

The Role of Camera-Bundled Image Management Software in the Consumer Digital Imaging Value Chain



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Executive Summary

This survey research on consumer digital imaging focuses on “image management software” (IMS). Its purpose is to understand the complementarities and interdependencies among the camera hardware, the software used to download, organize and manage the images, and printing and sharing services. We confined the survey population to Syracuse, New York, covering students, faculty and staff of Syracuse University. The entire survey gained a response from 725 people; 53% were Syracuse University staff and 47% were Syracuse University students.

Key empirical findings:

- There is no dominant or even leading IMS product. Neither camera-bundling, computer-bundling, off the shelf sales, nor online image management have emerged as the preferred or model.
- Most digital camera users cannot name the IMS software that came bundled with their camera.
- Only about 20% of the users rely primarily on online services for sharing, and less than half that amount (8.5%) rely on online printing - but reliance on online services is negatively correlated with age.
- As one proceeds from simple downloading to the higher-level functions of organization and sharing, the importance of the camera-bundled IMS drops off progressively.
- Longer term, the camera-bundled IMS’s primary role as a downloading mechanism could easily be usurped by the computer operating system.
- Most notably, IMS products have failed to make themselves the center of printing and sharing activities. Most users share digital images using standard email and print their images using stores or home printers.

Key conclusion:

The potential for vertical synergies between digital camera hardware, image management software, and online services are not being successfully exploited in the current marketplace. The weakest link in the digital value chain is the reluctance of the user population to embrace online services for storage, sharing or printing. The “seamless integration” of the PC and camera with the photo sharing and processing capabilities of the Internet envisioned by many manufacturers and software producers does not exist yet.

Key recommendation:

Digital camera manufacturers should explore the possibility of abandoning proprietary models of IMS software and cooperating on a common product that might achieve the critical mass needed to create an industry-dominating IMS.

Introduction

This research was undertaken by the Convergence Center at the Syracuse University School of Information Studies (www.digital-convergence.info). Project ICONICA, the name for the research, focuses on the strategic implications of digital Images and the CONvergence of Image management and image CApture.

Consumer imaging – the activity that we once called “photography” – is now recognized as in the throes of a digital transformation. At the end of 2003, market researchers estimated that about 30% of the households in the U.S. and 40% of the households in Japan owned digital cameras.¹ In 2004, of the 86 million new cameras sold (excluding one-time use cameras), a majority (56%) were estimated to be digital cameras.² Sales of photographic film, while still profitable, are declining precipitously.

The Revolutionized Value Chain

By eliminating the need for the purchase and development of film, digital imaging disrupts the value chain associated with the business of consumer imaging. Digitization eliminates many of the intermediary services that used to exist between the user’s capture of an image with a camera and the ability to display and share the image. Consumers can now see, store, and share their images in digital form, without sending rolls of film to a developing service and without ever making a print. There is still a major market for printing images, of course, but the market for that service, which used to be inextricably bundled with the service of developing film, has been shaken up. The digitization of imaging also alters user behaviors toward images in even more radical ways, for example by making it feasible to create much larger image collections, and by creating new ways of sharing or manipulating images.

In this paper, we take a first step toward analyzing the changing market structure of imaging. We focus in particular on the complementarities and interdependencies among 1) the camera hardware, 2) the software used to download, organize and manage the images, and 3) printing and sharing services.

Image Management Software

We started the research project with the idea that the most important and potentially radical aspect of the digital imaging marketplace is the use of software (or software-based online services) for the storage, organization and management of digital images. We speculated that this software, which we call “image management software” (IMS), has the potential to play a strategic role in the evolution of consumer digital imaging markets. The IMS links the digital camera to the personal computer (PC), which is the primary platform for communication, organization, manipulation and storage of images. It can also link the user to online services. In some respects, an online digital imaging service

¹ Michelle Slaughter, “Worldwide Consumer Digital Camera Outlook,” InfoTrends Research Group, presentation at Digital Imaging ’03 conference, October 8-9, 2003, San Jose, CA.

² Ibid.

can itself serve as “externalized” image management software – it offers the capacity to store, organize, print, and in some cases process or manipulate images. This integrated capability for networking, organizing, storing and manipulating images is the most distinctive feature of digital imaging. As a White Paper from Dell announcing the launch of IMS product Dell Picture Studio stated confidently in May 2001, IMS software “seamlessly integrates local digital image management applications on the PC with photo processing and distribution capabilities of the Internet.”³ So this research tried to find out more about the role of IMS – image management software – in the current transition.

Research Questions and their Motivation

The work was based on three research questions.

RQ1: What is the market share of different IMS software products? Does any particular software have a dominant position (roughly defined as used by more than 40% of the surveyed population)? We suspected that none did.

RQ2: Is the use of IMS software a) minimal, b) moderate, or c) central? “Minimal” means that the IMS is used for little more than to get the images out of the camera and onto the computer. “Moderate” means that the user utilizes one or two features in addition to downloading, such as basic cropping or organization of images into albums. “Central” means that the IMS software is the user’s primary mechanism for organizing, sharing, and printing images – it is as important as the camera itself to the user’s imaging activity. We thought use might be moderate, but did not really know what to expect on this RQ.

RQ3: How much vertical leverage exists between capture, management, and output products? Do users let their choice of digital camera dictate the IMS software they use, or do they select an IMS independently? To what extent does the IMS guide one’s choice of printing and other output services?

Method (survey research)

We chose to survey users to answer these research questions. Our survey population was not designed to be globally representative. Due to resource and time constraints we chose to survey a students and workers at Syracuse University. The survey took place in March and April of 2004.

The survey instrument was divided into three sections.

- Section 1 determined whether the respondent had a digital camera, what brand it was, and what camera-bundled IMS products they had, if any.
- Section 2 asked a series of detailed questions about what activities they carry out on their digital images after capture, such as organization, manipulation, sharing, and output. This was intended to lead to the development of a profile of different types of IMS users, and to test for the existence of vertical leverage.

³ Dell Technology White Paper: Dell Picture Studio™, May 2001.

- Section 3 solicited demographic information, as well as information about what computer operating system they used and their level of computer expertise.

The entire survey gained a response from 725 people. Of the respondents who took the Survey, 53% were Syracuse University staff and 47% were Syracuse University students.

The predominance of students in the population meant that the age and income demographics were skewed to the low side. The largest category of respondents was between 20-29 years (42.1%), and 105 (14.5%) were 19 years or below. Only 307 (42.3%) respondents were above the age of 30. Almost half (351, or 48.4%) of the respondents reported an income of below \$20,000. Another 135 (18.6%) respondents had an income range of \$20,000 - \$40,000. Only 227 (31.3%) respondents had an income above \$40,000. Educational levels also were skewed upwards. 36.1% of the respondents had only a high school diploma, 31.7% had a college degree and 23.6% a graduate degree. Despite the skewing of the population, many of the statistics correspond rather closely to surveys that attempted to cover larger populations in a more statistically representative manner. Moreover, there is so little public research on the transformation of photography that study of any population constitutes an advance in our knowledge.

Digital Camera Adoption and Market Share

Of the 725 respondents, 340 (47%), reported having digital cameras.⁴ In contrast, 528 (73%) reported having film cameras – significantly less than the 691 (95%) who owned personal computers. Table 1 shows the market share of various digital camera manufacturers reported by our survey population. Sony and Canon are the leaders, with Kodak a close third. These results are consistent with evidence of worldwide industry camera market share, once regional differences are taken into account.⁵ A significant number (9%) of the owners do not know the brand name of their digital camera. Seventy one (71), just fewer than 10%, of the survey population reported having camera phones. Thirty two (32) of them (45%) say they “hardly/never use it” for imaging.

The most important demographic factor our survey could identify affecting digital camera adoption was level of computer expertise. We asked respondents to rank their level of expertise on a 1 – 10 scale. As Table 2 shows, only 28% of those who self-rated themselves on the low end of the computer expertise scale owned digital cameras, whereas 58% of those who rated themselves highly owned digital cameras. Age and income are also positively correlated, but not as strongly as our self-applied measure of computer expertise.

⁴ The profile part of the data analysis (Section 2) however, has a population of only 331 digital camera users, as nine (9) respondents who classified themselves as digital camera owners did not complete Sec. 2.

⁵ Compare Table 1 results to estimates of global market share from Infotrends (Slaughter, 2003): Sony, 17-19%; Canon 17-19%; Olympus 17-19%; Fuji 13-15%; Kodak 8-10%; Nikon 7-9%; HP 4-6%.

Table 1
Digital Camera Market Share

1. Sony (17%)
2. Canon (16%)
3. Kodak (14%)
4. Olympus (12%)
5. *Don't know* (9%)
6. Fuji, Nikon (7%)
7. HP (6%)

Table 2
Relationship between computer expertise and digital camera ownership

Computer expertise		Do you have a digital camera		Total
		No	Yes	
Low	1 - 4	60	23 (28%)	83
Med	5 - 7	222	164 (42%)	386
High	8 - 10	103	144 (58%)	247
Total		385	331 (46%)	716

User Behavior Profile

In this section we use the survey data to describe what people do with their digital images. This will clarify later discussion of how they use IMS and related software. The data is based on Section 2 of the survey instrument, which contains a series of 12 questions describing a particular activity and asking the respondents how often they do it. Answers were selected from a 5-point scale with 0 meaning *never*, 1 meaning *rarely*, 2 meaning *sometimes*, 3 meaning *frequently*, and 4 meaning *always*. Table 3 summarizes the results.

The simple act of *deleting photos that are not so good* was the strongest tendency, with a mean (2.82) close to the value for “frequently.” *Emailing images to friends and relatives* and *organizing images by subject into albums or directories* were the second most common activities, with a mean between “sometimes” and “frequently.” The standard deviation for *organizing images by subject into albums or directories* is highest of all variables, however.

Ordering prints from an online service and *using keywords to search for images* were the least common behaviors, with the reported mean equidistant between the values for “never” and “rarely.” *Converting film images into digital format* also was a “rare” occurrence, according to our survey population. Slightly more common, but still close to “rarely” on our scale, was the behavior of *transferring photos onto an online album or storage location*.

Table 3
User Profile Questions, Descriptive Statistics
0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Frequently, 4 = Always

Activity	N	Mean	Std. Dev.
I delete the photographs that are not so good and only store the good ones	317	2.82	1.139
I email photographs to friends or relatives	317	2.55	.952
I organize the photographs by subject into different albums or directories	317	2.50	1.377
I bring family members to the computer to view the photographs	317	2.27	1.041
I crop, enlarge, or reduce the size of the photograph	317	2.24	1.053
I prepare a slideshow of a group of photographs	316	1.54	1.161
I add captions or titles to my photographs	316	1.40	1.160
I play with special effects or creative manipulation of the photograph	317	1.34	1.095
I transfer photographs onto an online album or online storage location	317	1.26	1.376
I convert the pictures I take with a film camera into digital format	315	.98	1.130
I enter keywords to search for my photographs	316	.55	.905
I order prints from an online service	317	.54	.946
Valid N (listwise)	312		

User Patterns

In order to make more sense of this data we measured how the users' tendencies to engage in various activities were correlated with each other. We were looking for clusters of related activities that could form the basis of a typology. We ran simple Pearson correlations to find these clusters. Appendix 1 contains a complete table of the correlations.⁶

⁶ When we cite correlations, two asterisks (**) means that the correlation is significant at the .01 level or below, one asterisk (*) means significant at the .05 - .01 level.

The Image Manipulators

The strongest correlation we found (.456**) is between the propensity to *crop, enlarge, or reduce the size of the photograph* and the tendency to *play with special effects or creative manipulation of the photograph*. This makes intuitive sense, in that both activities involve image manipulation. Preparation of *slide shows* and *captioning* could also be considered less direct forms of image manipulation. Confirming this hunch, we found that slide shows and captioning were significantly correlated with our two image manipulation variables, although not as strongly as the correlation between the two image manipulation variables. Preparation of slide shows was correlated with *creative manipulation* at .290**, and with *cropping and enlarging* at .244**. In general, slideshow preparation, captioning and organizing photos by subject are strongly inter-correlated at a statistically significant level (.305** to .317**). One of the most interesting findings about the image manipulators is that they tend to use independent or computer-bundled IMSs, not the ones bundled with their cameras.

Computer expertise does not seem to be a major factor enabling or motivating active image manipulation. Our measure of computer expertise correlates significantly with both of the two image manipulation variables (cropping: .160**; special effects, .136*), but not very strongly. Our data also revealed no relationship between gender and image manipulation propensities. There is actually a *negative* relationship between propensity to manipulate images and education level (-.200**). Apparently, the more educated a person becomes the less likely they are to engage in active manipulation of digital images. This negative relationship cannot be confused with age, because age level shows no statistically significant relationship with image manipulation, even though education level itself is correlated with age.

The Young Online Sharers

Another distinct dimension of user activity that emerged from the profile data might be called the tendency to go online. This is the degree to which people *transfer images to an online storage location* and *order prints from online services*. As noted earlier in the descriptive statistics, regular use of online storage and printing is not that common. Only 54 respondents (16% of the digital camera owners) said that they were “most likely” to share photos through online services or albums. Only 26 of the respondents (8%) said that they were most likely to use an online printing service for their output. However, online storage and use of online printing services are fairly strongly and significantly correlated (.340**), although not as strongly as one might expect given their technical interdependence. In addition, the frequency with which respondents said they stored their images online was positively correlated with the tendency to make slide shows (.335**), caption images (.363**), and organize images into albums (.311**). In determining who this group is, computer expertise is a statistically significant but weak explanatory factor, with the correlation only .146**. The strongest identifiable factor in the adoption of online services seems to be youth. The tendency to use online storage is negatively correlated with age at -.212**. We conclude that there is a small but identifiable group that relies on online services for sharing images. As forms of sharing, online albums with captions, slide shows, and printing via online services are related extensions of this urge.

This result could, however, be an artifact of our population – college students staying in touch with remote family and friends.

The Personalized Sharers

The tendency of respondents to *bring family members to the computer to view the photographs* is correlated fairly strongly (.331**) with the tendency to *email photographs to friends and relatives*. We call this dimension of use “personalized sharing.” We call it *personalized* because bringing family members to the computer, which involves a sharing of the image in a manner comparable to passing around physical prints, is not correlated *at all* with online storage of images. And there are only weak correlations between the tendency to use email to share images with the tendencies to use online storage (.114*) and online printing (.120*). So there seems to be two different types of image sharers: those who do and those who do not avail themselves of online services. The latter class of image sharer seems to prefer more direct forms of exchange to the more impersonal online version. The personalized sharer is more likely to be female. Of the 37 respondents who said they “always” bring family members to the computer to view images, 28 were females and only 9 were males. A statistically significant gender difference also shows up in the tendency to email images to friends and family. Personalized sharing is negatively correlated with education levels, although this effect is probably caused by the gender difference, as gender and education levels in our population were negatively correlated at $-.115^{**}$. Personalized sharers do some cropping and enlarging, but not much. The frequency of personalized sharing is positively but weakly correlated with cropping and enlarging images, but there is no correlation at all with special effects and creative image manipulation activities.

A Survey of IMS Products

To complete our preliminary analyses, we now provide a quick overview of IMS products. A digital camera user can acquire IMS products in four distinct ways:

1. It comes bundled with their digital camera
2. It can be purchased at retail (either online or at a store)
3. It can be downloaded from the Internet for free, or bootleg copied
4. It can come bundled on their computer

For IMSs bundled with digital cameras, Table 4 (next page) provides a reasonably complete map of which software is associated with which hardware products. Table 5 provides a list (not exhaustive) of what we call “independent” or not-bundled-with-a-camera IMS products.

Table 4
IMS Products Bundled with Cameras

Digital Camera Manufacturer	Manufacturer's software bundled with camera	Software bundled with camera but produced independently
Kodak	Primary IMS Kodak EasyShare	None
Canon	Primary IMS ZoomBrowser (Windows) ImageBrowser (Mac) Supplementary Imaging Software PhotoRecord PhotoStitch FileViewer Utility RemoteCapture	Supplementary Imaging Software: ArcSoft PhotoImpression
Sony	Imaging Software Picture Package	Primary IMS Pixela ImageMixer 1.0, 1.5 PhotoSuite (a few older models) Supplementary Imaging Software Pixela ImageMixer VCD
Fuji	Primary IMS Fuji FinePix Software	Supplementary Imaging Software Pixela ImageMixer VCD
JVC		Primary IMS Pixela ImageMixer 1.0, 1.1, 1.7, 1.8 Roxio PhotoSuite MGI PhotoSuite PhotoVista ULead Photo Express
Minolta	Primary IMS Dimage Viewer	None
Olympus	Primary IMS Camedia	None
Nikon	Primary IMS NikonView Software	None
HP	Primary IMS HP Photo Imaging Instant Share	ACDSee viewer

Table 2 reveals a clear strategic distinction between manufacturers who have chosen to “in-source” IMS development and to associate their cameras strongly with a specific IMS and those who have chosen to “outsource” it. With the exception of Canon, most of the traditional film camera makers (Kodak, Minolta, Olympus and Nikon) sell their cameras bundled with their own, proprietary IMS and no additional or supplementary software. Companies coming from the consumer electronics space (Sony and JVC) have on the other hand tended to outsource their software. Canon and Fuji straddle the fence.

Another key distinction in the market is computer-bundled vs. camera-bundled IMS software. Many consumer-oriented computers came with an IMS, such as Apple iPhoto, Dell Picture Studio or Corel Photo House. The image downloading, viewing and editing software that is built into Windows 2000 and XP are special cases of computer-bundled

software. Users may not have to invoke or launch any software on their own, which makes it different from what we normally mean by a computer-bundled program; however, by being built in to the operating system it enjoys all of the strategic advantages of bundling with the computer. Over the long term, this kind of bundling may prove to be the most potent.

Table 5
List of Independent IMS Products (not exhaustive)

ACDSee
Adobe Photoshop Album
Apple iPhoto (bundled with computer)
Corel Photo House (sometimes bundled with computer)
Dell Picture Studio (bundled with computer)
Kodak EasyShare (freeware, also bundled with camera)
IrfanView (freeware)
Microsoft Digital Image (sometimes bundled with Windows)
Paintshop Photo Album
PhotoSuite
Photo Explosion (Nova)
Picasa (freeware – recently acquired by Google)
ThumbsPlus

IMS Market Share, Levels of Use and Vertical Leverage

Our survey confirmed our expectation that digital imaging users have not yet settled on a dominant IMS or bundling model. They seem to have access to a wide variety of software products; multiple products are often installed on their computers and a sizable minority can and does move back and forth between them. To a greater extent than we hypothesized, consumer imaging users are not very aware of IMS names and capabilities or the differences among digital imaging software products. In the battle between camera-bundled and computer-bundled software, camera-bundled products dominate only downloading of images, but not organizing or sharing.

IMS Products Bundled with Cameras

When digital camera owners were asked to write down the name of the IMS software that came with their digital camera, a majority (181, or 55%) simply did not know. Note that only 9% of the respondents could not recall the brand name of their digital camera. Of those who were able to remember something, Kodak was the most widely reported (by 9% of the respondents). However, only 8 out of the 28 users who referenced Kodak's

IMS in some way actually remembered the brand name “EasyShare.” Canon and the Olympus Camedia software tied for second with 5% of the responses. As with Kodak, few Canon users remembered “ZoomBrowser/ ImageBrowser” as their camera IMS. Some users did not remember the primary IMS and remembered only the name of the supplementary software.

Table 6
What IMS came with your digital camera?

N = 329	Frequency	Percent
Dont Know	181	55.0
Kodak EasyShare	29	8.8
None Came	19	5.8
Other	19	5.8
Camedia (Olympus)	18	5.5
Canon Software Suite	13	4.0
Sony Camera Software	9	2.7
Fuji Camera Software	8	2.4
Nikon Camera Software	7	2.1
ACDSee	7	2.1
Photoshop	7	2.1
HP Software	6	1.8
Windows	4	1.2
PhotoSuite	2	.6

ACDSee and Photoshop were remembered as bundled IMSs by a measurable percentage of our population (2%). Yet these responses are questionable, because Photoshop is photo-editing software not an IMS, and as far as we know does not come bundled with any digital cameras; some ACDSee-branded features do come with HP digital cameras, but for the most part it is an independent IMS.

IMSs Purchased at Retail

Only 25% of the digital camera owners reported purchasing digital photo-related software online or at a retail store. The decision to purchase an independent IMS at retail is correlated most strongly (.231**) with the size of the respondent’s image collection. It is also correlated with computer expertise (.182**) and income (.167**).

Table 7
Relationship between independent IMS purchase and size of photo collection

Size of collection	Bought IMS at a Retail Store		
	No	Yes	Total
Small, <300	131 (81%)	25 (19%)	156
Moderate, 300-1000	87 (71%)	35 (29%)	122
Large, >1000	26 (55%)	21 (45%)	47
	243 (75%)	81 (25%)	N = 325

Other Independent IMS products

To gain more information about independent IMS products, we presented respondents with a list of 13 known products (See Table 5) and asked them to mark whether each one was a) just installed on their computer, or b) installed and actually used by them.⁷ The responses, unfortunately, were ambiguous. Presenting the respondents with a list may have created a tendency for them to overstate the amount of software on their computer. The size of the list may have stretched their memory and patience. Or there may have been ambiguities in their interpretation of the question regarding which computer or computers were being referred to. For example, a few respondents who said they were users of the Windows operating system reported having Apple's iPhoto software installed and/or used. As far as we know, there is no iPhoto version available for Windows users.

Despite the flaws in this data, the results are consistent with two hypotheses that further research can test more carefully: 1) there is no dominant or even leading product, and 2) it appears to be surprisingly common to have multiple IMS products installed on consumer computers.

Table 8
Installation and Use of IMS Products

IMS Product	Installed	Installed and Used*
ACDSee	41	28 (8%)
Adobe Album	67	21 (6%)
Apple iPhoto	26	15 (5%)
Corel Photo House	21	7 (2%)
Dell Picture Studio	60	31 (9%)
Kodak EasyShare	67	40 (12%)
IrfanView	19	12 (4%)
Microsoft Digital Image	64	28 (8%)
Paintshop Photo Album	48	21 (6%)
Photo Suite	54	32 (9%)
Photo Explosion (Nova)	3	2 (0.6%)
Picasa	7	4 (1%)
Thumbs Plus	6	4 (1%)
Photoshop**	--	20 (6%)

* Percentages are calculated as a portion of total number of digital camera users (331). Percentages do not sum to 100% because neither installation nor use of an IMS is exclusive.

** The survey contained a blank for "Other" and Photoshop was cited by a significant number of respondents. Photoshop was not included in the list of non-camera-bundled IMS products because we classified it as an image manipulation program not as an image management program.

⁷ We included Kodak EasyShare in this part of the survey because Kodak distributes the software independently of its cameras (e.g., one can download it from the web and sometimes find discs in retail stores).

Even taking into account a wide margin of error, no single IMS product came anywhere near a dominant installed share or usage share. If one looks at the IMSs the respondents claim to use (which is probably less prone to error than their report on what is installed), one sees nine (9) products with a comparable percentage of the digital camera-owning population, almost all in the single digits. (Table 8) Kodak's leading share in this comparison benefits from a kind of double-counting, in that 46 respondents reported having a Kodak digital camera, and thus received the EasyShare software bundled with it, in addition to those who obtained it as a free downloadable.

The data also suggests that a significant number of users have multiple IMSs installed. Having two (a computer-bundled IM software and a camera-bundled one) is intuitive, and the data suggests that it is quite common. The data suggests that another third of the camera owners have in addition one or two freely downloadable IMSs installed or illegal copies that they got from friends, work, etc. (Table 9)

Table 9
Number of Independent IMS's on Computers of
Student Digital Camera Owners (N=168)

	No IMS	1 IMS	2 IMSs	3 IMSs	4 IMSs	Total across
Installed	18	24	28	15	3	70
Installed & Used		63	13	4		80
Total Vertical	18 (11%)	87 (52%)	41 (24%)	19 (11%)	3 (2%)	168

Levels of Use

Consistent with the low brand awareness, our survey found that camera-bundled IMS level of use is somewhere between minimal and moderate on the whole. We asked respondents what software or services they used to a) download, b) organize, and c) share their images. As one proceeds from simple downloading to the higher-level functions of organization and sharing, the importance of the camera-bundled IMS drops off progressively.

Table 10
What IMS do you use to download photos?

	Frequency	Percent
Use Digital Camera IMS	202	61.4
Use Independent IMS purchased at Retail or Online	30	9.1
Use Independent IMS got Free	23	7.0
Use Various IMS	17	5.2
Do Not use any IMS	57	17.3
Total	329	100.0

Bundling of IMS software with cameras seems to give camera producers some control over what software consumers use to *download* their photos, although not as much as one might think. Table 10 shows that 61% of the respondents reported that they used the camera's IMS to download their photos. Is the glass then 61% full or 39% empty? Of the 39% who do not stick with the camera's IMS, 17% of them claim not to use any IMS at all for downloading.⁸ The remaining 21% either use an independent IMS, or different IMSs at different times.

When it comes to *organizing* photos, the importance of the camera-bundled IMS drops even more. (Table 11) The percentage of users who organize their images using the camera-supplied IMS drops to 43% (from 61% for downloading). For organizing images, the number of consumers who use more than one IMS software product jumps from 5% to 11%. Almost one quarter of the users (23%) do not use any IMS at all for organization, presumably relying on the operating system and moving files around in directories.

Table 11
What IMS do you use to organize your photos?

	Frequency	Percent
Use Digital Camera IMS	140	42.6
Use Independent IMS purchased at Retail/Online	38	11.6
Use Independent IMS got Free	40	12.2
Use Various IMS	37	11.2
Do Not use any IMS	74	22.5
Total	329	100.0

⁸ We included this option (do not use any IMS) because we knew that the Windows operating system has a built-in image downloading wizard that kicks in automatically unless an installed IMS product overrides it. We projected that users might view this not as an IMS but as a part of the operating system.

When it comes to sharing, the news for IMS is even worse. (Table 12) IMS products have completely failed to make themselves the center of printing and sharing activities. Only 13.5% of our population reported using their IMS to share photos. Plain old email, with image files attached, is far and away the most common way to share digital images, with 63% reporting it as the most likely method they use to share. Only 9.5% of the users said they use their IMS to email the photos. A small but significant portion of the digital camera-using population (N=67, or 20%), reported using online albums or storage as the basis for sharing.⁹ But only 13 of them (4%) use their IMS to upload photos to the online storage or album site. Most of them upload the photos to the online storage service in some other way.

Table 12
How do you share your photos?

	Frequency	Percent
Open up my IMS and use email function	31	9.5
Use Regular email to attach photos	204	62.6
Open IMS and upload photos to Online album/storage	13	4.0
Directly upload photos to Online storage/album	54	16.6
Have not done any of the above	24	7.4
Total	326	100.0

One of our most surprising (to us) findings concerns the way digital camera users print their images. A surprisingly large number rely on their home printers; a surprisingly small number take advantage of online services. (Table 13).

When asked whether their IMS product links them to an online printing service, 40% of the respondents said they didn't know. Another hefty percentage, 43%, said that their IMS product did *not* link them to an online printing service. So for 83% of the relevant population, the link between online services and the IMS is effectively nonexistent. Of the 82 respondents who used some kind of an online service, only 10 (which amounts to only 3% of the total population of digital camera owners), said that they had discovered the service through an IMS.

⁹ We note again a close correspondence to InfoTrends data, which reports that 19% of internet households have uploaded photos to an online photo service – irrespective of whether they own a digital camera or not.

Table 13
How do you make prints of digital photos?

	Number	Percent
Take photos to physical store	59	19.3
Print on home printer	175	57.2
Use online printing service	26	8.5
None of the above	46	15.0
Total	306	100.0

It is clear that for most users, camera-bundled IMS is primarily a downloading tool. The higher level the functions become, the less likely users are to rely on the IMS for it.

Conclusions

If there is a potential for vertical synergies between digital camera hardware, image management software, and online services, they are not being successfully exploited in the current marketplace. The “seamless integration” of the PC and camera with the photo sharing and processing capabilities of the Internet envisioned by many manufacturers and software producers does not exist yet. Instead, the camera-bundled IMS is primarily a downloading mechanism – a role that could easily be usurped by the computer operating system. Secondly, the camera-bundled IMS serves as a vehicle for organizing images, but less than half of the population seems to rely on it for that. Neither camera-bundling, computer-bundling, off the shelf sales, nor online supply of image management has emerged as the dominant model. Perhaps the weakest link in the vertical chain is the reluctance of the user population to embrace fully online services for image storage, sharing or printing.

Thus, the digitization of photography, while proceeding rapidly, has not as yet led to a complete embrace by consumers of the full networking potential of digital imaging. Users take advantage of digitization to delete bad photos, send email files as attachments, and organize their photos by subject. Is this a temporary phenomenon, requiring more time to adjust thinking and practice? Or does it reflect a stable pattern? Probably the latter, as our data indicates that age is one of the most important factors affecting the tendency to go online. Also, there may be unappreciated usability problems and economic obstacles facing users’ attempt to integrate their PC and camera with the online world.

The absence of a dominant product or model is good in the sense that there is room for entry, competition and innovation. But it also indicates that consumers do not think that the problem of image management has been solved adequately. When a dominant service or product emerges – e.g., Google in search engines, the Microsoft operating system, or

the Lotus spreadsheet – it indicates that the dominant provider has “nailed” a particular category of activity in a way that is readily appreciated as superior by the broad mass of users. The emergence of such a provider also stabilizes consumer expectations and makes it easier for them to learn how to use the service. Right now, the strongest factor driving consumer use of IMS is simply the minimal inertia achieved through its bundling with the digital camera, which makes it the default choice for downloading. Other than that, the value and usability IMS products provide to digital camera users simply are not compelling enough to attract a critical mass that will snowball beyond that.

We conclude that digital camera manufacturers ought to seriously entertain the possibility of abandoning their proprietary models of IMS software and cooperating on a common product that might achieve the critical mass needed to create an industry-dominating standard. In line with that objective, there are several areas in which more research is needed. We need a better understanding of the dynamics of computer bundling vs. camera bundling of image management software, and better measures of the degree to which users are relying on the Windows OS built-in functions. We also need to know more about the degree to which it is useful and profitable for IMS's to fully integrate different image management functions (downloading, organizing, viewing, sharing and output), or whether separate software programs invoked at different times are more optimal for users.