



Thermoforming goes digital: New opportunities with HP Latex Inks

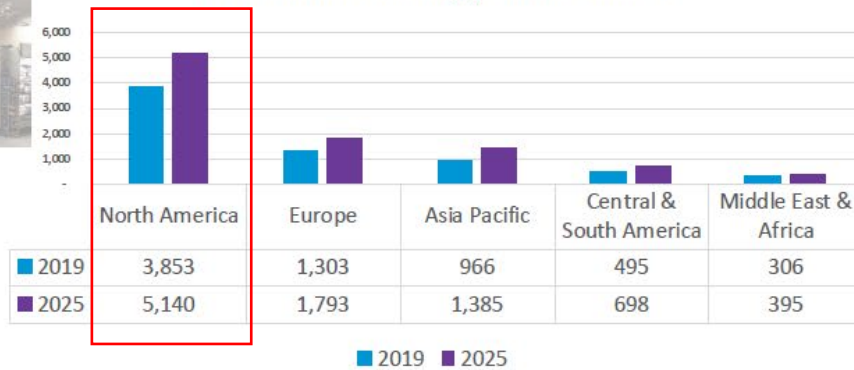
Thomas Giglio – HP Inc.
October 20, 2021



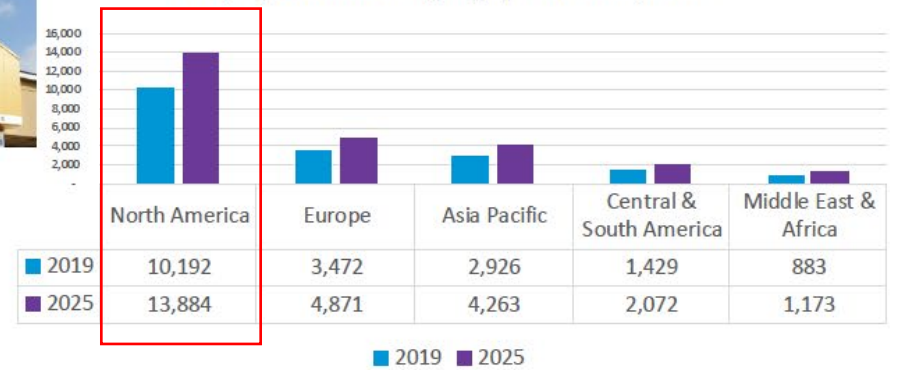
Printed Thermoforming market by application area



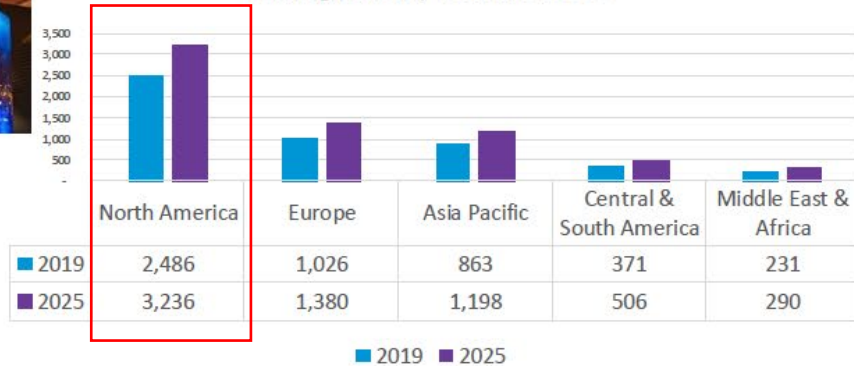
Promotional & Branding | Revenue \$000's



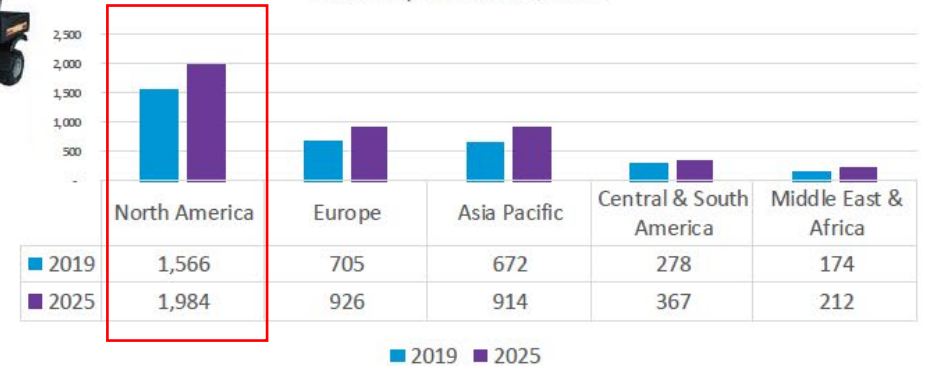
Display & Outdoor Signage | Revenue \$000's



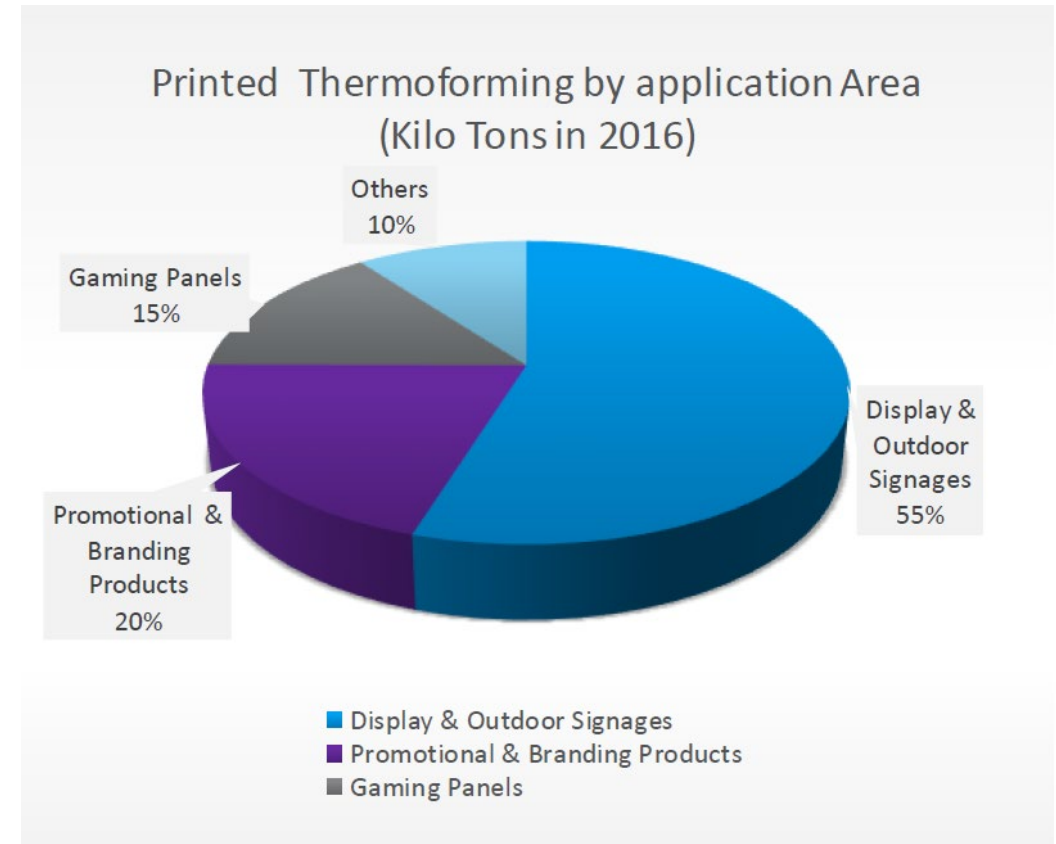
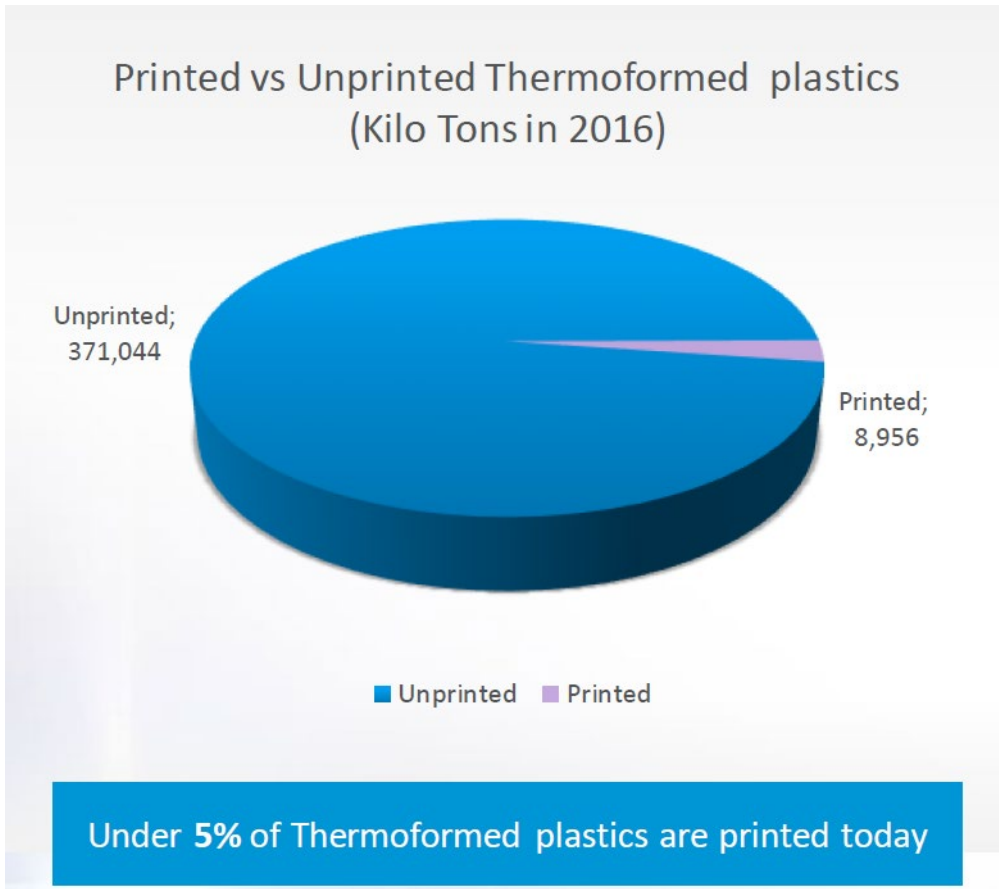
Gaming Panels | Revenue \$000's



Others | Revenue \$000's



Printed versus unprinted



Most of this is decorated manually or screen printed!!

Entry into new markets, constantly reinventing yourself

Outdoor Signage



Outdoor signage typically printed on polycarbonate

Gaming



Backlit signage typically printed with white ink onto PETG

Point-of-Purchase



Indoor signage printed on styrene, PVC and acrylics

Industrial



Various substrates such as ABS, modified acrylic and polycarbonate

Analog printing and digital printing comparison - technology

Analog (Screen/litho/flexo) printing



- Long set-up time/process for first print
- Economy grows with longer print runs
- Multiple iterations for distortion printing
- Multiple/custom ink options
- Ceiling on image quality

Digital printing



- Fast first print, no setup time
- Instant-dry prints, ready to form
- Short run costs are minimal
- Sustainable printing
- Higher image quality

Analog printing and digital printing comparison – market opportunity

Market	Analog Printing	Digital Printing
Many customers have faster GTM (go-to-market) modeling	X	✓
Customers demand shorter, more targeted runs	X	✓
Versioning and custom color combinations	X	✓
Long runs with one universal message	✓	X
Use of photography (4-color process)	✓	✓
Branding/messaging can be spread across many mediums	✓	✓

Common ink types involved in thermoforming today



Conventional: Screen printing inks

- Both UV and solvent versions
- Inexpensive compared to digital inks
- Colors are mixed and thinned
- HAPs and VOCs are higher than digital



Digital: UV and Solvent/Eco-solvent inks

- “Special” ink sets
- Excellent adhesion
- Choice points” adhesion, density or gamut
- Density is a problem – tradeoffs
- UV inks can re-wet, block and crack/craze
- Costly piezo print heads



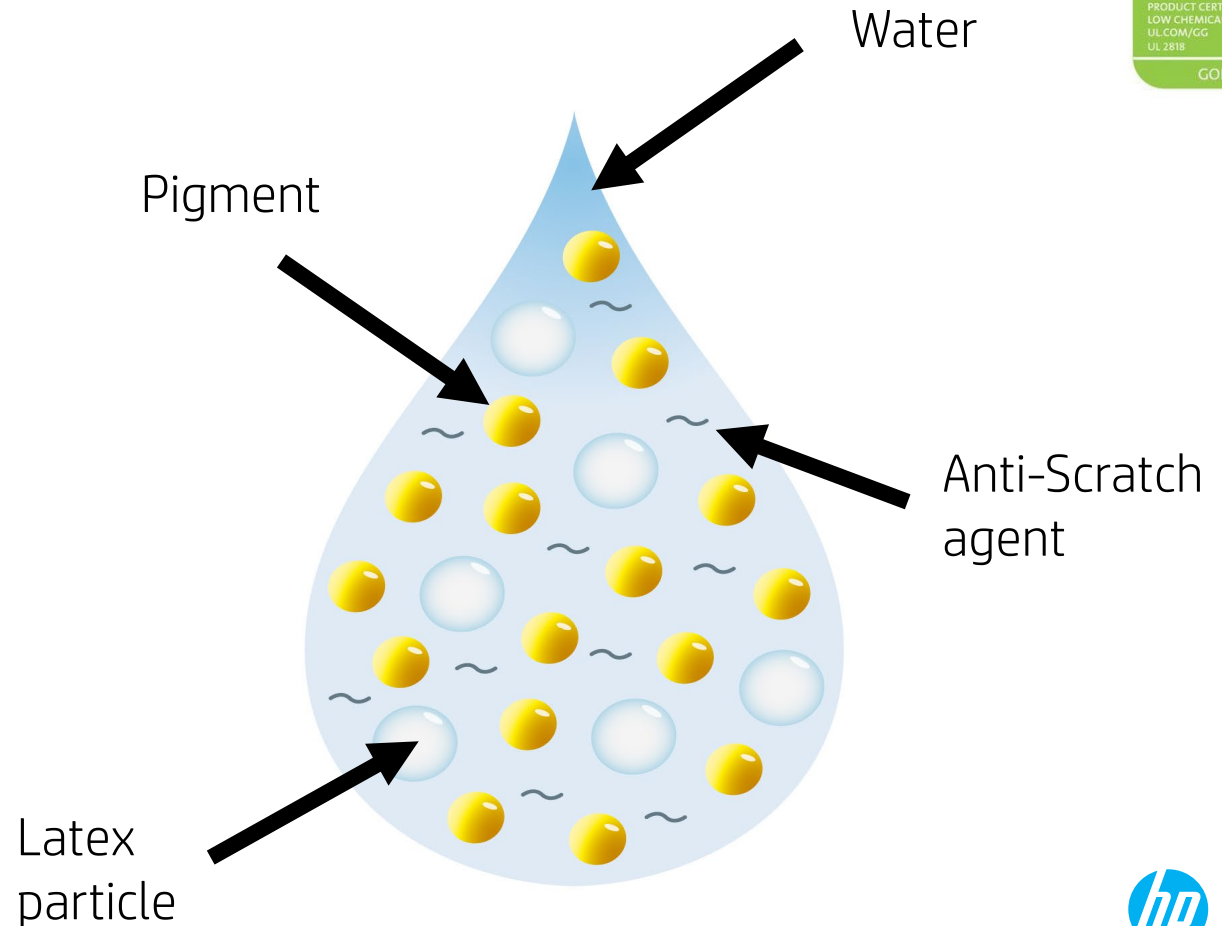
Digital: HP Latex inks

- “Universal” Water-based ink, including white ink
- No reactive monomers
- High pigment loads for a digital ink
- Excellent elongation
- Inexpensive thermal print heads
- Thin ink film thickness
- No ventilation needed

Deep-dive into HP Latex ink technology

Heat evaporates water and encapsulates the pigment into a latex film

- HP Latex Inks contain between 60-70% **water**
- Once the vehicle is evaporated, heat (about 150-deg F cures the co-polymer (resin)
- An inline **optimizer** is placed between the substrate and ink to allow for image quality and fixing of dot placement.
- An optional **overcoat** can be applied for handling and minimal durability



ROADMAP TO
ZERO



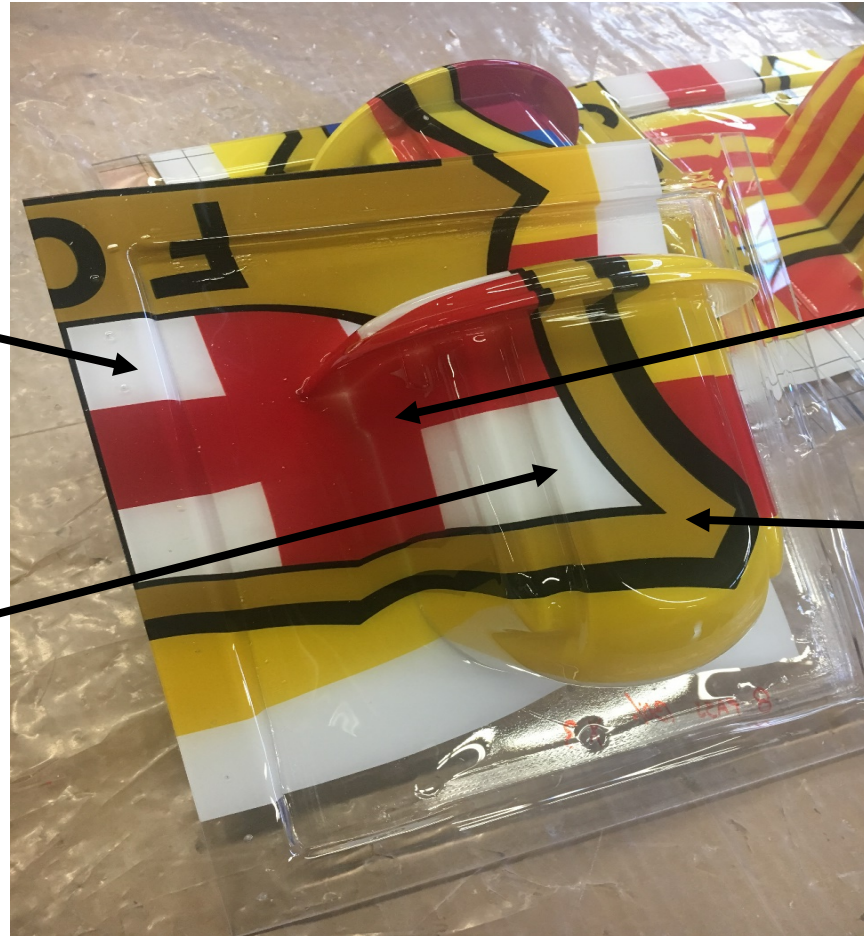
Anatomy of an HP Latex printed part used in thermoforming

White ink:

Printed in-line in 60%, 100%, 160% or 260% densities

“Sandwich” modes:

3-layer color-white-color
or 5-layer color-white-black-white-color



Extreme ratio forming and elongation

no cracking/crazing and minimal loss of density – only seen where thermoplastic is thinning

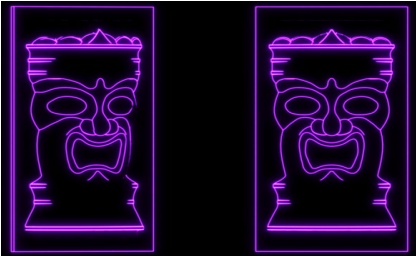
High density/

Rich colors

Up to 390% ink in a single pass

Distortion printing process

Overview



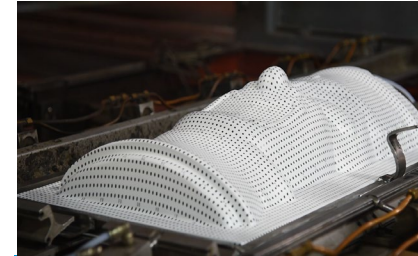
Create 3D model
that will be used for
creating the mold
and artwork



Create the mold and
mount to a vacuum
box on the
thermoformer



Use the 3D file and
create artwork in
pre-press



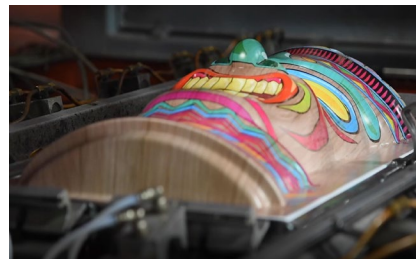
Use grid to align
artwork
to the mold



Print the artwork
on an R Series
printer!



If needed, coat the
materials with a
roller coater



Printed parts are
thermoformed



If needed, parts
can be finished with
a router or robot

Distortion printing process



Printing time = about 350 ft²/hour
Material = .060" Digi HIPS (styrene)
3 versions, 100 each quantity
Ink cost was about \$0.25 per ft²

HP Latex R Series

The first HP Latex rigid printers

“Plus” models



\$160K MRP

R1000 Plus (64")



\$220K MRP

R2000 Plus (98")

Includes: white ink option, roll-to-roll option, extra set of extended tables and 18-month warranty

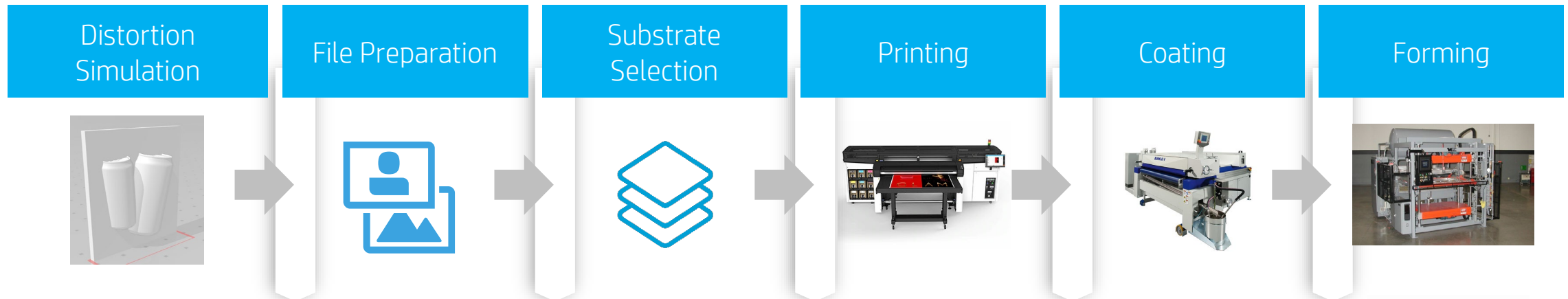
Where to start

Transitioning to digital

- Learn as much as possible from HP and SPE experts
- Arrange a demo to see the printing process
 - Facilities nationwide and in Canada
 - Spec project using all components (benchmarking)
 - Capture metrics/costing information
- Work with consultants on e2e solution:
 - Markets
 - Workflow
 - Facilities/physical plant space
 - Labor considerations
 - Finishing

HP Latex Thermoforming ecosystem

An open end-to-end system for optimum customer adaptation



R1000 (64")
R1000 Plus (64")
R2000 Plus (98")



Best practices for moving forward



1. Going digital is not that hard if aligned with the right technology and enablers in the ecosystem
2. Determine what digital can do for you now but more importantly what it can do for the future!
3. HP has a great, innovative and proven solution with many workflow and ecosystem partners.



Q&A

Thank you - from all of us at HP and our partners

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