



Position Paper on Digital Delivery in Engineering
Developed by the ACEC Technology, Transportation, and Risk Management Committees
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Introduction

The American Council of Engineering Companies (ACEC) recognizes the transformative paradigm shift in the engineering industry from traditional 2D plans to a model-based digital delivery approach. Numerous public agencies have developed and adopted implementation plans and are moving towards digital delivery and Model as the Legal Document (MALD).¹ Effective integration of digital tools and processes in infrastructure project delivery is crucial for improving efficiency, accuracy, collaboration, and sustainability and meeting our clients' needs. This ACEC committee-produced position paper outlines the expected benefits and challenges of digital delivery and provides recommendations for successful adoption and implementation of digital delivery practices in the engineering sector.

Anticipated Benefits of Digital Delivery

- 1) **Enhanced Collaboration and Communication:**
Digital delivery facilitates real-time model/data-based collaboration among stakeholders through cloud-based 3-D/data-centric platforms, reducing misunderstandings and improving project coordination. This efficient communication and collaboration enhance the integration of diverse multi-disciplinary expertise, leading to more innovative and effective engineering solutions. It also helps ensure project staff are using the correct design data and the “single source of truth.”
- 2) **Increased Efficiency and Productivity:**
As adoption and proficiency increase, the use of digital workflows can streamline the design and construction process. Automated processes such as clash detection and automated quantity take-offs help reduce manual errors and save time, which may ultimately increase productivity and allow for faster project completion.
- 3) **Improved Accuracy and Quality:**
Digital delivery provides repeatable digital data exchanges between design and construction, providing enhanced clarity on design intent and streamlined digital workflows. MALD provides reliable and accurate digital data, enabling client agencies and contractors to have a

¹ While varying definitions have been developed by different agencies, ACEC generally understands “digital delivery” to mean an exchange of asset and project information that occurs using digital data as opposed to analog representations comprised of paper or from which the information must be extracted manually, whereby construction projects have the ability to be bid using 3D technology and no longer only be delivered in a traditional construction plan format (see e.g. [PennDOT Digital Delivery Glossary of Terms](#) and [Utah DOT Glossary of Terms](#)). “Model as the Legal Document” means a form of digital delivery in which a model comprises the primary construction contract document.

more holistic understanding of the design, resulting in more accurate bids, properly allocated risk, improved constructability and schedule certainty, and reduced change orders.²

4) **Advanced Life-Cycle Performance:**

Digital construction technologies can support more effective operations and maintenance, asset management systems, and life-cycle performance. The creation and use of tools such as digital twins and digital as-builts and other project data management can improve overall project quality and sustainability.

Typical Challenges to Adoption

1) **Initial Costs and Investment:**

The transition to digital delivery requires significant upfront investment in strategic staffing, technology, software, hardware, education and training. Some engineering companies, particularly smaller firms, may find these initial costs prohibitive, necessitating the consideration of financial supports to encourage adoption.

2) **Standardization and Interoperability:**

The lack of standardized data exchanges and interoperability between different proprietary digital tools and platforms creates inefficiencies and hinders effective collaboration. Establishing client agency-adopted industry-wide open data standards and requirements is crucial to streamlining data exchanges and enabling digital workflows.

3) **Cybersecurity and Data Management:**

With the increased use of digital tools comes the heightened risk of cyber threats. Protecting sensitive project data and maintaining robust cybersecurity measures are essential to safeguard against potential breaches and data loss.

4) **Workforce Training and Change Management:**

The successful implementation of digital delivery requires a skilled workforce adept in using new technologies. Professional development and training programs are necessary to equip engineering companies with the required digital competencies. Firms must also recruit and retain other skilled technology professionals outside the traditional engineer or technician to support the necessary workflows.

Key Considerations for Engineering Companies

1) **Upfront Communication:**

It is essential to have candid communication between the engineering firm and the client agency from the project outset regarding specific project digital deliverable requirements, including specific digital deliverables required and level of information need. This transparency lays a solid foundation for successful project delivery and sets clear expectations through documentation.

2) **Client Benefits and Value:**

It is critical to clearly delineate the potential benefits to the client agency and the value of the digital products being delivered. This includes recognizing potential advantages for the full lifecycle of a project, such as enhanced collaboration, more accurate bids, fewer change

² See e.g. [AGC Policy Statement on Digital Means and Methods](#).

orders, and improved utility and conflict resolution, and the potential uses in asset management and eventual upgrade or replacement in the future.

3) Model Intended Uses and Accuracy Requirements:

Articulating clear requirements of model digital data, including accuracies and tolerances is critical for all stakeholders, including owners, contractors, and engineering companies. It is important that the required digital deliverables (e.g. contractual and “for information only”), level of information needed, and intended use/limitations for these deliverables is clearly defined by the client agency in the BIM Execution Plan and Model Element Breakdown table.

4) Quality Management Practices:

Developing and implementing effective quality management practices for 3D models is essential. This includes rigorous systematic reviews to confirm models are accurate and suitable for their intended use. Model based quality management may require new tools and competencies for reviewers.

5) Generative Design and AI:

The inclusion of generative design and AI technologies in digital delivery can revolutionize the engineering process. As these innovations come online, it is essential to address how data is owned and used, protect intellectual property, safeguard the engineer stamp and licensure, and maintain the professional standard of care and compliance with ethical obligations.

6) Common Terminology:

Establishing common terminology for engineer, client agency, and contractor use is important for clarity and consistency. Consistently defining key terms ensures that all stakeholders have a shared understanding of the language and concepts used in digital delivery.

ACEC Recommendations

1) Promote Industry-Wide Open Data Standards:

ACEC advocates for the development and adoption of national data standards for digital deliverables to support efficiency, innovation, and automation. ACEC also endorses having client agencies require open data standards for contractual digital deliverables to provide reliable and repeatable data exchanges throughout the project lifecycle in a software agnostic format.

2) Support Upfront Financial Investments:

To alleviate the financial burden on firms, ACEC urges the use of contract types, terms, and conditions that adequately support the adoption of digital delivery technologies. The negotiation over the scope of work, the costs incurred, the level of effort, and the value of deliverables must be fair and reasonable. Use of the lump sum payment method, rather than hourly cost-based billing, may be better suited in many situations to accommodate the adoption and use of new and emerging technologies.

3) Enhance Cybersecurity Measures:

ACEC urges firms to implement robust cybersecurity strategies, including regular audits, employee training, and the adoption of advanced security technologies. Industry

collaboration on best practices and threat intelligence sharing is vital for safeguarding digital assets.

4) Invest in Workforce Development:

ACEC emphasizes the importance of continuous education and training programs to upskill the engineering workforce and to recruit other technology professionals outside the traditional engineer/technician model. All stakeholders, client agencies, engineering companies, and contractors will all be dealing with the learning curve associated with creating, using, and understanding what it means to work using a digital delivery process and receive a model as the deliverable. Partnerships with educational institutions and technology providers, online courses, and certifications in digital tools and methodologies will ensure that engineering firms are well-equipped for the digital era.

5) Engage with Other Stakeholders

ACEC appreciates the current collaboration among client agencies, project sponsors, regulatory agencies, contractors, technology providers, and other critical stakeholders in infrastructure project delivery. ACEC and its members will proactively engage with these entities at both the national and state levels to promote the views and interests of the engineering industry and partner in the advancement of shared goals.

Conclusion

The American Council of Engineering Companies is committed to championing the adoption and integration of digital delivery in the engineering industry. By leveraging the benefits of digital tools and addressing the associated challenges, we can pave the way for a more efficient, accurate, and sustainable future. ACEC will continue to advocate for policies and initiatives that support digital delivery while protecting the financial, professional, and ethical interests of engineering companies, ensuring that our members are at the forefront of this digital transformation.