

2005 Photo Print Quality Research US, France, and China

Results & Analysis
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Executive Summary — Project Objectives

- Independent quality evaluation of photos printed on various consumer photo printers available in the retail market
 - *Obtain feedback from photo consumers and professional photographers*
 - *Competitive print systems include inkjet printers, dye-sublimation printers, and lab-processed (silver halide) photos*
- Discuss quality assessment of photos printed on inkjet printers relative to lab-processed photo prints
- Demonstrate that printer specifications, such as high DPI or a greater number of ink colors, do not necessarily correlate into better photo quality
 - *Best way to judge photo quality is to actually compare photos*



Executive Summary — Scope

Photographic Print Quality Preference Research

Quantitative Pair-wise Preference

Qualitative Quality Attribute Discussion

Include Professionals as well as Mainstream Consumer Photographers

Overall Print Quality Preference

Quantitative, Pair-Wise

Qualitative Follow-up

Five Test Images

Target Print systems

° *HP Photosmart 8750 Professional Photo Printer*

° *HP Photosmart 8050 Printer*

° *HP Photosmart 385 GoGo Photo Printer*

Controlled Viewing Environment



Executive Summary — Scope (cont.)

International Fielding

US (New York)

France (Paris)

China (Shanghai)

Analysis

Quantitative Preference

By Country

By Consumer/Professional



Executive Summary — Print System Comparison Pairs

Target Printers	Comparison Printers/Print Systems		
	USA	France	China
HP Photosmart 8750	Canon i9900 Epson Stylus Photo R2400 Epson Stylus Photo R1800 Kodak EasyShare Gallery (Ofoto)	Canon i9950 Epson Stylus Photo R2400 Epson Stylus Photo R1800 Kodak EasyShare Gallery (Ofoto)	Canon i9950 Epson Stylus Photo R2400 Epson Stylus Photo R1800 Lepal (Kodak Royal Paper)
HP Photosmart 8050	Canon Pixma iP5000 Canon Pixma iP6000D Dell AIO 962 Epson Stylus Photo R320 HP Photosmart 8050 (Kodak Ultima Paper) Kodak EasyShare Gallery (Ofoto)	Canon Pixma iP5000 Canon Pixma iP6000D Lexmark P915 Epson Stylus Photo R320 HP Photosmart 8050 (Kodak Ultima Paper) Kodak EasyShare Gallery (Ofoto)	Canon Pixma iP5000 Canon Pixma iP4000 Lexmark P915 Epson Stylus Photo R310 HP Photosmart 8050 (Kodak Ultima Paper) Lepal (Kodak Royal Paper)
HP Photosmart 385	Canon Selphy DS700 Dell Photo Printer 540 Epson Picture Mate Deluxe Kodak EasyShare Plus Kodak EasyShare Gallery (Ofoto)	Canon Selphy DS700 Lexmark P315 Epson Picture Mate Deluxe Kodak EasyShare Plus Kodak EasyShare Gallery (Ofoto)	Canon Selphy DS700 Lexmark P315 Epson Picture Mate 500 Kodak EasyShare Plus Lepal (Kodak Royal Paper)

- Unless otherwise noted, manufacturers' recommended 4x6" (10x15cm) media was used
- Printer settings of default for the selected media were used and black & white image used 'grayscale' option, where possible
- All photos were printed through Windows Photo Printing Wizard; however, since the Lexmark P315 does not support printing via PC, prints were obtained using a Compact Flash card



Executive Summary — Summary Results

Print System		US			France			China			Worldwide		
Target	Competitive	Total	Consumer	Professional	Total	Consumer	Professional	Total	Consumer	Professional	Total	Consumer	Professional
HP Photosmart 8750	Canon i9900	55%	54%	57%	X	X	X	X	X	X	55%	54%	57%
	Canon i9950	X	X	X	52%	50%	55%	60%	60%	60%	56%	55%	58%
	Epson R2400	65%	68%	58%	67%	69%	64%	73%	70%	78%	68%	69%	67%
	Epson R1800	81%	80%	84%	68%	68%	70%	70%	68%	74%	73%	72%	76%
	Kodak (Ofoto/AgX)	58%	55%	63%	65%	68%	60%	85%	86%	83%	70%	70%	69%
HP Photosmart 8050	Canon iP5000	70%	73%	65%	66%	69%	60%	75%	73%	79%	70%	72%	68%
	Canon iP6000	56%	53%	61%	56%	51%	65%	X	X	X	56%	52%	63%
	Canon iP4000	X	X	X	X	X	X	65%	63%	68%	65%	63%	68%
	Dell 962	58%	55%	63%	X	X	X	X	X	X	58%	55%	63%
	Lexmark P915	X	X	X	75%	76%	73%	84%	81%	89%	79%	79%	81%
	Epson R320	51%	53%	47%	51%	50%	53%	X	X	X	51%	51%	50%
	Epson R310	X	X	X	X	X	X	68%	70%	66%	68%	70%	66%
	Kodak Ultima Paper	55%	55%	53%	67%	65%	71%	65%	60%	74%	62%	60%	66%
	Kodak (Ofoto/AgX)	70%	71%	67%	65%	66%	65%	86%	85%	88%	74%	74%	73%
	HP Photosmart 385	Canon DS700	79%	76%	84%	75%	75%	76%	86%	85%	88%	80%	79%
Dell 540		88%	87%	91%	X	X	X	X	X	X	88%	87%	91%
Lexmark P315		X	X	X	76%	78%	74%	82%	81%	83%	79%	79%	79%
Epson Picture Mate Deluxe		80%	79%	82%	69%	70%	68%	X	X	X	75%	74%	75%
Epson Picture Mate 500		X	X	X	X	X	X	56%	52%	63%	56%	52%	63%
Kodak Easy Share Plus		89%	90%	87%	84%	85%	82%	90%	87%	95%	88%	87%	88%
Kodak (Ofoto/AgX)		66%	67%	65%	65%	65%	63%	84%	82%	88%	72%	71%	72%

HP Win
 Comparable
 HP Loss

Percentages represent number of times target print system chosen over competitor
 Red/Blue tinted percentages are Statistically Significant (2-tailed 95% Confidence: <2.5% or >97.5%)



Executive Summary – Key Results

“Congratulations! It’s really evolving”

French Consumer

Overall

- *Inkjet photo quality has reached, and in many cases even exceeded, the quality of conventionally-processed AgX photos*
 - The quality of photos printed on HP printers is as good as or better than conventionally-processed photos
 - Majority of respondents expect inkjet printers to produce high quality photos
- *Professional Photographer and Consumer preferences were generally similar*

Surprised? “No, we know we can get inkjet pictures that are better than conventional”

French Consumer

Printer-Specific Worldwide Results

HP Photosmart 8750

- *Preferred over Canon i9950, Epson R1800 & R2400, and AgX prints*
- *Comparable to Canon i9900*

HP Photosmart 8050

- *Preferred over Canon iP5000, iP6000& iP4000, Dell 962, Lexmark P915, Epson R310, and AgX*
- *Comparable to Epson R320*
- *Photos printed on HP photo paper preferred more than those on Kodak Ultima photo paper*

HP Photosmart 385

- *Preferred over all competitors: Canon DS700, Dell 540, Lexmark P315, Epson Picture Mate Deluxe & Picture Mate 500, Kodak Easy Share Plus, and AgX*

“You guys got some good printers”
(re: HP)

US Consumer



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Research Methodology

Project Dimensions

Photographic Test Images

Controls and Blinds

Fielding Venues

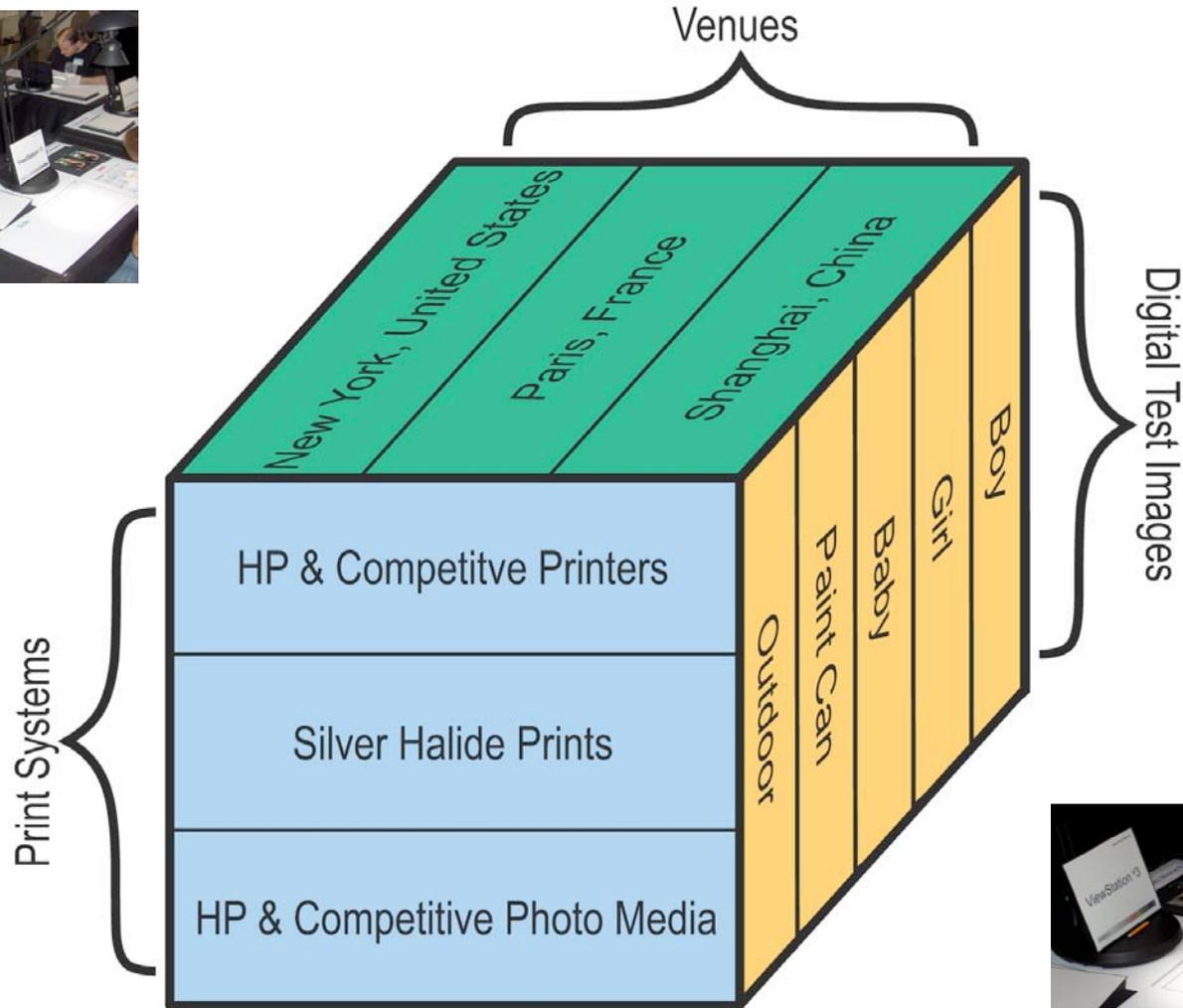
Participant Demographics

Statistical Analysis

Worldwide Results



Methodology — Project Dimensions



Methodology — Photographic Test Images

Test Images

Five test images

Image Sourcing

spencerLAB and HP

Each image printed through each of the Target and Competitive print systems

All print systems used a single original digital file for each image

Multiple copies printed at the same time with the same consumables, if possible

All print systems assumed to be representative

Prints allowed to dry at least 24 hours, then stored in archival sleeves, light shielded

4x6" prints pair-mounted in neutral matting with white opaque backing

Each pair had an HP product paired with a competitor's product of similar class

° Test consisted of five images printed on the Target printer and Competitive printers; Competitors were only tested against the Target printer, not each other.



Methodology — Photographic Test Images (cont.)



“Boy” Black-and-White

Young male skin tones with high dynamic range, highlight and shadow detail



“Girl” in Brocade

Female in brocade dress with piano; skin and hair tones, dress and piano detail and color



“Baby”

Baby boy in multicolor outfit on couch; consumer digital camera shot



“Paint Can”

Paint roller tray with paint can on bench; strong red with natural metallic and wood



“Outdoor”

Sky and grass with shrubs and building details



Methodology — Controls and Blinds

Controlled Viewing Environment

Six ViewStations

Randomized Viewing

- ° *Pseudo-random ViewStation Sequence – different for each participant per session*
- ° *Random photo-pair sequence – randomized for each participant*
- ° *All prints were identified solely by an arbitrary code*

Viewing Environment

- ° *Controlled lighting (4700°K halogen), near-neutral surrounding*
- ° *Black-surfaced ViewStations, white placemats, white cotton gloves*

Quantitative Pair-wise Preference

Each participant asked to judge preferred overall print quality of each pair

Qualitative Quality Attribute Discussion

Participants were asked why they preferred one over the other

Some general discussion about printing attitudes



Methodology — Fielding Venues

Test Venues

United States (New York)

France (Paris)

China (Shanghai)

198 Participants

66 participants in each venue

◦ 11 *mini-group sessions*

◦ 6 *participants each*

42 Mainstream Consumers and 24 Professional Photographers

◦ 7 *Consumer mini-group sessions, 4 for Professionals*



Methodology — Participant Demographics

Participants

64% Consumers (126) – who regularly take photos

- *Currently own and use a camera (film and/or digital)*
- *Have at least 5 rolls of AgX film developed per year and/or get prints of at least 8 digital photos a month*
- *Have perfect vision (natural or with corrected lenses) and are not colorblind*
- *Do not work in*
 - Design/manufacture of scanners, photographic equipment, or printers
 - Advertising
 - Public Relations, Market Research

36% Professional Photographers (72)

- *Earn money from their photos*
- *In addition, develop at least 8 rolls of AgX film per year and/or gets prints of at least 20 digital photos a month*

General

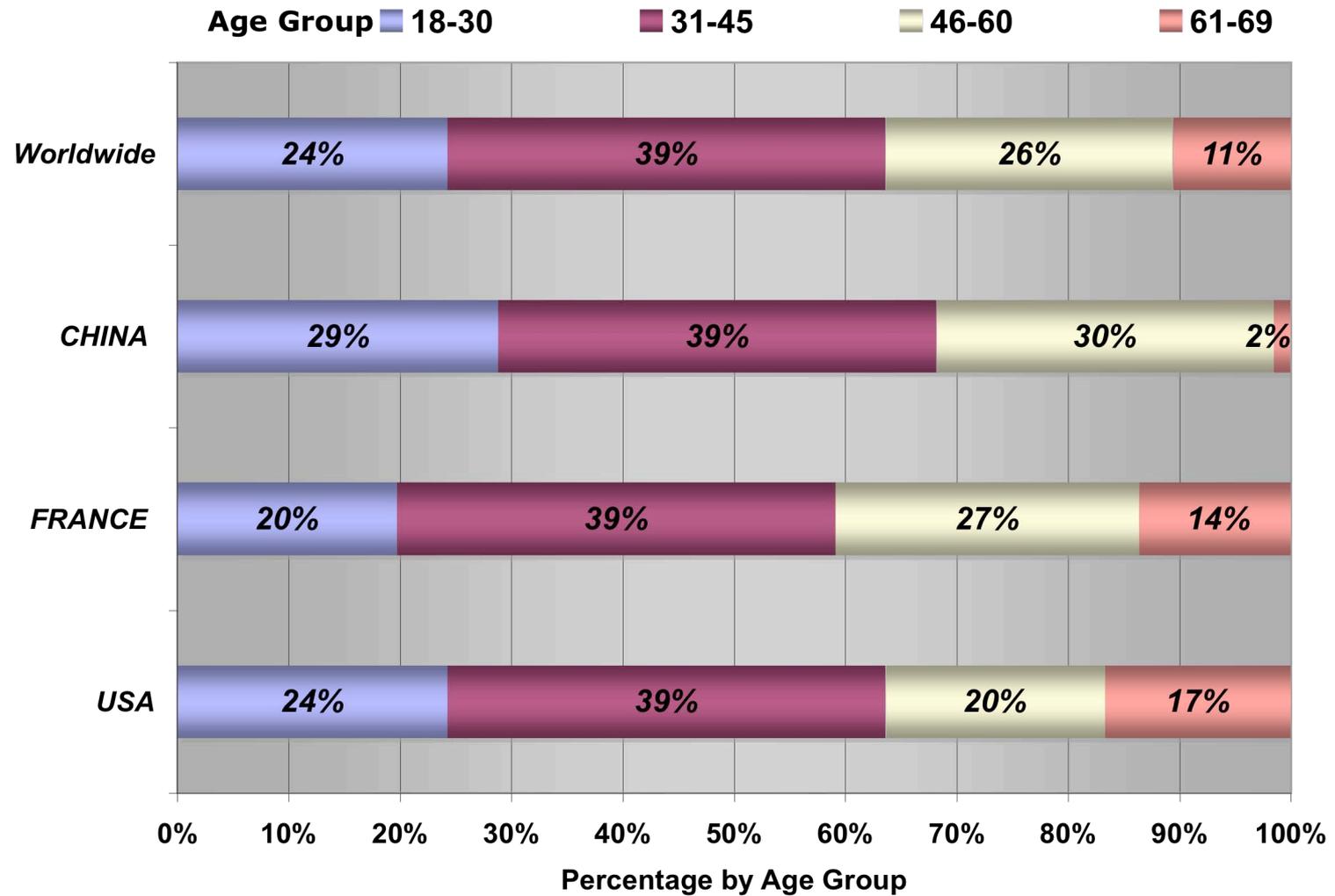
56% Male / 44% Female

Age

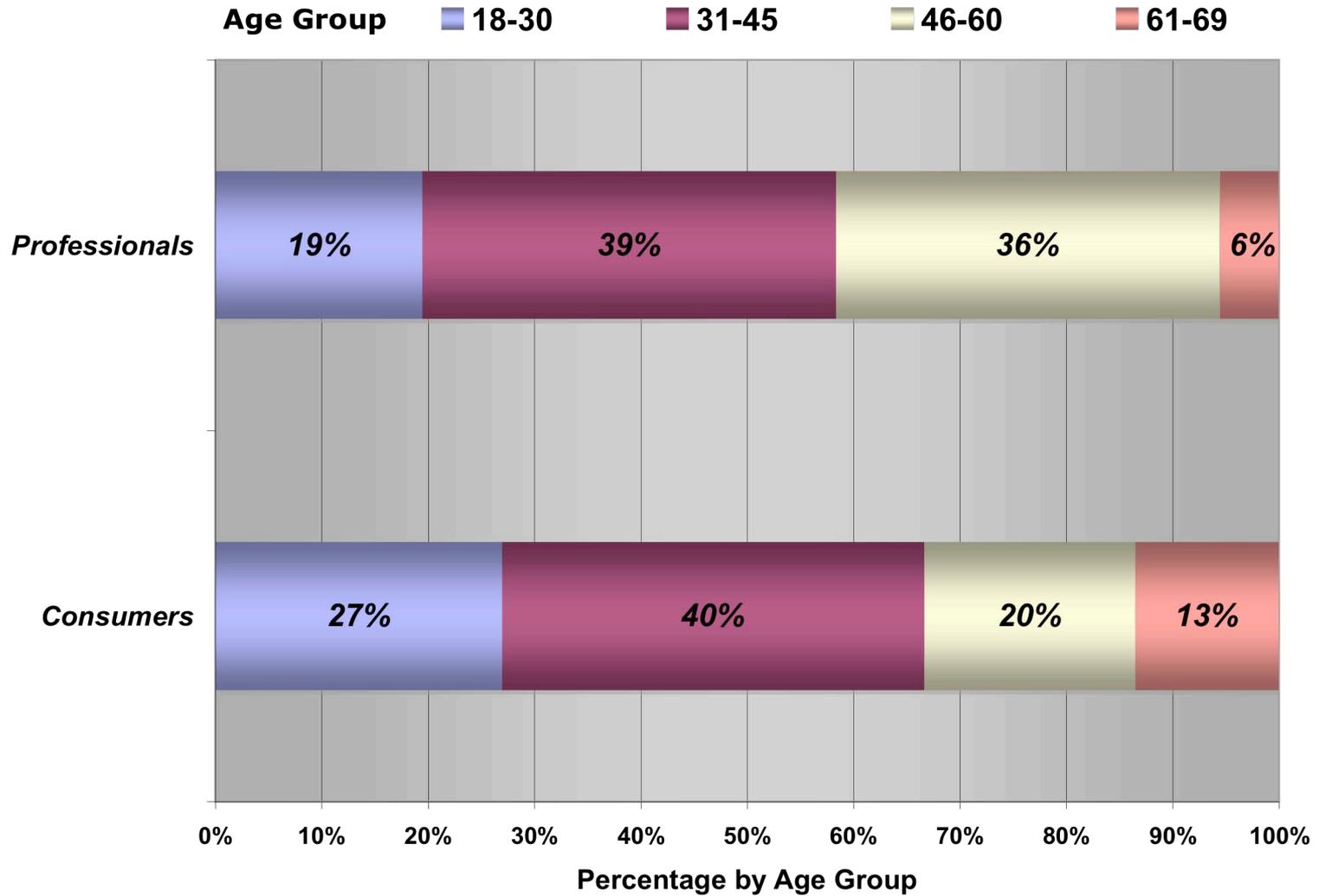
- *Graphs by Country and by Professional/Consumer follow...*



Methodology — Participant Demographics: Age



Participant Demographics — Professionals / Consumers: Age



Methodology — Statistical Analysis

Target-Competitive Printer Pairs

Preference for Target compared with preference for Competitive printer

Statistical Significance

° *Calculated at 2-tailed 95% Confidence level*

Participant preference responses aggregated over all images

° *For every pair separately for each Country*

° *For every pair separately for Consumers and Professionals*

° *For every pair separately for all participants worldwide*

Preference Ratios

Participant preference responses calculated over all images

° *For every pair separately for all participants worldwide*



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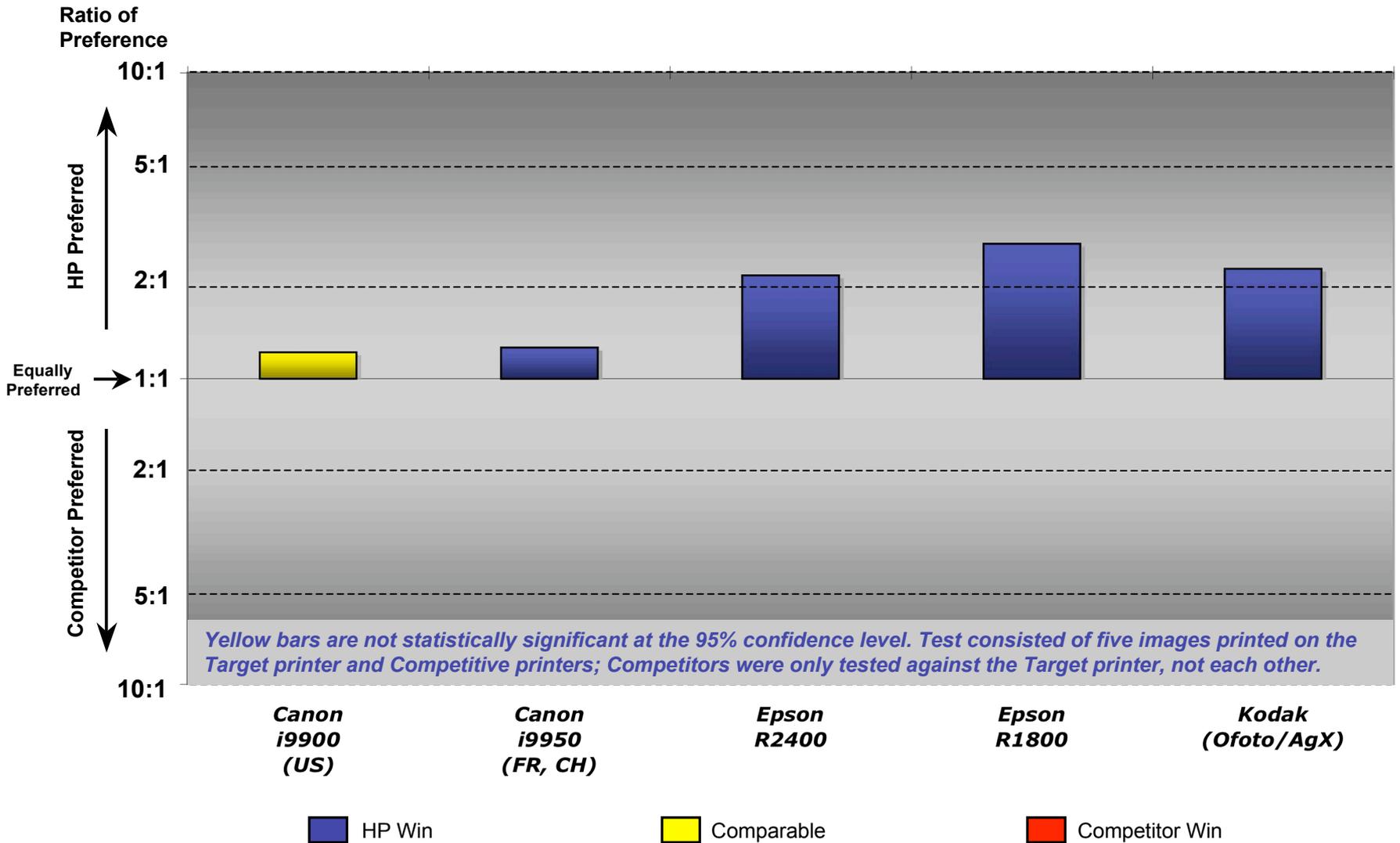
Worldwide Results

Results by Target Printer

- ° *HP Photosmart 8750 Professional Photo Printer*
- ° *HP Photosmart 8050 Printer*
 - Media Comparison: HP Premium Plus Photo Paper vs. Kodak Ultima Paper
- ° *HP Photosmart 385 GoGo Photo Printer*



HP Photosmart 8750 Overall Comparison



Observations — HP Photosmart 8750

Worldwide, prints from the HP Photosmart 8750 were preferred more often* than those from...

...conventional (silver-halide, or AgX) processing

...the Epson Stylus Photo R1800

...the Epson Stylus Photo R2400

...the Canon i9950 (France/China)

° *US results against the Canon i9900 showed similar preference*

"Complete Black & White, I think it's great!"

French Professional

"That is slamming, that is nice"
(fact that it was inkjet)

US Professional

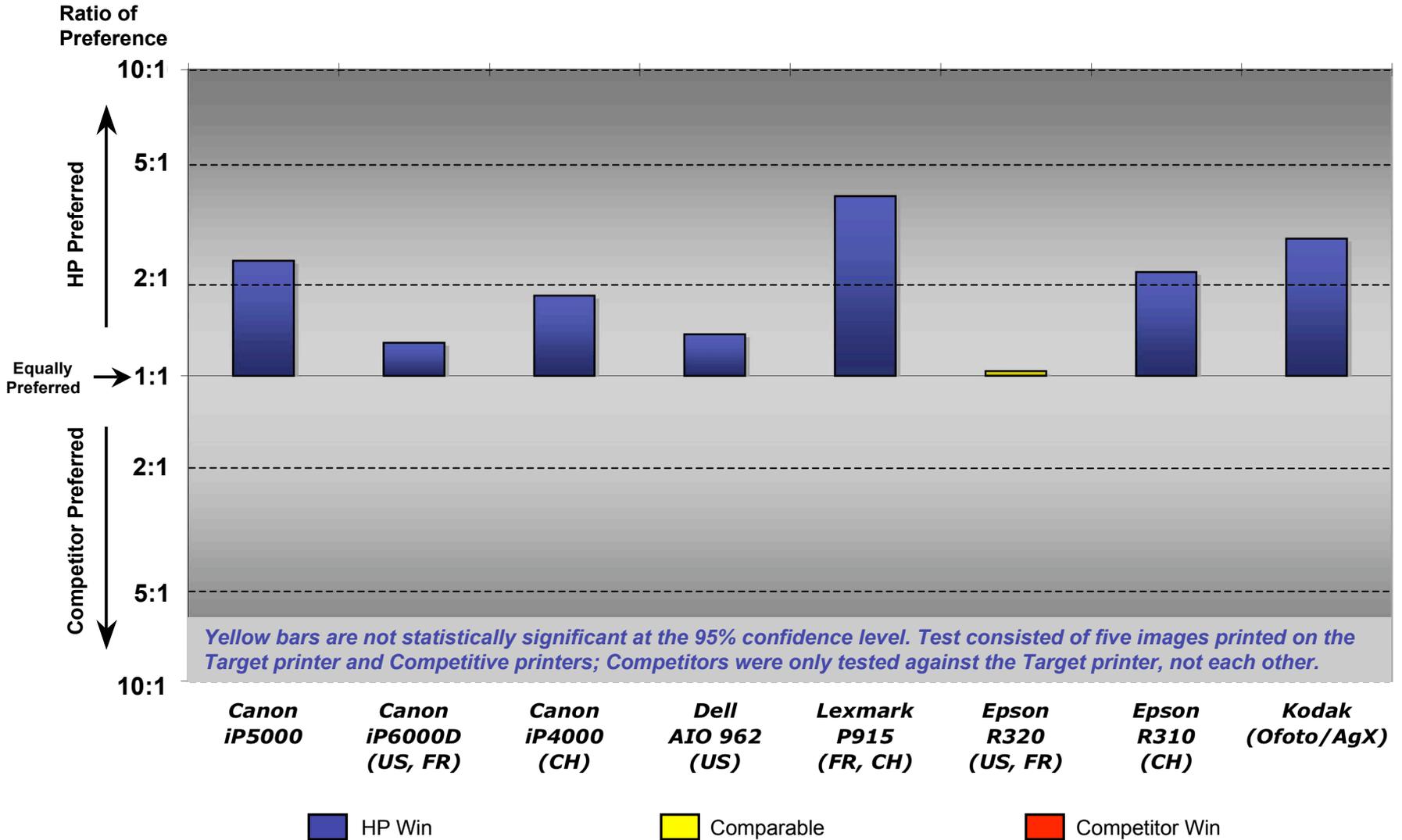
"(HP) Blows away Competitor (AgX) in general"

US Professional

* preferred more often => statistically significant at the 95% Confidence Level (two-tail)



HP Photosmart 8050 Overall Comparison



Observations — HP Photosmart 8050

Worldwide, prints from the HP Photosmart 8050 were preferred more often than those from...

...conventional (silver-halide) processing

...the Canon iP5000

...the Canon iP4000 (China)

...the Canon iP6000 (US/France)

...the Dell 962 (US)

...the Lexmark P915 (France/China)

...the Epson R310 (China)

° Results for the Epson R320 (US/France) were comparable

"No reason to take photos to a lab anymore"

French Consumer

"Bravo for quality"

French Consumer

"The color is vivid.

We have [now] evaluated lots of photos; this is quite close to the benchmark"

Chinese Professional



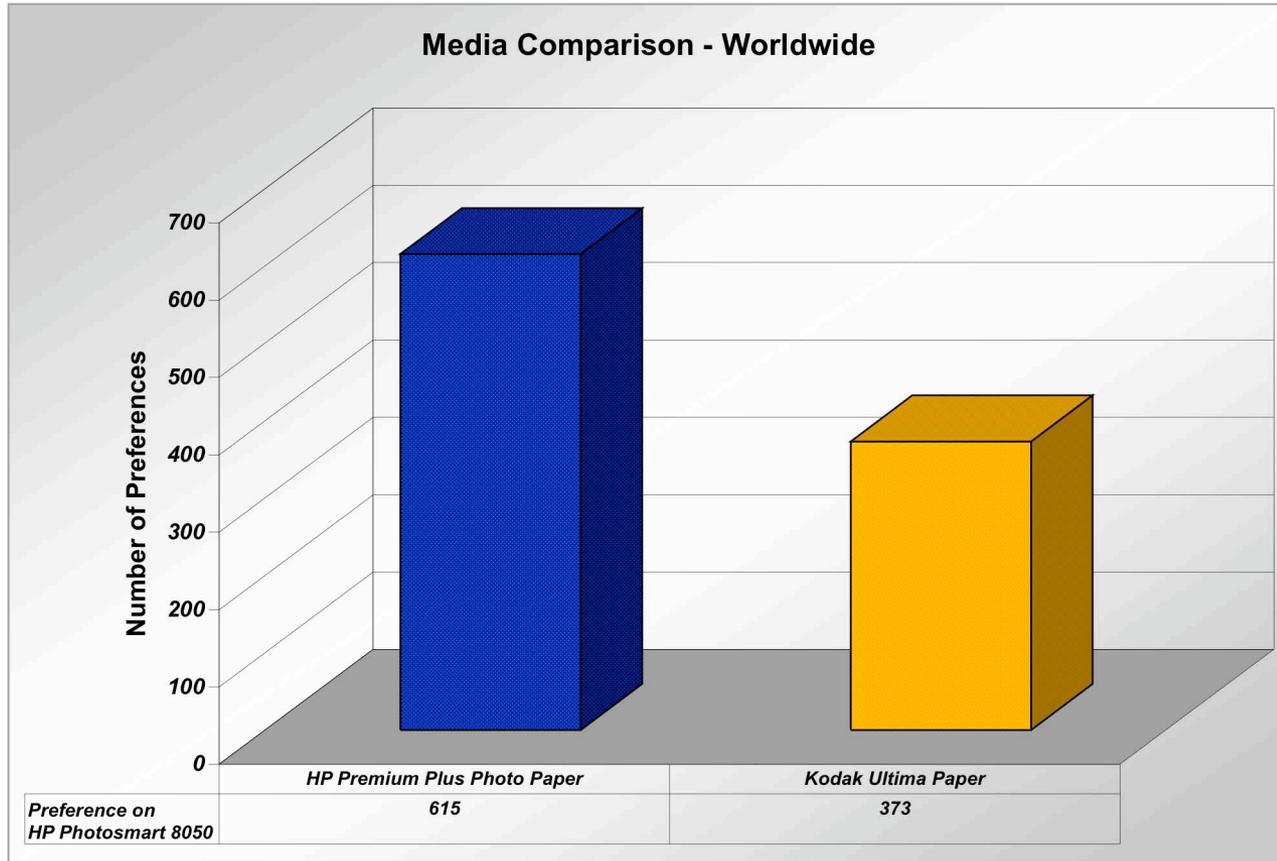
Worldwide Results — Media Comparison

Worldwide, prints from the HP Photosmart 8050 on HP Premium Plus Photo Paper were preferred more often than those on...

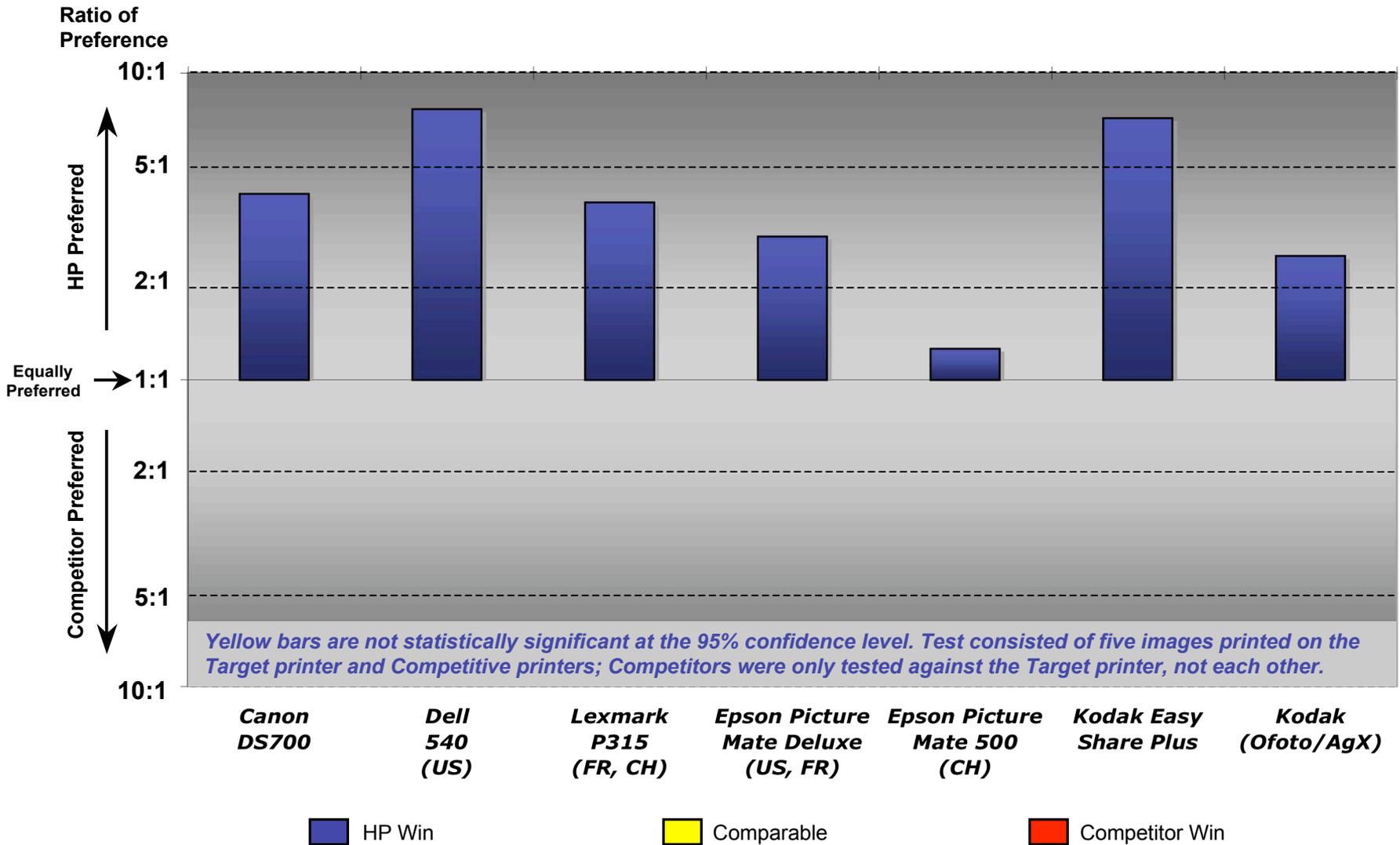
...the Kodak Ultima Paper

“Incredible”
(re:HP paper; fact that only paper was different)

French Professional



HP Photosmart 385 Overall Comparison



Observations — HP Photosmart 385

Worldwide, prints from the HP Photosmart 385 were preferred more often than those from...

...conventional (silver-halide) processing

° HP Photosmart 385 prints were preferred over conventional processing in every country

...the Canon DS700

...the Dell 540 (US)

...the Lexmark P315 (France/China)

...the Epson Picture Mate Deluxe (US/France)

...the Epson Picture Mate 500 (China) by Professionals

° Professionals preferred HP Photosmart 385, but Consumers' had similar preference

...the Kodak Easy Share Plus

° HP Photosmart 385 prints were preferred in every country

"Touches me most because of brilliance"

French Professional

"No contest"
(with Competitor)

US Consumer

"The Winner!"

US Professional



Thank You — The *spencerLAB* Project Team

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