make that information available to their consumers. This will help establish reasonable expectations.

The customer experience must become as simple and seamless as possible. The more information given to the customer about standard upload, production, and ship times, the better the chance that their expectations will be correctly set.

Digital input via media cards, CD, the web and kiosks has greatly increased the customer’s involvement in placing an order. Not only are these orders placed independently of retail help, they are often for multiple products in a single order. Photo books, calendars, and gift items, can be ordered from home or through a kiosk with little or no retail staff assistance, so it is critical that those systems clearly inform the customer about production and delivery times.

Consumer Difficulties with Retail Kiosks

Consumer terminals, which were intended to be a mostly self-serve process, have become a challenge for the photo clerk. Today’s consumer has high expectations when it comes to service and ease-of-use, so if software or technical problems arise they expect knowledgeable help from the retailer.

Some issues that can enhance the kiosk experience are controllable from a retailer’s point of view and some less so. A major area of concern is overall customer knowledge, which can range from “How do I get started?” to someone who will sit for hours building a complex photo book.

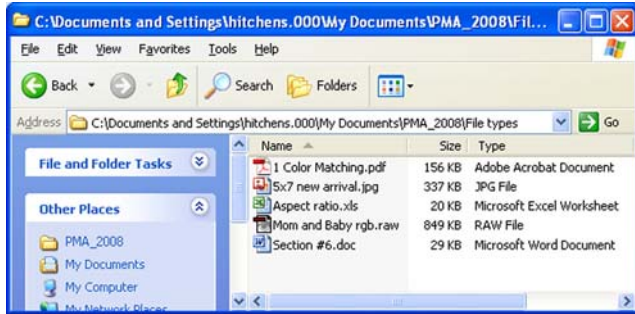
There will always be some customers who need the help of a clerk to complete their transaction, but there are also the customers who have enough knowledge to complete their order but are confused by the software or the order flow.

Providing single page, product specific quick-reference guides for use by the consumer may alleviate some of the frustration of the casual consumer who is just looking to get prints or a simple gift produced.

Kiosk software impacts the consumer experience on many levels, including ease of use, the amount of time spent at the kiosk and wait-times for other customers to finish. Maximum sales on a kiosk are greatly enhanced by simplifying procedures, especially for multiple product orders. Speed in handling the transaction is crucial, as it enables more customers to use the equipment in a given time frame. Issues at the kiosk have a domino effect, as they slow traffic at the kiosk and lower the productivity of the counter clerk when they are required to help customers complete the kiosk transaction.

Confusion about file formats may be a factor in kiosk use. Not everything saved on the thumb drive is a photo, nor can the kiosk handle some file formats like RAW or PSD. Does the kiosk recognize most incompatible file formats and display correct messaging to the consumer? How this information is communicated will help determine the customer's experience at the kiosk.

File Format Confusion



Of this list of 5 files that are normally found on consumer media, only the jpg file will normally print from a kiosk.

A common occurrence is for a consumer to come to a kiosk with a multi-gigabyte memory card filled with hundreds of images. Most customers will print only a few of those images, but will take a lot of kiosk time reviewing their photos one by one. An improved kiosk search/sort mechanism is one approach that might improve this situation, but the real answer is consumer education in image management

Digital Memory Card Corruption

When a memory card becomes corrupt the problem is not that the data is lost, but there is an error in the pathway to the data. Put simply, the bridge is out, which means that software is unable to make the connection between the camera or computer and card. Without this connection, access to the images that are stored on the card is lost. Most recovery software works through bypassing this washed-out bridge and safely retrieving the images and allowing them to be transferred to the computer.

Background Information

Memory card corruption often results from human error. Awareness of the causes can help prevent card corruption from occurring. Here are several causes of memory card corruption:

- Turning off a camera before an image is completely written to the memory card.
- Removing the memory card from a camera while an image is being written to the card.
- Removing the card from a card reader while files are still being transferred to a computer.
- Dead or dying camera batteries as files are transferred from the camera to a computer.
- Removing the card from a card reader while folders and files from the card are open on a computer.
- Opening, deleting, renaming or moving files on the card while the card contents are open or in use on a computer.
- Using a memory card which has not been formatted in the camera.
- Formatting the card in a computer instead of the camera.
- Inserting a second memory card into a card reader before closing and removing the first when viewing images on the card with a computer.
- Taking photos when camera batteries are nearly dead.
- Taking photos too rapidly: camera cannot complete writing one image before starting the next.
- Continually shooting and deleting, shooting and deleting images when the card is full.
- Letting a memory card get completely full before downloading the images to a computer or storage device. Cards that are full may overwrite the card headers.
- Using a memory card from one camera in a different camera without first formatting it in the new camera.

Consumer information and possible solutions

- Use brand name memory cards recommended by the camera manufacturers.
- Never turn off the digital camera while photos are being transferred to the PC or vice versa.
- Never remove the media card while the camera is on.
- Reformat camera cards at regular intervals depending on how frequently you use the digital camera. It is recommended to reformat after each download. Use the camera itself to reformat the memory card; don't do this on the computer.
- Do not switch to the View (or Play) mode while the picture is still being written to the disk.
- Do not shoot the next photograph while the previous one is still being written or saved to card's memory.
- Make sure camera batteries are properly charged.
- Don't delete files from the memory card using Windows Explorer. Use the controls on the camera or the photo management software supplied by the camera manufacturer.
- If the memory card starts to show problems, invest in a new memory card before disaster strikes.
- Do not use the same memory card in different cameras.

Salvaging those seemingly lost images:

Is it possible to retrieve lost data from a corrupt card? Yes. Most photo retailers offer the service for a nominal cost.

There are several websites where downloadable software is available to help you with this task. Many of the options are free or low cost (considering the value of the memories on the card) and are user friendly. Here is one website that offers links to several options.

<http://photography.about.com/od/organizingyourphotos/tp/topsharingwebsites.htm>

Keep in mind that cards that are unrecognized or unable to be accessed usually cannot have data recovered but it might be worth using the retailer's services to make sure that all options are exhausted.

Memory Cautions - Long term storage

Remember that a media card is not intended to serve as a hard drive. DO NOT use the card as a means of long term storage of important files or photos. A small amount of electrostatic charge can render the card useless and can permanently destroy the files.

Media cards typically have a shorter life span than a flash drive because of the differences in technology. It is better to use a USB-flash drive for transporting images.

Traveling with a media card:

Can airport screening damage memory cards? Airport X-Ray machines can produce small amounts of static electricity but the amount produced is reportedly safe for electronic devices. Media card manufacturers do suggest treating media cards as if they would be damaged by the x-ray machines and ask for hand inspection of them.

Consumer Photo Management

Many images captured today are considered disposable. A picture taken on a digital camera or cell phone is viewed by a group of friends, or shared on the web and then deleted. For a different segment of the market, however, the challenge is quite different. With film, the equation was fairly simple, throw the negatives in a box or a drawer, and as long as they were kept dry and in the dark the images would last for generations. Managing digital images over time is more complex.

There are many people who still consider pictures of important events in their lives, a wedding, the birth of a child or a child's first birthday or Christmas, to be very valuable. These are images to save and treasure for generations to come. How is that best done in the digital age? Today it is possible to store images in many different ways:

- Prints, photo books, cards, calendars, or gifts— properly printed and stored
- Saved on the computer hard drive
- Saved on a camera card
- Uploaded to an online photo site
- Uploaded to an online data storage site
- Saved on a CD or DVD

Consumer information and possible solutions

All of the above methods have strengths and weaknesses. While prints correctly stored can last decades they can be destroyed by fire or flood. A camera card can store images very conveniently; but, it can be overwritten by accident or destroyed by static electricity. A computer hard drive can be lost due to virus infection or mechanical failure. Online data storage sites can be a very secure way to store images, but may be expensive for 30 or more years of storage. The images may be impossible to access from an online site if the original customer passes away without sharing file details. CD's and DVD's can store images very well but are susceptible to physical damage or deterioration if not stored correctly. Over a period of time the CD/DVD will become obsolete, much like the floppy disk, so periodic transfer to the latest media format is required

No storage method is guaranteed against failure. The best way to approach archival image preservation is with two types of

storage, in other words, redundant back-up. Storing the most favored and important photos using at least two different methods give the best assurance that those images will be around for many years.

Have images printed as multiple thumbnails per page so they can be commented and used as a future index. Prints, especially inkjet prints made with a single manufacturers' printer, ink and paper have some of the longest potential life spans of any storage method, approaching 200 years. There are no worries about future compatibility when images are stored as prints.

Images taken on digital cameras can be transferred to a home PC hard drive. Then, using the camera, the images are deleted from the memory card so more pictures can be taken. Next is to organize the pictures into folders. Backup the home PC hard drive onto a portable hard drive, then upload the images to an online photo site that offers permanent storage. Redundancy in storage methods may take extra time, but it will insure that those treasured images are safe for a long time to come.

Author Biography

Jay Hitchens is the Director of New Product Innovation for Qualex, Inc. He has more than 20 years experience in managing engineering and operations in the prepress and digital printing fields. Prior to Qualex, he worked for Hell Graphics, Linotype, Heidelberg and Varis Corp. Hitchens received an ASEE from Penn State and a BA from DePaul University. He is on the Advisory Committee for PMA's Society of Photo Finishing Engineers.

*The PMA Society for Photofinishing Engineers Advisory Committee
Committee Chair:*

Tom Kelly – Ritz Camera

Committee Members:

Robert Day – Costco

Jay Hitchens - Qualex

Steve Howe - Fujifilm

Peter Malizia - Costco

Dienna Schmidt – Blacks Photo

Committee Advisors:

Steve Noble – PMA

Herb Stein –PMA Technical Advisor