TAGA NextGen

Toronto Metropolitan University

Tampere University of Applied Sciences

Expanded Color Gamut in Printing: Applications, Challenges, and Overcoming Obstacles

Dr. Krzysztof (Kris) Krystosiak (TMU)
Dr. Kai Lankinen (TAMK)
Dr. Martin Habekost (TMU)

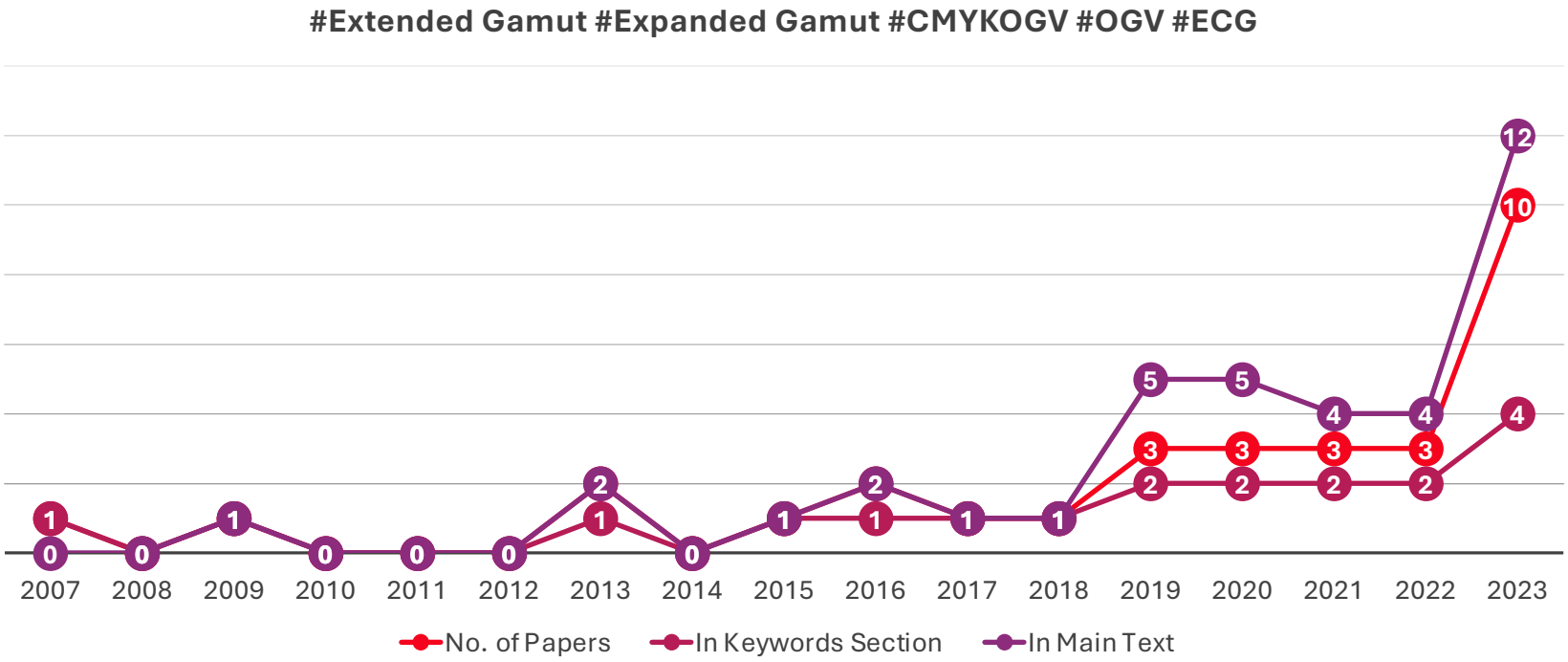
Agenda

- Expanded Color Gamut (ECG)
- ECG in research
- Idea of the research
- Results
- Future Directions

What is an Expanded Color Gamut?

- ECG is an advanced process printing expanding the color gamut beyond the traditional CMYK color space.
- It significantly expands the range of reproducible colors, allowing more accurate and vibrant simulations of spot colors and a closer match to brand colors without the need for custom-mixed inks.
- It’s usually done with additional Orange, Green and Violet color primary inks, but can also be made with other process color sets e.g. RGB.
- ECG can also be called as “Fixed Color Palette” as the primary inks in the printing press are kept constantly same.
- It is a spot color simulation achieved through autotypical color mixing.

ECG in TAGA Proceedings 2007-2023

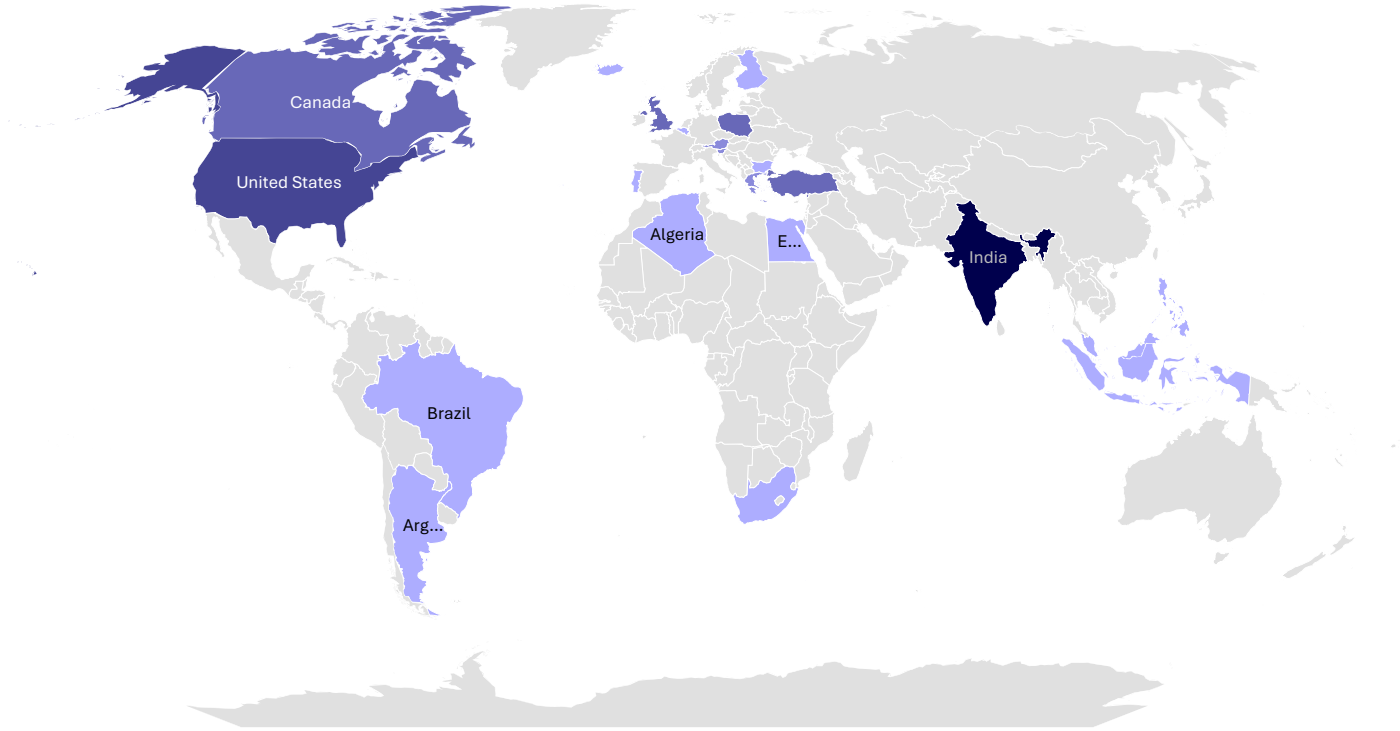


Idea of this research

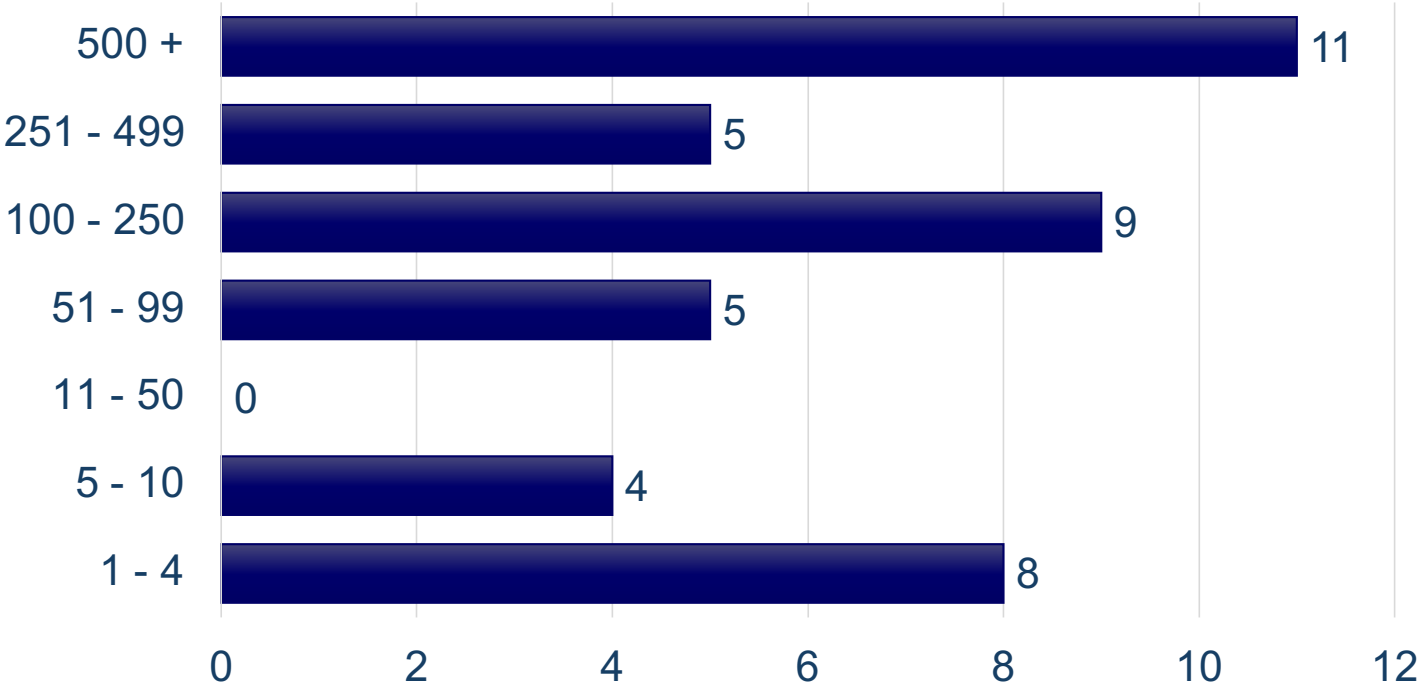
- **Knowledge level** about ECG in printing companies
- **Reasons** for implementing
- **Obstacles** with the implementation of ECG in printing
- Why ECG isn't **widely used** in printing
- Potential **reasons to implement** ECG
- **Implementation phase** of the ECG concept
- **Success stories** to share!

Demographic information

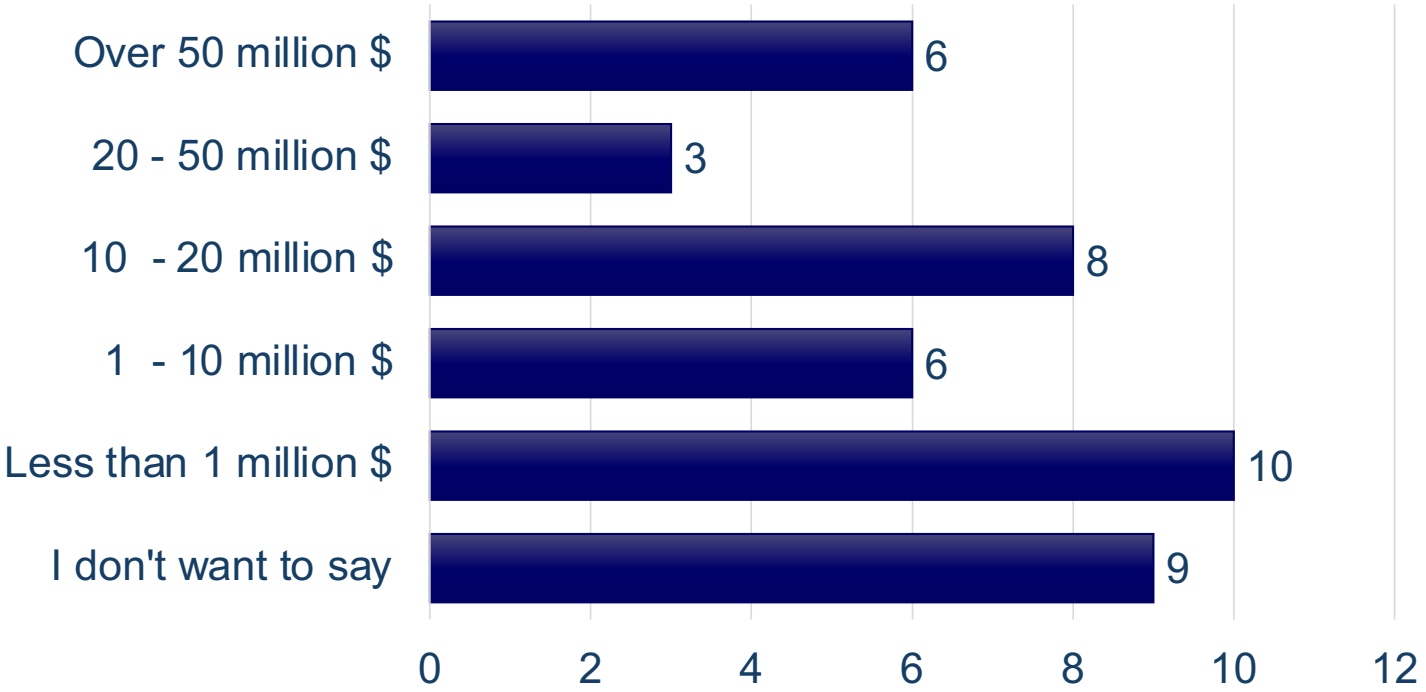
India	6
United States	4
Turkey	3
Canada	3
Poland	3
United Kingdom	3
Austria	2
Greece	2
Slovenia	2
Portugal	1
Singapore	1
Brazil	1
Philippines	1
Finland	1
Iceland	1
Algeria	1
Egypt	1
Bulgaria	1
Argentina	1
South Africa	1
Malaysia	1
Belgium	1
Indonesia	1
TOTAL	**42**



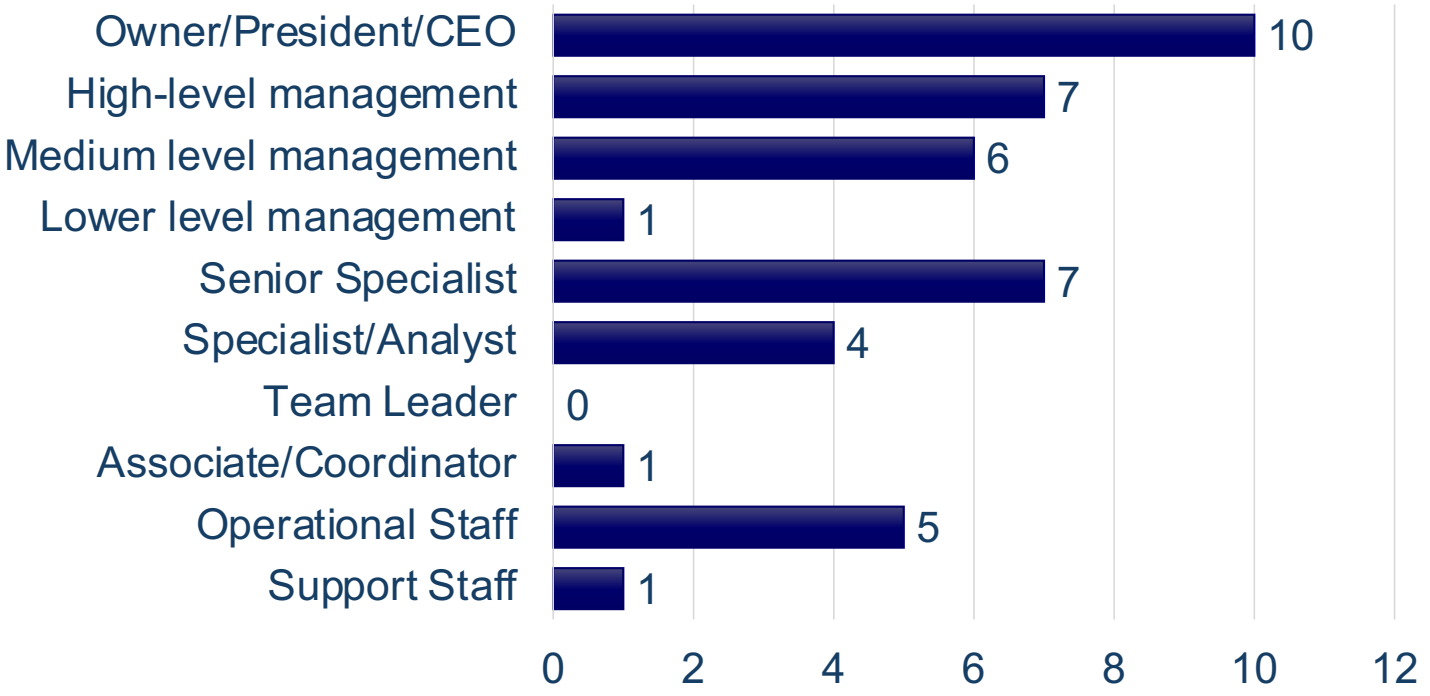
Company size – number of employees



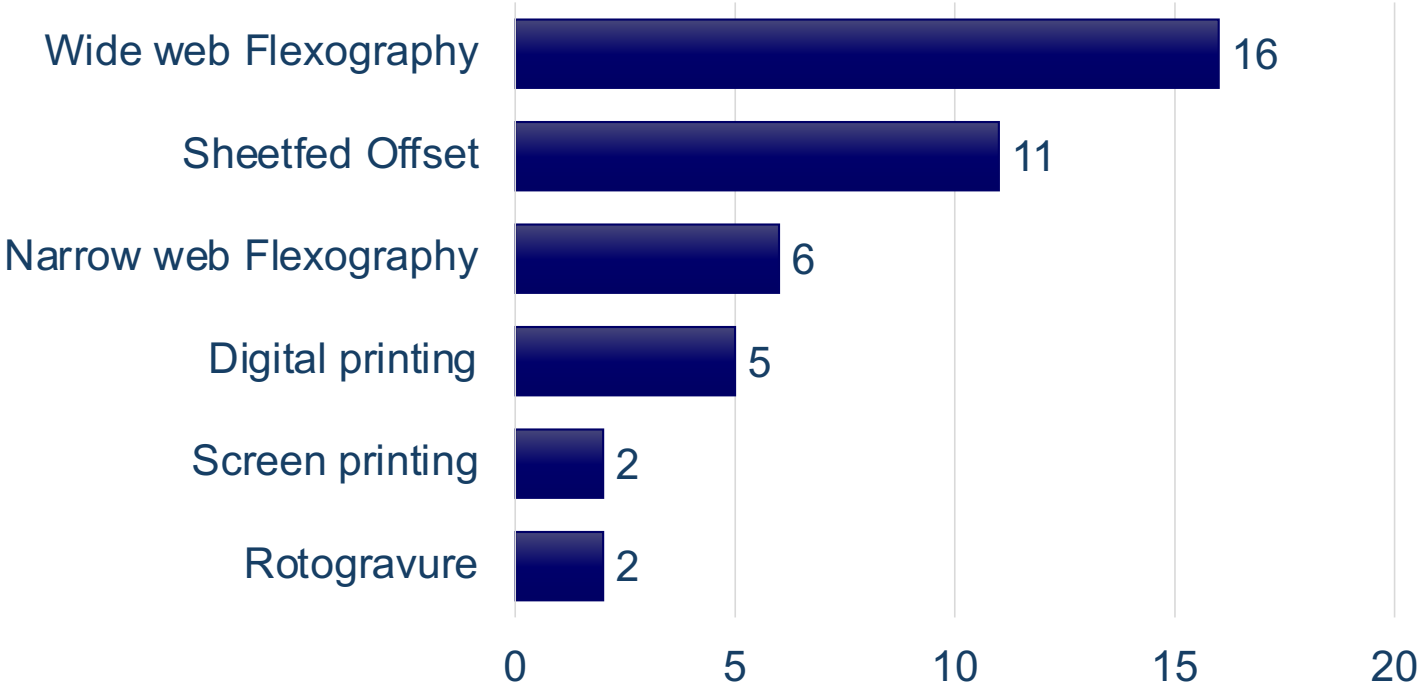
Company annual turnover (USD)



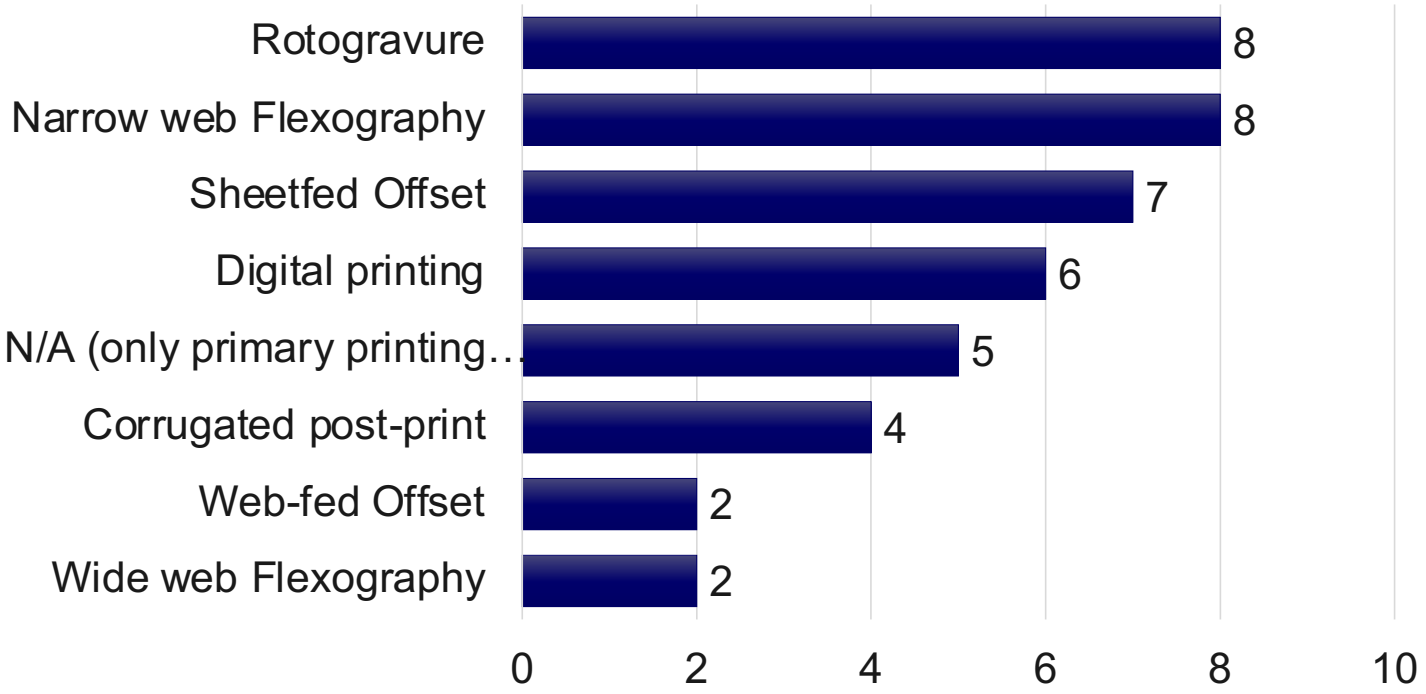
Respondent position held



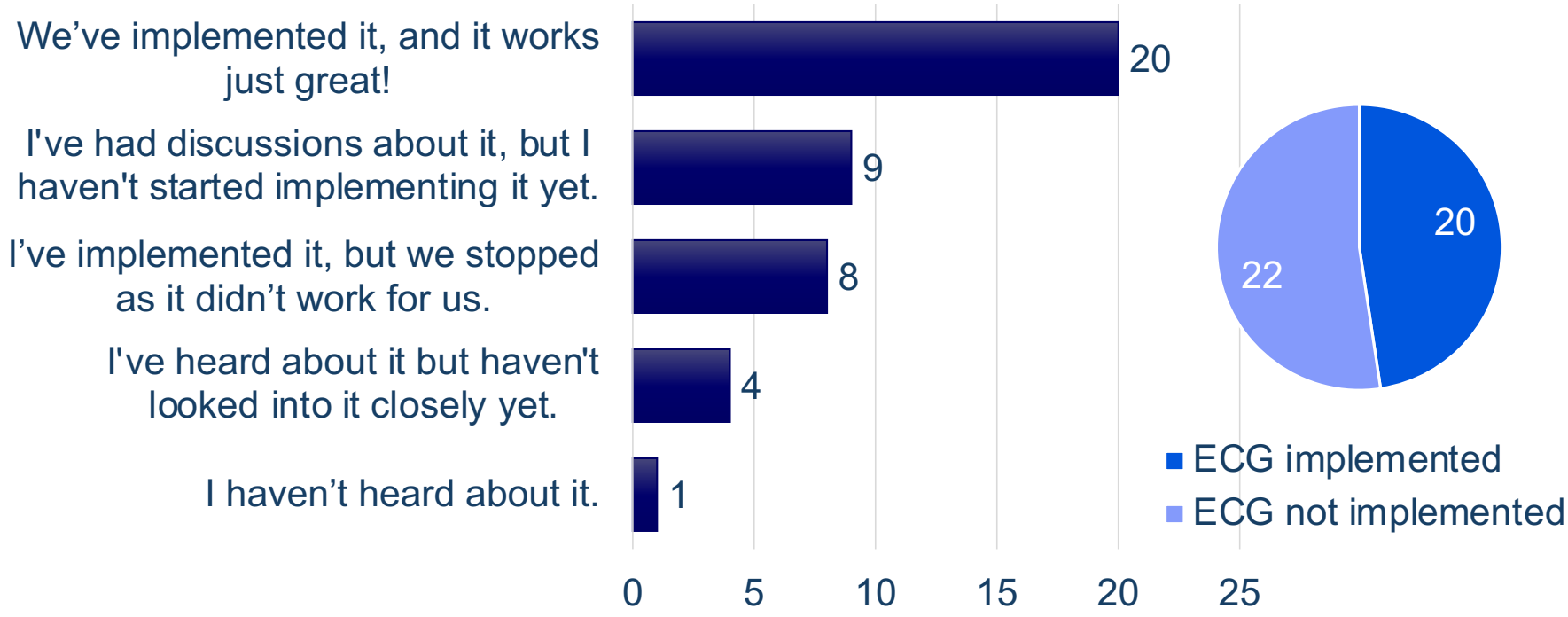
The primary printing technology used



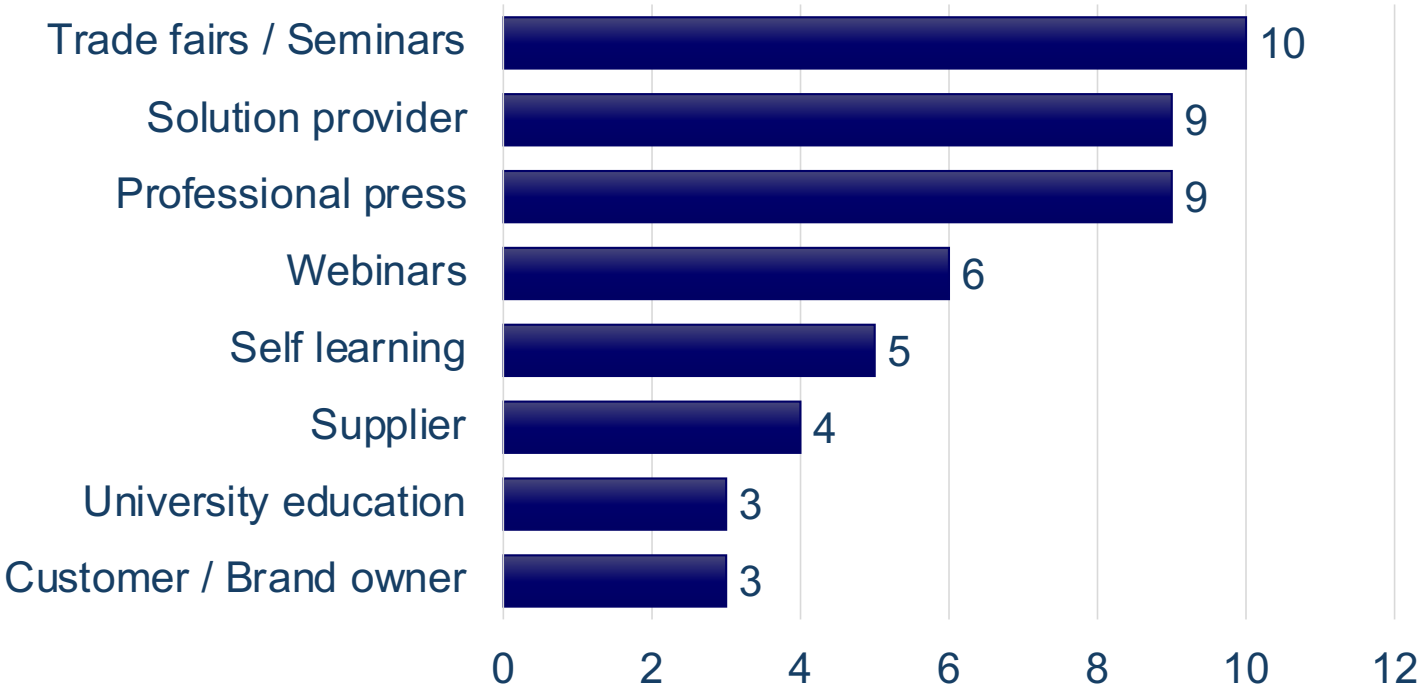
The secondary printing technology used



Have you heard about the Expanded Color Gamut in Printing?

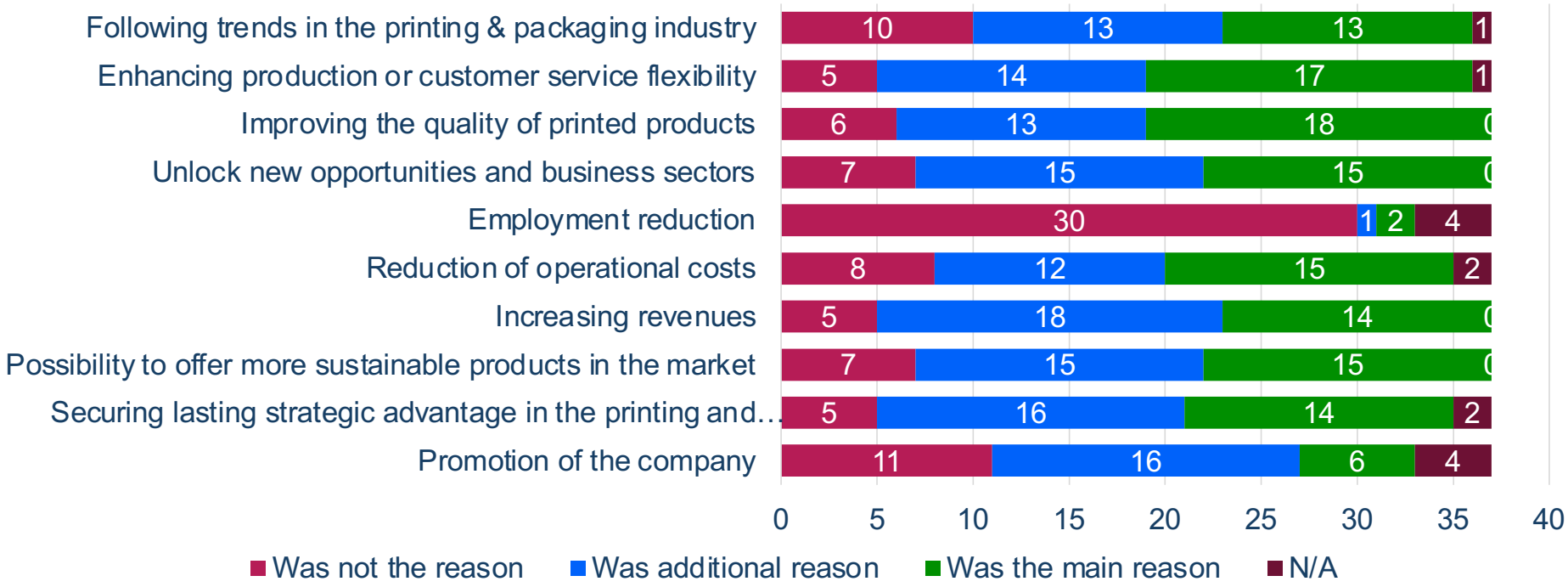


How did you first learn about Expanded Color Gamut in printing?

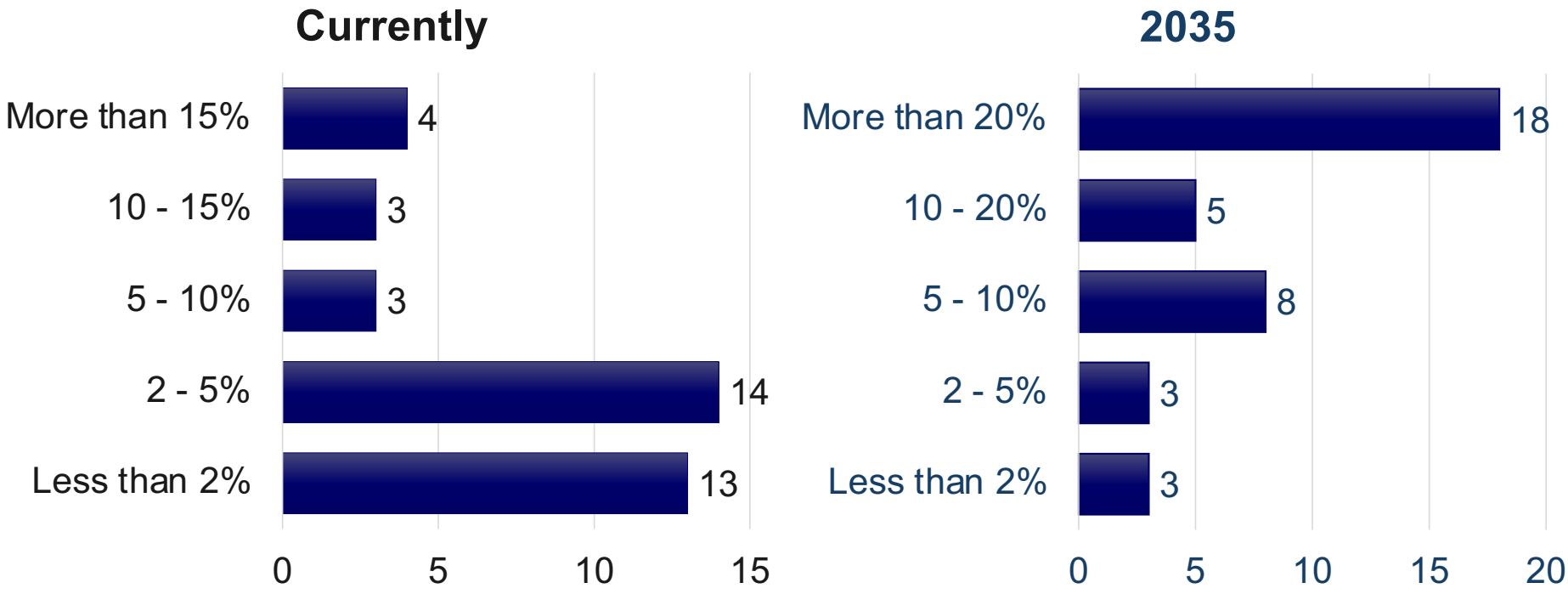


From your knowledge and/or practical experience, what challenges or barriers have you encountered when implementing Expanded Color Gamut?

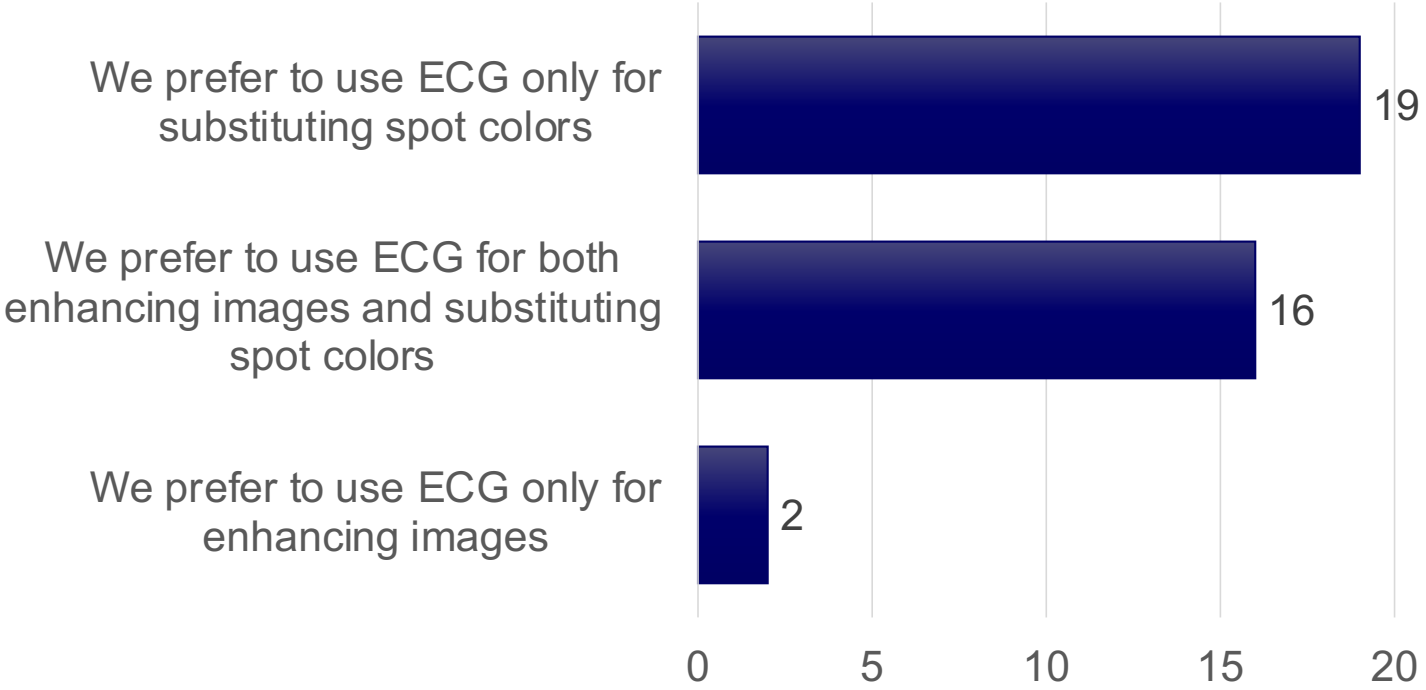
What are the primary reasons for implementing, or considering the implementation of, Expanded Color Gamut in your company?



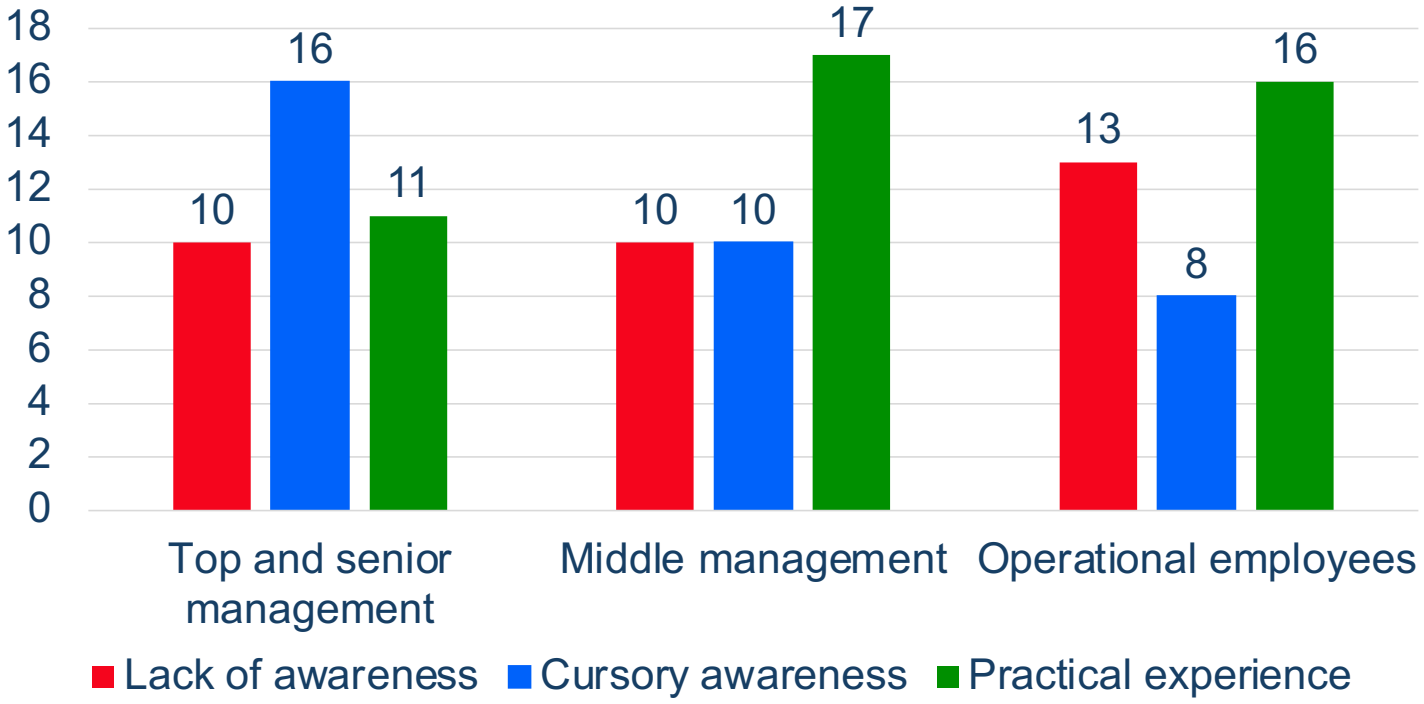
What do you estimate the implementation percentage of packaging printing using Expanded Color Gamut (CMYKOGV) – currently and in 2035



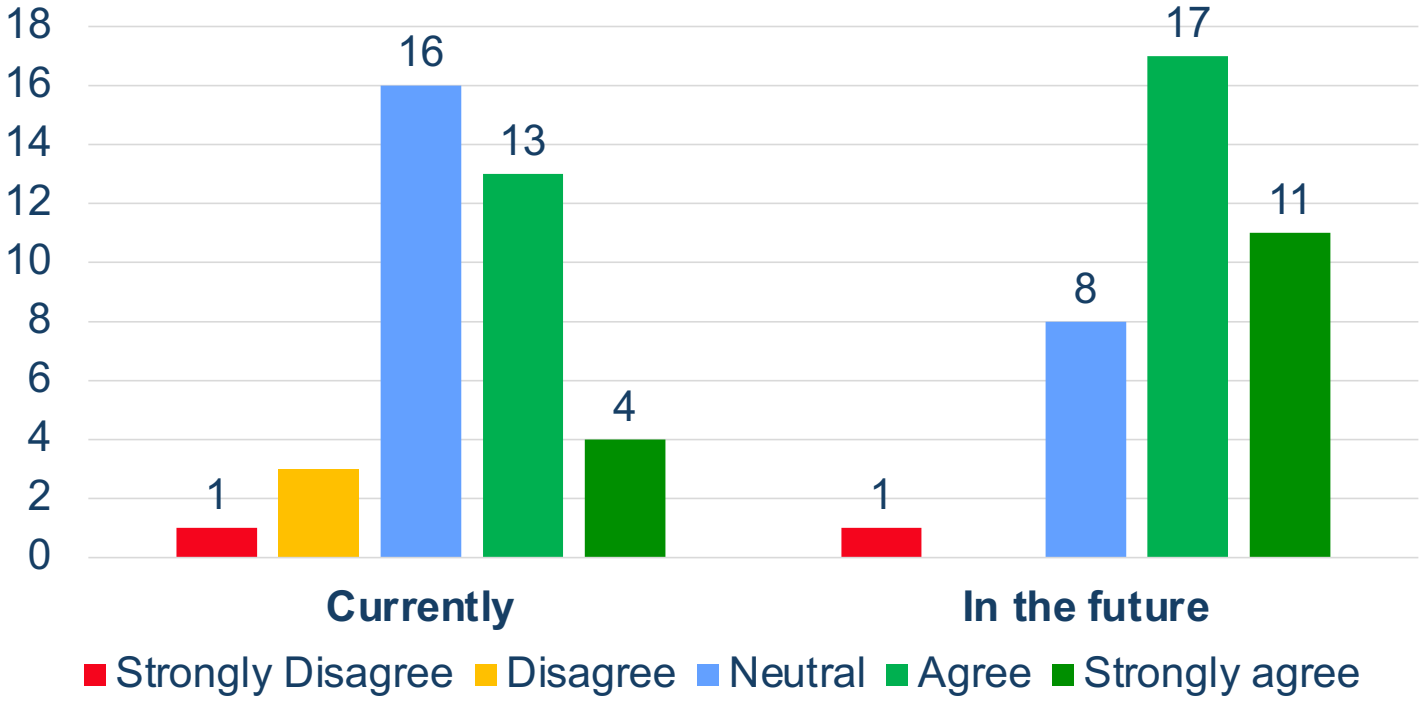
What is your purpose in using Expanded Color Gamut in printing? Please choose one answer



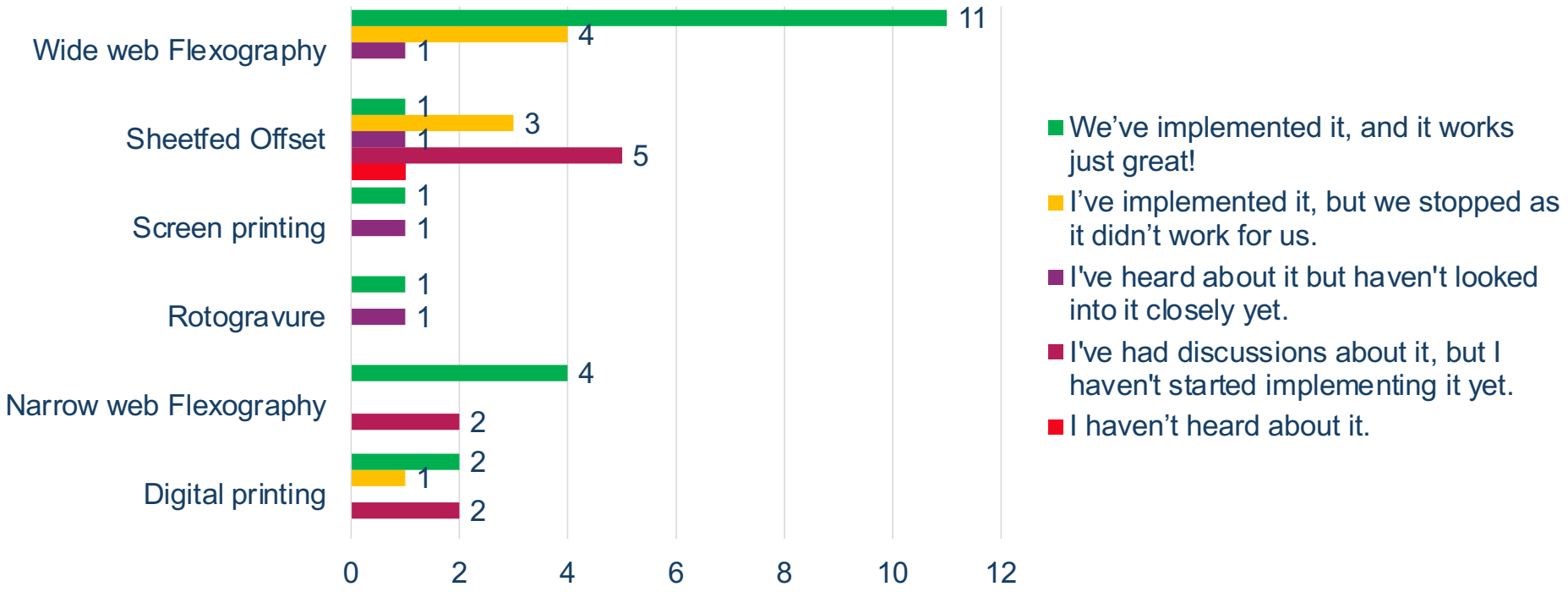
Please specify the level of expertise of Expanded Colour Gamut within your company



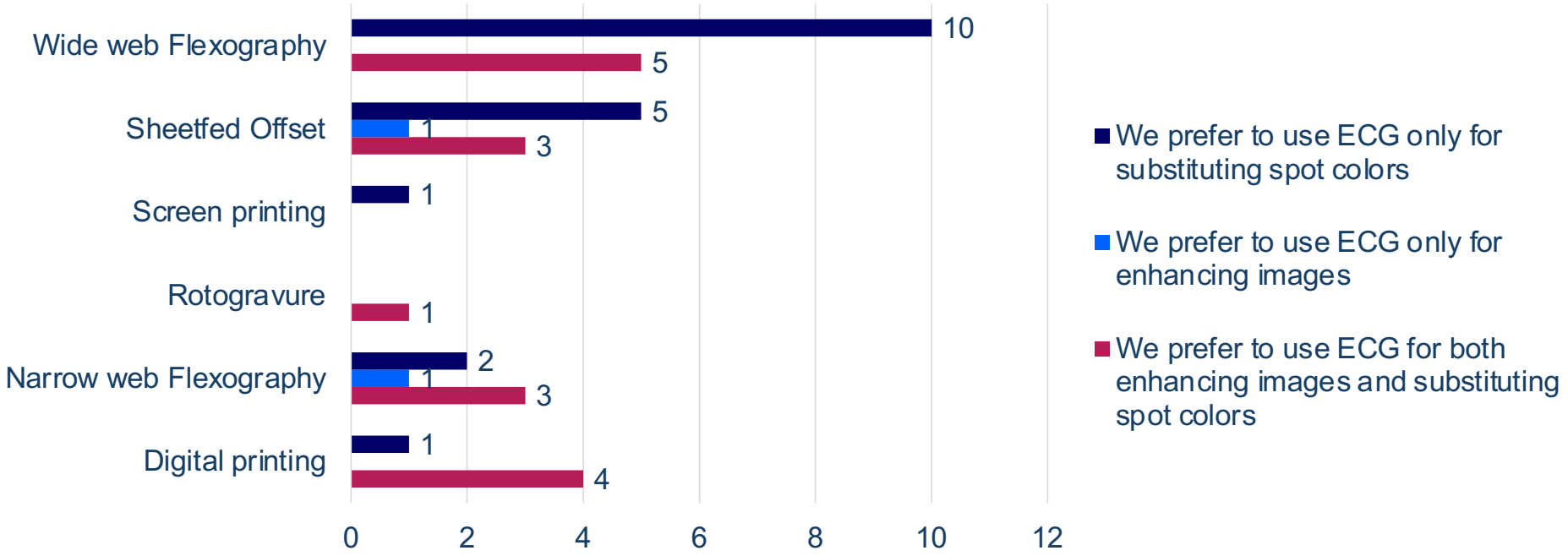
Please outline how the implementation of Expanded Color Gamut in Printing supports and aligns with your company's strategic goals and objectives



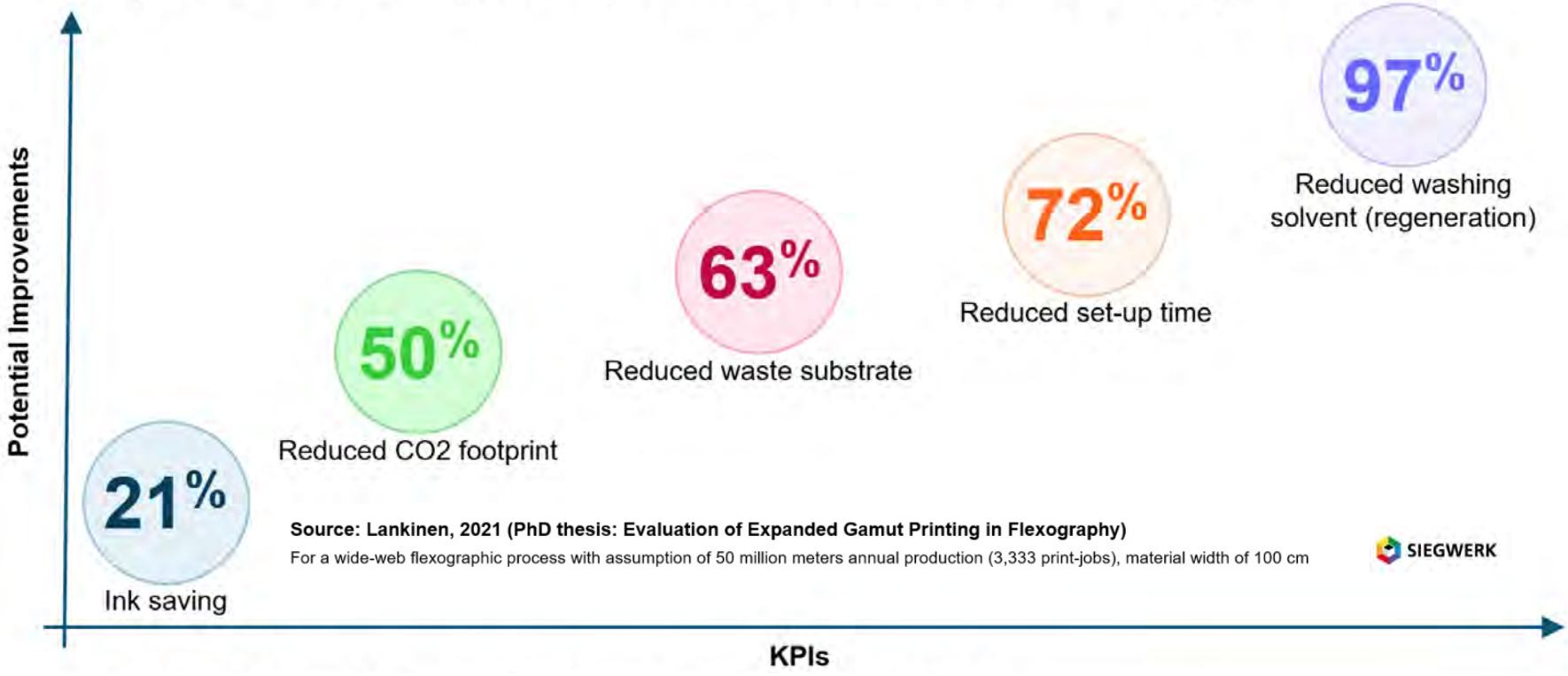
ECG implementation phase vs Primary Printing Technology



ECG purpose of using vs Primary Printing Technology



ECG key benefits by Dr. Lankinen PhD thesis



Source: Lankinen, 2021 (PhD thesis: Evaluation of Expanded Gamut Printing in Flexography)

For a wide-web flexographic process with assumption of 50 million meters annual production (3,333 print-jobs), material width of 100 cm

SIEGWERK

Benefits of SPOT vs ECG color systems

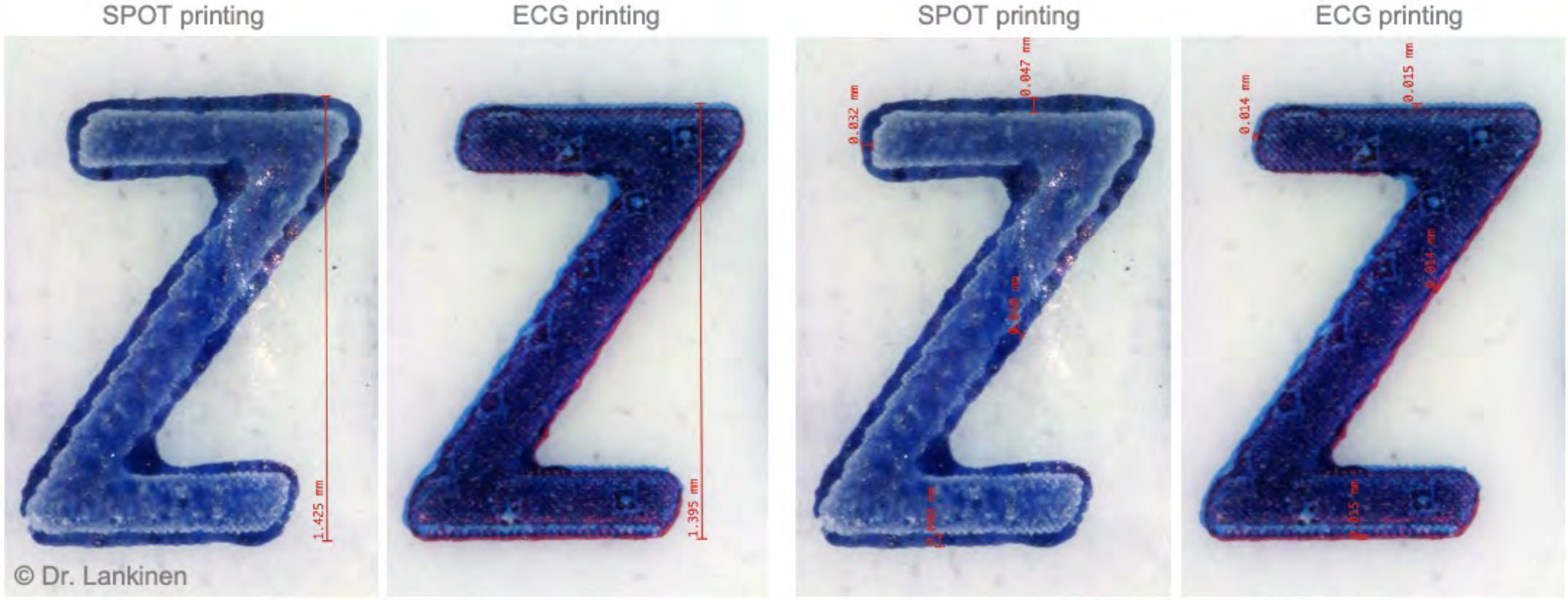
POSITIVE (+)
On-press color adjustmet
Lower process control
Less prepress knowhow
Lower register accuracy

NEGATIVE (-)
High ink volume
High drying energy
Smearing / ink fill
Low resolution vignettes
Lower press speed
Longer job setup
More press cleaning
More ink logistics
Higher inventory
Higher waste
Colors not always accurate
Often highest CO_2 footprint
Additional costs

POSITIVE (+)
Low ink volume
Less drying energy
Less smearing / ink fill
High resolution vignettes
Higher press speed
Shorter job setup
Less press cleaning
Less logistics
Less inventory
Lower waste
Color proof close 1:1
Often lowest CO_2 footprint
Sharp details

NEGATIVE (-)
Process stability needed
Some colors unachievable
More prepress knowhow
Hihger register accuracy

Small text: Spot vs. ECG printing

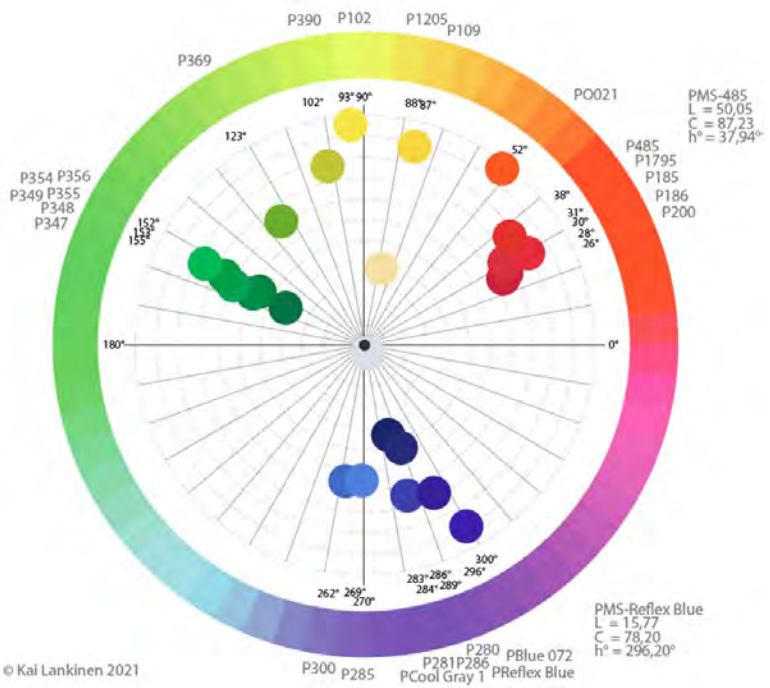


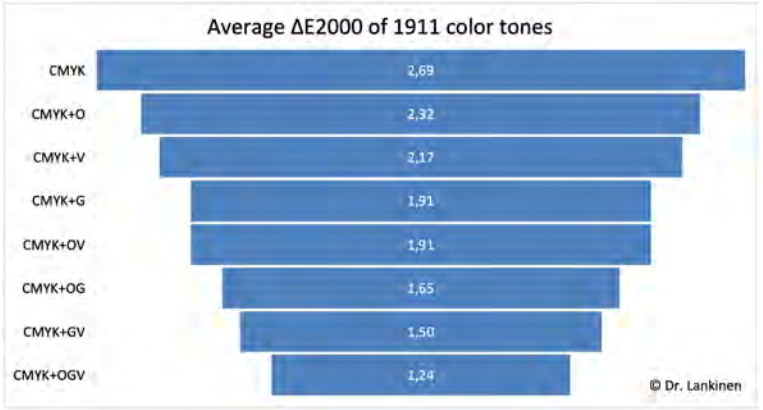
Examples of small texts with ECG (50x)

Most typical 25x spot colors with ECG

K.Lankinen / 12.2.2021 dE2000, M1, D50/2°

PMS	CMYK	EGP
200	1,71	0,00
186	1,13	0,00
185	3,26	2,08
1795	0,10	0,00
485	1,69	0,07
Orange 021	6,81	2,25
109	3,33	0,77
1205	1,48	0,37
102	2,57	1,23
390	3,53	1,34
369	3,25	0,00
356C	1,32	0,00
354	8,70	1,35
355	1,79	0,00
349	0,07	0,00
348	0,20	0,00
347	2,12	0,00
300	4,62	0,86
285	4,20	2,58
Cool Gray 1	0,01	0,00
281	7,66	0,43
286	8,49	1,74
280	6,73	0,00
Reflex Blue	8,70	0,90
Blue 072	9,48	1,44





Summary of the 25 most typical PMS colors in packaging printing			
DATA ANALYSIS	FOGRA39	DATA ANALYSIS	ECG(REF)
ΔE_{00} Max	9,48	ΔE_{00} Max	2,58
ΔE_{00} 90th percentile	8,62	ΔE_{00} 90th percentile	1,94
ΔE_{00} Average	3,72	ΔE_{00} Average	0,70
ΔE_{00} Median	3,25	ΔE_{00} Median	0,37
ΔE_{00} StdDev	3,08	ΔE_{00} StdDev	0,83

Poll 2021/02 on LinkedIn group "Flexography Around the World"
FOGRA39 is CMYK and Reference profile as ECG (CMYKOGV)

Dr. Lankinen

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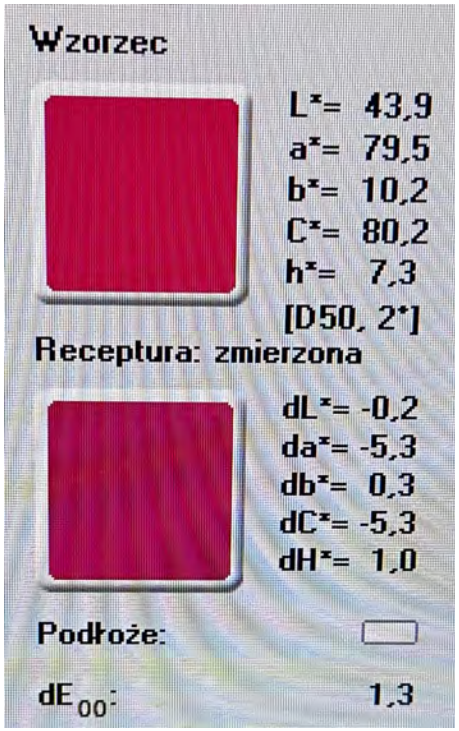
Future Directions, Concerns

- Brand owners
- Designing for ECG!
- Life Cycle Analysis for ECG vs Spot Colors
- Impact on Sustainability
- Impact on material waste = savings
- Variability of inks – batch-2-batch
  - ($\Delta E \leq 2.0$ means sometimes Δa or $\Delta b > 2.0$)



Conclusions

- **Implementation**: Many companies successfully use ECG, but knowledge gaps exist at the operational level
- **Key Benefits**: Delivers cost savings and boosts capacity. Enhances image quality, improves color consistency, and reduces ink inventory
- **Future Outlook**: ECG is expected to grow, with many predicting it will exceed 10-20% of packaging printing by 2035
- **Challenges**: Lack of brand-owner awareness slows adoption; education and engagement are crucial for wider implementation
- **Strategic Alignment**: ECG supports business goals but requires investment in training and stronger collaboration between printers, converters, and brand owners

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Thank you!

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