

Digital Photography's Coming of Age

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Introduction

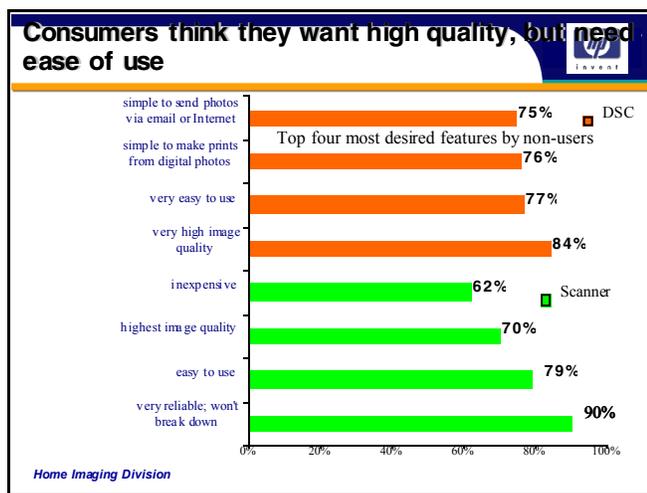
Good morning ladies and gentlemen. My job entails developing and growing the personal digital photography business for Hewlett-Packard. As such, my experiences have taught me several things, primarily that technological paradigms have the ability to shift psychological paradigms.

All of us are here because we know a revolution is underway, and we know it will profoundly affect each of us. I'm here to talk about that impact from a consumer behavior perspective.

Hierarchy of Needs

Last year, Info Trends Research Group reported that digital camera revenue peaked 1.2 B for North America. They project that more than 6 million units will be sold by 2003. What exactly does this mean? How will these cameras be used and how can the industry help accelerate this paradigm shift.

Recent IDC survey results show the following desires for current consumers.



Reference: InfoTrends Research Group, Inc.

Figure 1. IDC Survey Results

The needs of consumers as they participate in the act of photography are driven by a hierarchy akin to Maslow's hierarchy of human needs.

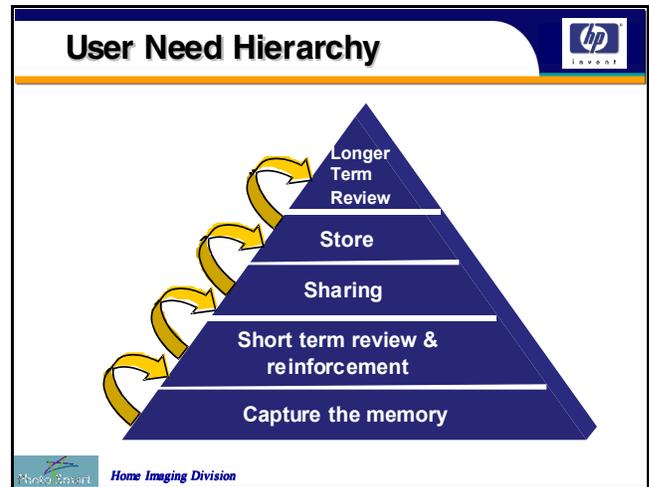


Figure 2. User Need Hierarchy

We are basically driven to "capture" special moments, to share them, to retain them and, on special occasions, to review them.

Let's discuss the hierarchy beginning with capture of memories.

Once photography became a "consumer" phenomena with low costs and a widely available infrastructure, the desire to capture and record special moments became realizable for most of the world's people.

Digital cameras are essentially substitutes for silver halide cameras in fulfilling this need. They have a few advantages; no film cost so more pictures can be taken, and a few disadvantages; battery usage, slow shot to shot.

At this point the capture need has not changed and is not activating new behavior; rather, camera manufacturers are striving to replicate the old functionality using new technology.

The main trends for the industry will be cost reduction for 2Mp and greater sensors that provide nearly equivalent output to silver halide. This will open the market but is not the area of revolution.

Sharing

The next need is to review the photos and to share them, usually locally i.e. within the family, the next day at work, etc. Sharing of memories significantly improved within the realm of digital photography by the use of a LCD to view what you captured. In addition, an A/V output plug

allows use of the TV as a share device and most cameras today contain a simple "slide show" mode to facilitate this. Once you experience this kind of event you're a convert. I took pictures at my niece's high school graduation and was able to play them back once we all reassembled at home. This reinforcement of the new memory was very appreciated.

In addition, printers that can print directly from cameras will soon ('01 - '02) begin to penetrate the market making instant prints an easy occurrence.

To move this forward, very low cost printers that work without being connected to the PC must become pervasive. Just capture and print it!

PC's, and soon without a PC. This will become the dominant "sharing" mechanism of the 21st century.

Digital cameras however, have the ability to significantly affect the quality of memories captured because they can be "multi media" devices capturing sound and motion. Many of today's cameras contain features like this. Unfortunately they require PC's and rather complex software.

Digital cameras will be able to upload photos directly to the web or be e-mailed directly from the camera. Now I can send vacation shots while I'm on vacation and birthday party pictures during the Birthday party.

At this point the infrastructure is not well developed, and there is much work to do to develop it; but, when it reaches critical mass, it will create an entirely new "need" to share immediately, both in print and e-form.

Does the industry need digital mini labs and/or web based print services? They do help legitimize digital photography, but I fundamentally don't believe the "old" service center paradigm will survive this revolution because it doesn't offer the immediacy you will become accustomed to with the rest of the experience.

With today's photographic home printers, evolving appliances like electronic photo frames and albums, and even the set top box, I can have immediate access to pictures that can be printed at quality that is beginning to rival 35mm silver halide. Add to this "wireless" connectivity and I get point, shoot, and print instantly.

Challenges

What are the challenges to be overcome? First, cost of home printed output must decline. To a great degree this is a volume-based problem that can be resolved by use of roll stock or through larger media packs. About 30% of inkjet media cost is in cutting and packaging. Second, durability must improve, and this will happen. Light fastness can rival silver halide, and in addition, inkjet won't yellow upon dark storage. This area only requires focus as home printing becomes more common consumers will demand this attribute be addressed.

However, my premise is that printing will be a small aspect of the new digital infrastructure. The advantages of digital images are that they can be stored, transmitted, and continually reproduced without loss of quality. This just isn't true of film, and reproduction of printed output leaves much to be desired.

Taking a global perspective, there are few digital imaging operations.

There is always much press coverage of digital printing services as the "answer" to the infrastructure development that opens up digital photography. This just isn't true. The infrastructure needs are for standardization of protocols and file formats such that consumers can be confident that they can view their photo's anywhere, at anytime, even centuries from now. Today we have communication standards like "HAVi" evolving for the entertainment environment, "WAP" for cell phones to internet, XML for internet, Fax formats, etc.

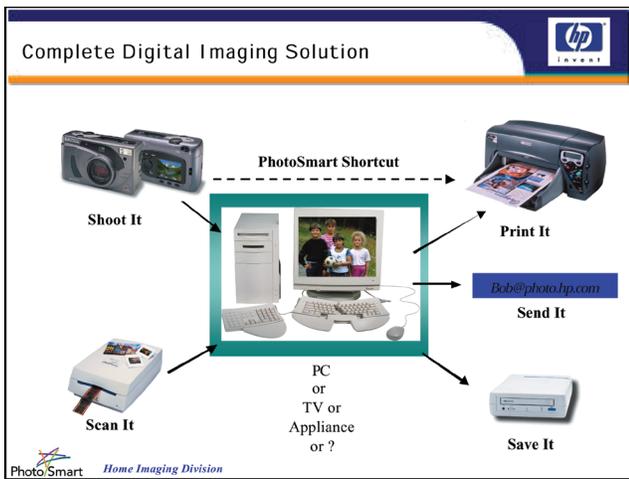
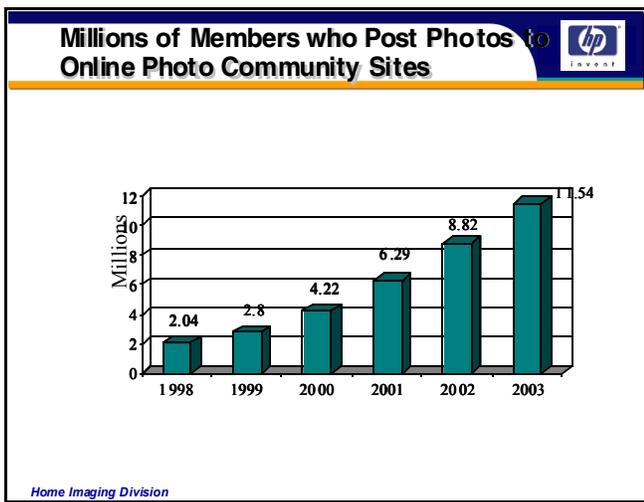


Figure 3. Complete Digital Imaging Solution



Reference: InfoTrends Research Group, Inc.
Figure 4. Online Photo Community Sites

The revolution is how we share. E mailing and web posting have become "killer apps" for digital cameras on

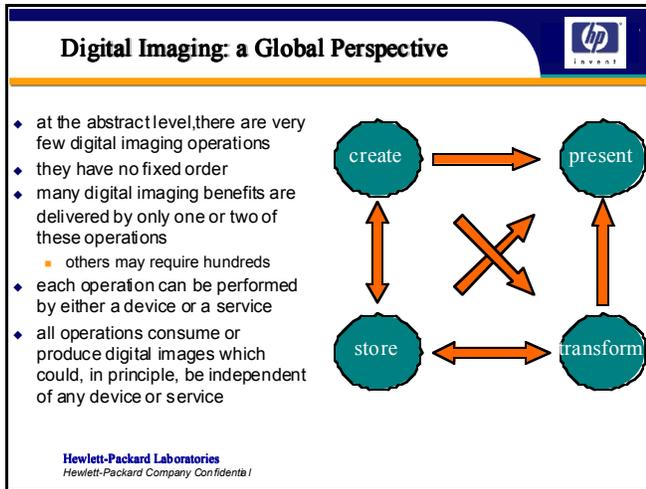


Figure 5. Digital Imaging: a Global Perspective

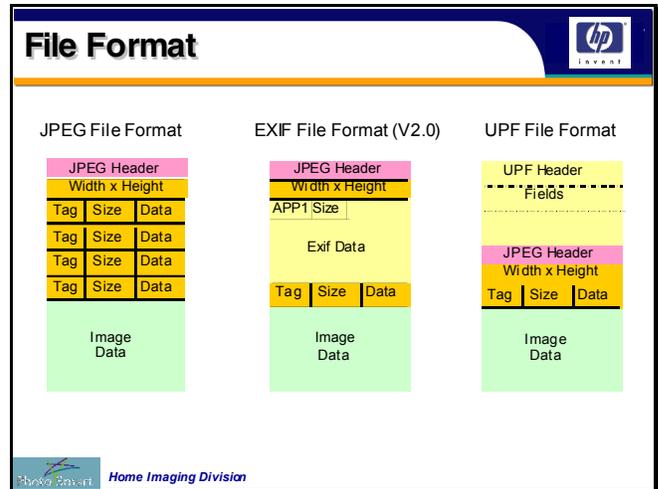


Figure 7. File Format

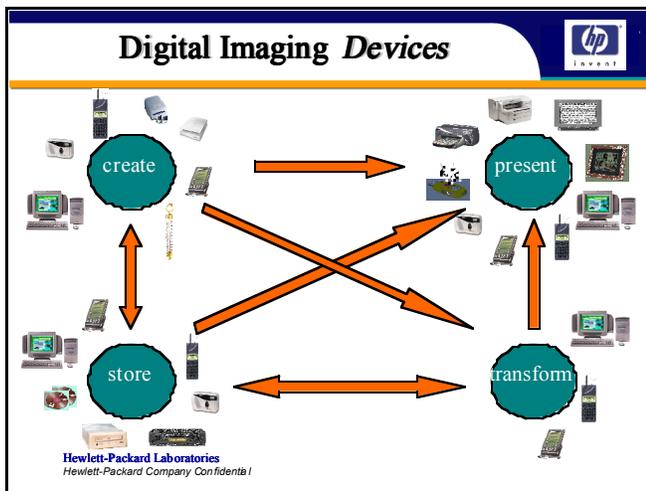


Figure 6. Digital Imaging Devices

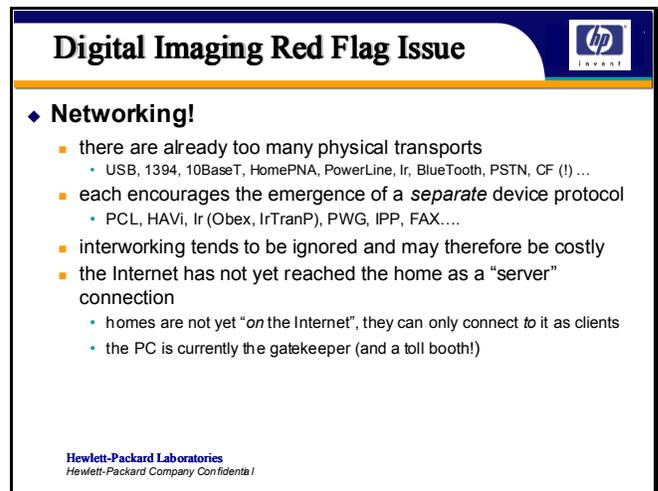


Figure 8. Digital Imaging Red Flag Issue

Development of market acceptance of communications protocols is in its infancy; but basic picture file formats have been around for a while, and the fact that they continue to proliferate is of concern. 3 examples are shown in Fig. 7.

Camera manufacturers have so far been peripheral players, focusing on camera and picture taking functionality like DPOF, not on how their images will network and be transmitted. As long as you could get your photos to a PC, you were done; but PC penetration is limited, and will continue to be so because of the learning curve involved.

The core of this standardization involves color interchange formats, compression formats, and communication protocols. Today we have the ISO (International Standards Organization) committee and the IEC (International Electrotechnical Commission) vying to drive these standards. Both committees must cooperate with each other and must base their decisions on technical robustness that is experimentally verified. Too often decisions within these standard bodies become political in nature.

Digital photography can be a key driver of these formats and my call to action is to get involved and drive the direction for the benefit of digital imaging.

Storing/Archiving

Storing digital photography is the next need. Again, universal format standards do not exist and this causes great consumer anxiety for long term use of digital photographs.

Unless a physical film analog like low cost memory or a standard file type develops this area will be the point of maximum insecurity. We all recognize how easily types of "recorded media" can be replaced; vinyl records, 8 track tape, etc. The company that puts forward a 50 picture, \$10 solution will dominate this area and finally allow consumers the ease-of-use and affordability that allow digital to succeed.

In the interim, many ideas will evolve. The two best approaches, in my opinion, will be non-PC, CD then DVD writers and Internet storage. The CD/DVD paradigm is a comfortable and familiar one. Again, standards and protocols

make a big difference as the writeable DVD market is in shambles as the 2 sides duke out their positions.

Internet storing is more worrisome given hackers, instability of many startups, etc. A large well known trusted company should be able to dominate this segment and I am frankly surprised no one has.

My hope is that 2001 or 2002 will see the entry of some of the newer technological innovations like MROM or ARS in a product focusing on out of pocket cost, not on dollars/MB of memory.

Long Term Review

The last need of long term ability to review can make or break the whole digital paradigm. The burgeoning baby boomer generation is turning with a passion to wrap up of their lives in their photos. If these photos can't be accessed, how can they tell their stories? After all, the "needs" are just the documentation of a life; where we went (vacations), who we are (special events), what we accomplished, and most of all who we leave behind our children.

We are vulnerable if we don't solve this core need.

If we do, we open a world of richer memories through multi media capture, more immediacy and person to person connection through e-sharing development, and more security for our memories through web banks or long life storage media that has global commercial acceptance to provide longevity of format.

It's up to us and it requires focus on standardization.

Summary

In summary, there are 3 key strategic issues:

Key Strategic Trends

- "Sharing" Has Become The Goal of Digital Photography
- Standards for "Interchange" Make or Break the Industry
- Connectivity is King
 - Simple
 - Wireless
 - Ubiquitous

Home Imaging Division

Figure 9. Key Strategic Trends

Thank you for this opportunity to share my thoughts.