







The study identifies distinct barriers to innovation, caused by market failures,<sup>4</sup> beyond the public good nature of technology infrastructure, that create further inefficiencies and magnify the role of public institutions in meeting these scientific and technical needs. The gaps alongside critical uncertainties increase the cost of advanced R2R research, development and deployment. Just as an R2R end user cannot easily verify the quality of the inks and substrates, they cannot verify the quality of proprietary data and testing developed by ink and substrate suppliers. The data collected in this study showed “firms are spending money duplicating one another’s efforts to address strikingly similar challenges: validating input materials quality, building reference databases, sorting out alignment and registration on moving substrates, and developing real-time metrology and process modeling software and tools.” In this environment, publicly available and trusted third-party data can lower research and adoption costs and increase the incentive to invest in new technology. Absent critical materials property data for inks and substrates, process control metrology and other critical standards, advanced R2R research, development and deployment is excessively costly and the incentives for private investment in R2R research will continue to be low.

Finally, in addition to critical measurement and standards needs, this study identifies a number of critical technology platforms such as new inks, substrates, process models, and other technology platforms. At times, these technical barriers are substantial. The study reported that “precision and speed are never going to go together until huge revolutions are made.” The study finds that ensuring technology platforms are developed that meet industry needs may require investments in public-private manufacturing consortia.

## References

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<sup>1</sup> See O’Connor et al [4].

