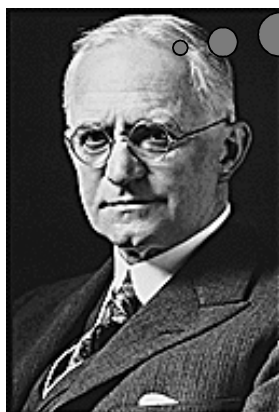


Technologies and Paper Properties for Printing Photos in the Digital Age

Wolfgang A. Schmidt
Felix Schoeller jr., Osnabrück,
Germany

Consumer photography started in
1900



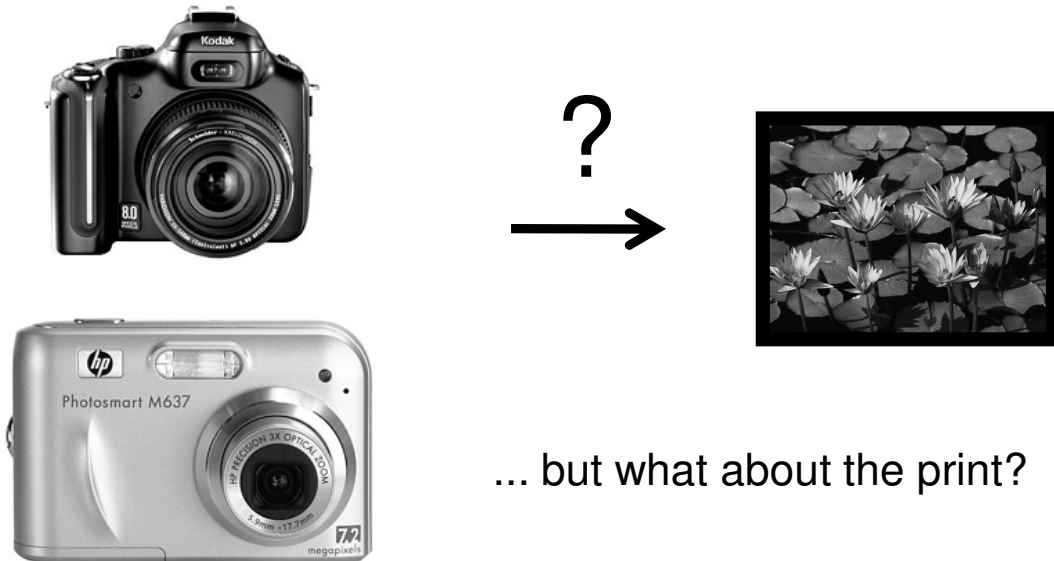
George Eastman

You press the button,
we do the rest



...comprising the complete imaging chain
from shot to print

Since 2000, exposure definitely
changed to digital....

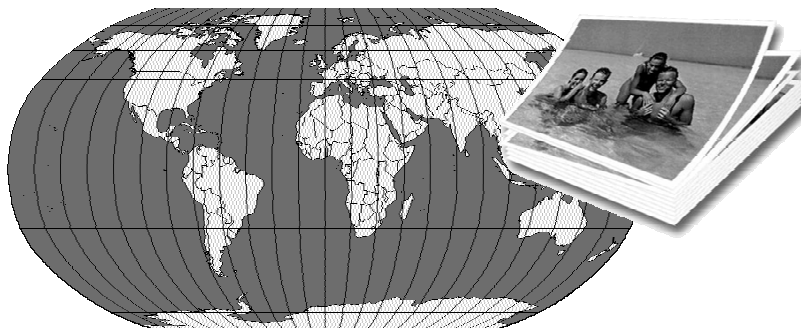


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The overall number of photo prints
stays almost constant



120 Billion 10 x 15 prints per year
demanding

2 Billion m² =

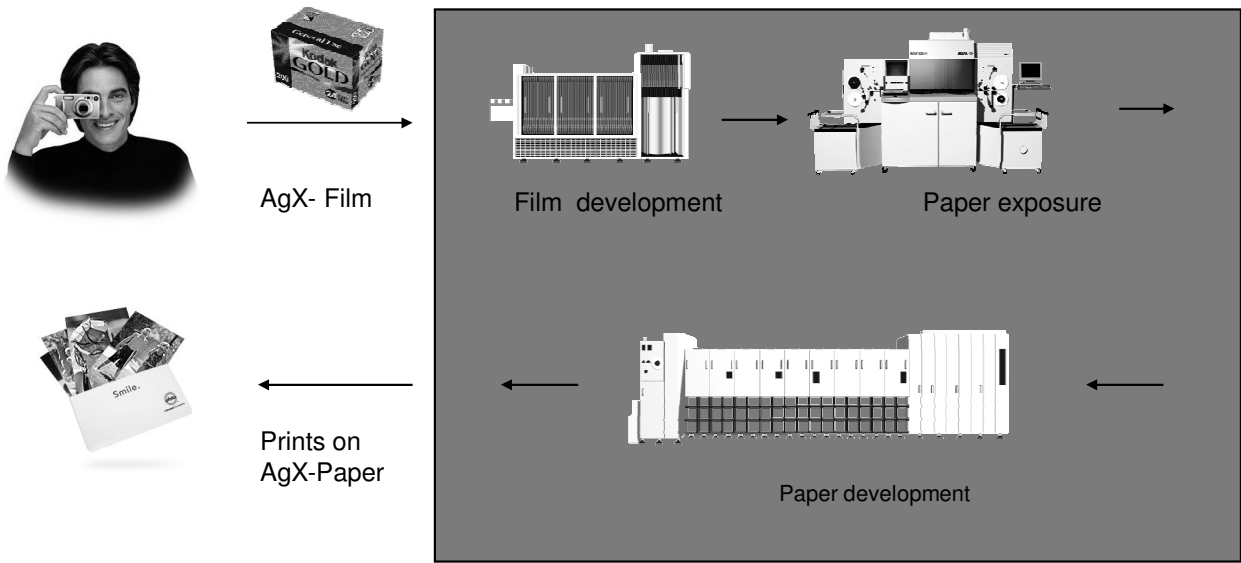
400.000 to. of photo paper

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Silver halide photo printing...

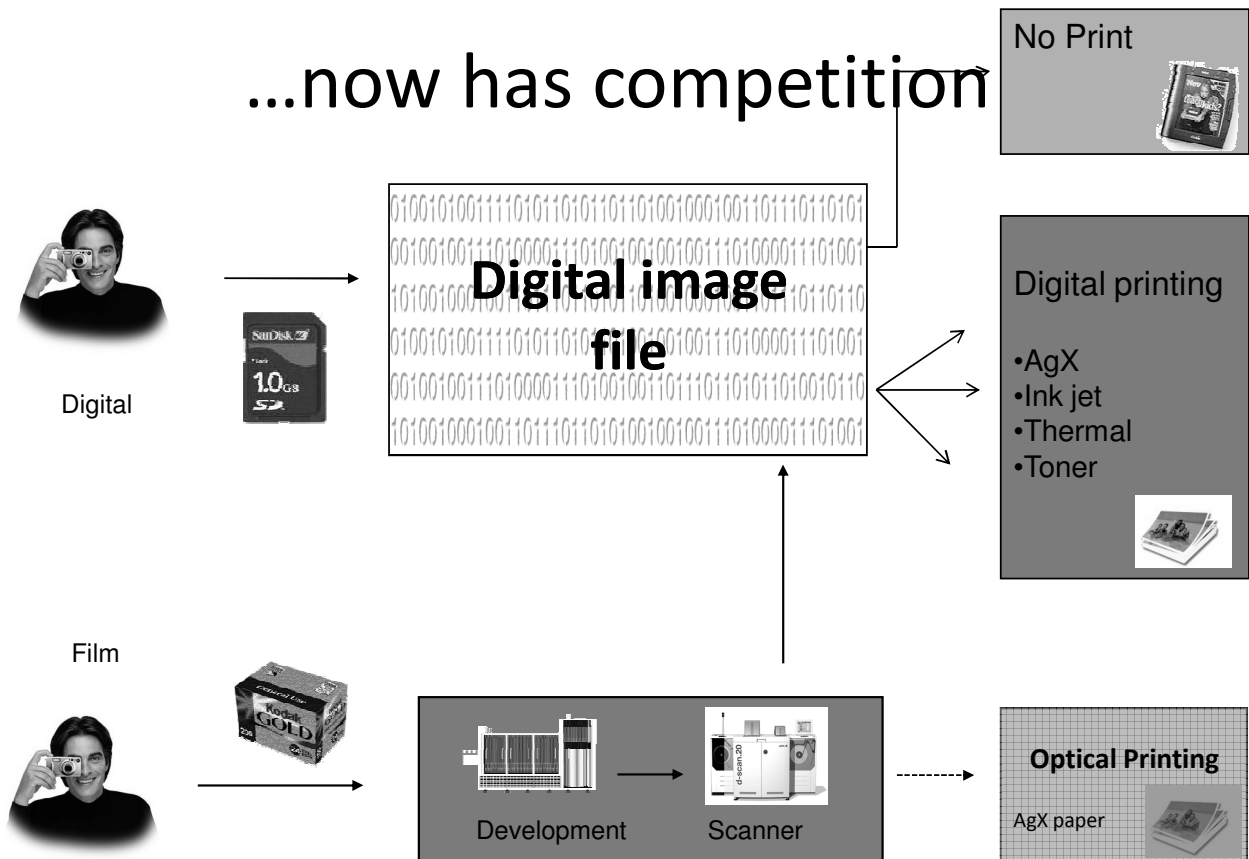


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...now has competition

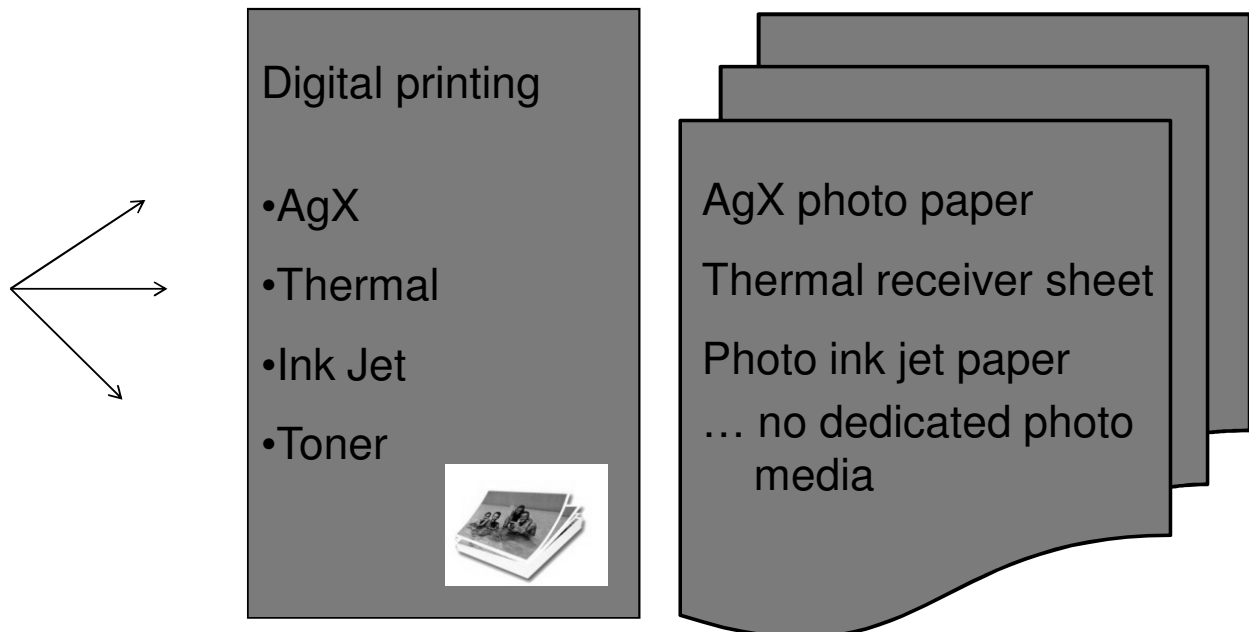


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Printing technologies and paper media in detail



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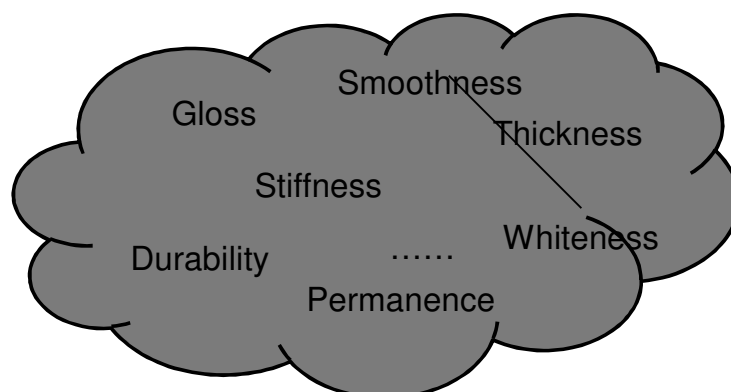
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General requirements for imaging papers

Silver halide print is the benchmark!

“Real Photo” look and feel



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Competing printing technologies and materials

1. Silver halide (AgX)
2. Thermal / "Dye sub" / "D2T2"
3. Ink jet
4. Toner / Electro photography / Color laser

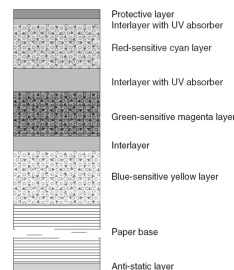
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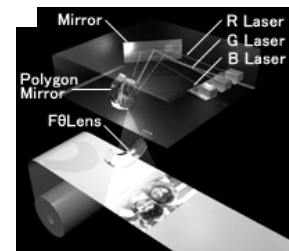
9

Silver halide - technology

- Multi-layer coated material (7 ... 10 layers)
- Exposure with light (R G B)
 - Digital light exposure with laser, LCD ...
- Processing (development) with harsh wet chemicals



Silver coating: approx. 0.60 g/m²
Total layer thickness (without base): approx. 10 µm.



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Silver halide – key paper features

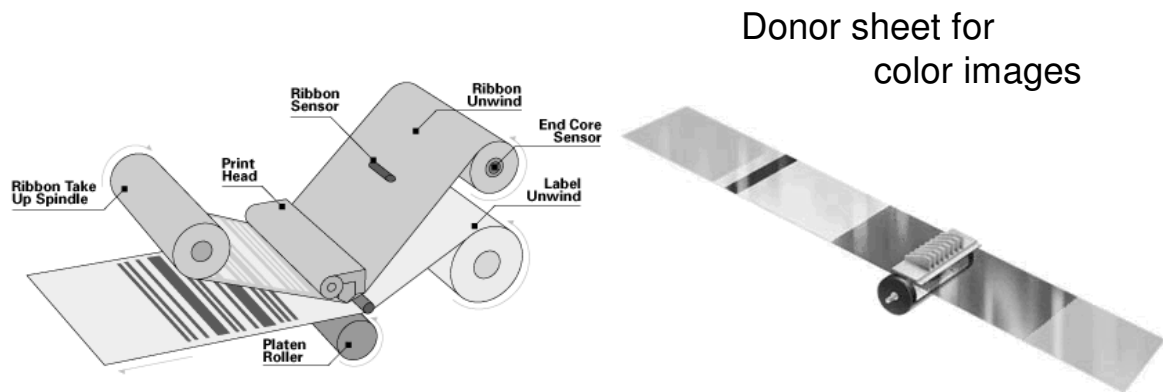
- Resistant to water and processing chemicals
- PE-coated paper (extrusion coating)
- Hydrophobic additives
- Chemical clean / pure
Silver halides are semiconductors!
- Strictly controlled raw materials and production lines

Competing printing technologies and materials

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Thermal / “Dye sub” / D2T2

Special dyes are diffusing from a donor sheet to a receiver sheet during local heating



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Thermal– key paper features

- Very smooth surface
- Thermal insulation
- Uptake of image dyes
- Combined extrusion coating/ foil laminating
- Air-containing foil lamination (BOPP)
- Dye receiving top layer of “hard” thermoplastic resin (about 5 μm)

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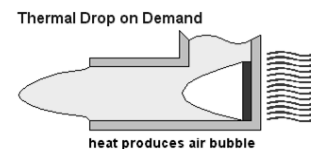
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Ink jet technology

⊙ Photo printing “Drop on Demand”

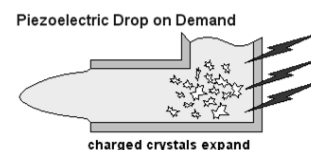
⊙ Print head type

- thermal / bubble
- piezo



⊙ Ink type

- Dye (solution)
- Pigment (dispersion, 50 ... 250 nm)

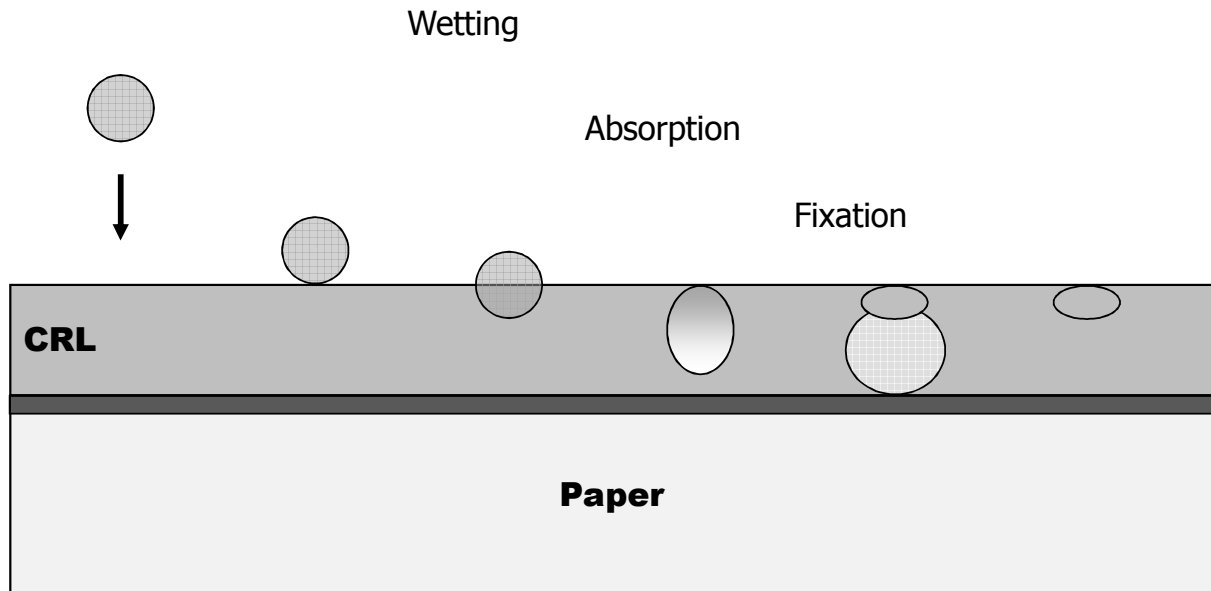


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Ink jet paper technology



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Ink jet– key paper features

- Liquid (water) absorption (about 25 ml/m²)
- Optical transparent coating
- Dimension stability (cockling, curl ...)
- Porous or swellable coating
- Mesoporous coating (nanoparticles)
- Extrusion coating with thermoplastic resin

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Competing printing technologies and materials

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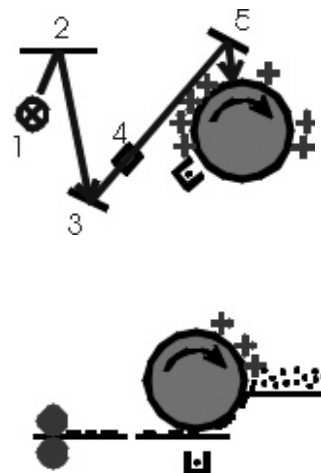
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Toner / Electro photography technology

- Light exposure of an electrically charged photosensitive semiconductor (drum)
- Application of toner (powder)
- Transfer to the substrate (paper)
- Thermal fusing of the toner image



No special photo media needed / available

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Competing printing technologies and materials

but which technology will make the race?

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Silver halide

- Market segments:
Centralized Labs, Minilabs (over the counter)
installed base!



- complex hardware
good image quality,
cheap consumables, but chemical processing involved

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Thermal / “Dye sub” / “D2T2”

- Market segments:
home printing , professional, “Kiosk”-self-service systems



- simple hardware /printers,
good image quality,
complex consumables

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Ink jet

- Market segments :
home printing , “Kiosk”-self-service systems (emerging)



- Good image quality
Simple hardware / printers
Consumables still expensive (ink !)

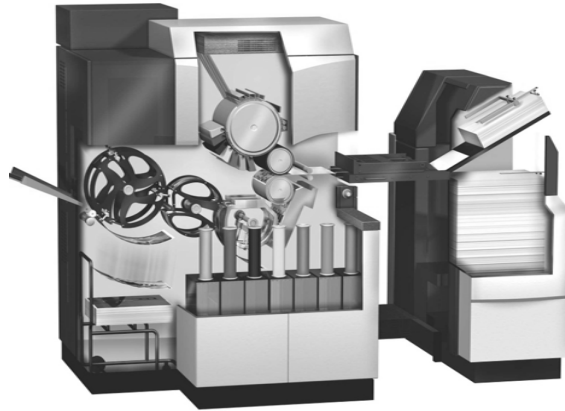
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Toner / Electro photography technology

- Market segments: Industrial printing, centralized labs for photo books



- Hardware complex and expensive
Image quality still at the low end
Consumables (toner) rather expensive

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Competing printing technologies and materials

which technology will make the race?

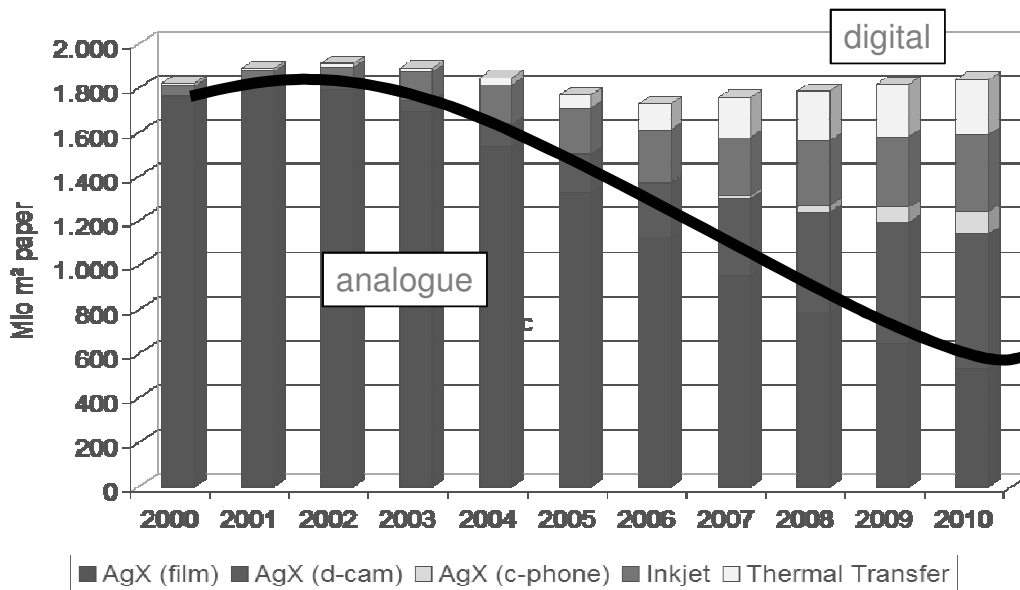
.... trying to look into the near future

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AgX market share still rather high and stable!



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Summary

- Consumer photography became digital within the last 5 years
- The market for photo prints is rather stable
- Competing technologies exist for printing: AgX, Thermal, Ink jet, (Electro photography)
- Photo “look and feel” is a key feature
- Paper properties have to be adapted to the printing technology and process

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