



The Digital Manufacturing Institute

# **MxD REQUEST FOR PROPOSAL**

## **TECHNICAL SUMMARY, PROGRAM OVERVIEW and PROPOSAL PREPARATION INFORMATION**

### **MxD-21-12:**

### Virtual Interaction with Supply Chain using Digital Twins

Revision 1.1 Release Date: December 1, 2021

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## I. RECORD OF CHANGE

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Revision	Date	Sections	Description
1.0	30 Sept, 2021	N/A	Original
1.1	1 December 2021	N/A	Extended due date from 2 December to 16 December

## II. PROJECT OVERVIEW

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RFP Released	30 September, 2021
Pitch Session (Optional)	20 October, 2021
Technical and Cost Proposal Due	16 December, 2021
Anticipated MxD Funding	\$500,000
Period of Performance	12 Months

## III. INTRODUCTION

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MxD: The Digital Manufacturing Institute is where innovative manufacturers go to forge their futures. In partnership with the Department of Defense, MxD (also referred to as the Institute) equips U.S. factories with the digital tools and expertise they need to begin building every part better than the last. MxD's core mission is to transform American manufacturing, by fully integrating the digital thread across the manufacturing enterprise to reduce overall manufacturing costs, stabilize and grow the manufacturing industrial base and improve US competitiveness through the world.

MxD has invested over \$120 million in more than 85 applied research and development projects in areas including design, product development, systems engineering, future factories, agile and resilient supply chains, and cybersecurity.

MxD operates from a nearly 75,000-square-foot innovation center near downtown Chicago. Its future factory floor features some of the most advanced manufacturing equipment in the world, which partners can use for experimentation and training on everything from augmented reality to advanced simulation techniques.

MxD uses a broad and collaborative process to develop the Strategic Investment Plan (SIP) and Technology Roadmap to ensure its technology, outreach, and education investments provide U.S. manufacturing with the right skills, solutions, and tools to compete globally. A Request for Proposal (RFP) is initiated when MxD desires new and creative solutions to problems and/or advances in knowledge, understanding and technology for digital manufacturing and design. Once the RFP topic is developed and approved, the MxD RFP will be posted to the MxD website and represents the official notification to Proposal Teams of a request to submit the required documents.

This RFP contains the following elements:

1. Technical Summary: description of a specific technology objective
2. Program Overview: description of technical and program requirements

3. Proposal Preparation Information: background and guidance for the preparation of required forms and instructions needed to submit a proposal to MxD

The RFP is available on the MxD website at <https://mxdusa.org/projects/>. Amendments to a MxD RFP may be used to extend due dates, clarify procedural requirements, or modify technical requirements. If an updated RFP is issued, the previous RFP will be rescinded. Proposal Teams should carefully monitor the MxD website after an original posting of an RFP, up to the time of the Technical Proposal and Cost Proposal submission date. Any revisions, amendments or updates will appear in the same section of the website as the original solicitation. It is the responsibility of the Proposal Team to monitor the MxD RFP updates and ensure their proposal meets the solicitation requirements. MxD welcomes any comments or suggestions for improving the contents of this guide. Please address them to [projects@mxdusa.org](mailto:projects@mxdusa.org).

MxD refers to the Proposal Team Lead as the non-Federal organization that submits a proposal in response to a Request for Proposals. Proposal Team members are other participants on the proposal and are further broken down into Recipient/Subrecipient relationships similar to a prime/subcontractor relationship in traditional contracting.

Any questions regarding this solicitation must be provided to [projects@mxdusa.org](mailto:projects@mxdusa.org). The questions will be sent to the appropriate MxD and/or Government POC, and answers will be published on the MxD website, if appropriate. Questions submitted within one week prior to a deadline may not be answered.



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# TECHNICAL SUMMARY



## IV. TECHNICAL SUMMARY

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### PROBLEM STATEMENT

The term Digital Twin was coined only ten years ago, but the concept is rapidly becoming a must-have in the manufacturing sector. In 2020 a Gartner poll found that 62 percent of respondents expected to be using digital twin technology by the end of 2021; only 13 percent of them were using it at the time. Manufacturers are becoming increasingly aware of the benefits of digital twins as they help drive business value and have become a vital component of enterprise IoT and digital strategies.

For the purposes of this document, a digital twin is made up of three components: a physical system, a virtual representation of it, and the data that flows between them. The physical system could be an individual device, a complex machine, a whole production line, or even an entire factory. The virtual representation can be as complex as necessary to represent the system. The data connection keeps the virtual twin as closely in sync as possible with the physical twin, often tracking and updating changes in real time.

A digital twin operating in isolation can provide organizations with plenty of value, but the real rewards that few are able to realize are achieved through making connections. Data integration between multiple sub-components of a digital twin, between multiple digital twins, or between digital twins on separate IT/OT networks, is key when advancing beyond initial use cases. This next step in the evolution of the technology focuses on the ability to connect digital twins across organizations within a supply chain. There are at least three types of relationships for which a digital twin can integrate:

- 1) **Hierarchical**, in which digital twins can be grouped together into increasingly complex assemblies, such as when the digital twins for several pieces of equipment are grouped into a larger digital twin for a whole production line.
- 2) **Associational**, where a virtual twin for one system is connected to a virtual twin in another system, in the same way that their physical counterparts are interrelated, such as wind turbines connected to a power grid.
- 3) **Peer-to-peer**, for similar or identical equipment or systems working together, like the engines of a jet airplane.

To achieve this advancement, organizations must first focus on the safe and secure transfer of data. A digital twin can contain confidential and proprietary information so there is a need to control the access of data to certain parties while still allowing full analysis and computation to be performed. Another consideration to consider is the fact that data streams will be coming in from different sources, at different points in time, and in different formats. It is important to identify the challenges related to the specific data streams. For example, the data feeding the digital twin is likely coming from within an organization from a merged OT/IT source. Then there is the interaction between digital twins across the supply chain which is more managed and is likely IT only. While the first has more privacy concerns, the second has more standards-based and interface concerns. An organization will need to figure out a way to ingest this variety of data while still allowing for the real-time collaboration on a digital twin from multiple users throughout the supply chain. The successful breakthrough of these barriers has the potential to accelerate adoption of digital twins throughout the wider U.S. manufacturing base by developing a playbook of validated standards and protocols for other organizations to use.



The digital twin is the driving concept behind many of MxD's projects. According to Deloitte, "with the creation of the digital twin, companies may realize significant value in the areas of speed to market with a new product, improved operations, reduced defects, and emerging new business models to drive revenue." Hence, the most advanced manufacturers are focusing their digital manufacturing efforts on implementing the digital twin concept in their own operations and across their supply chain.

## OBJECTIVES

The following objectives outline the key activities that MxD considers applicable for a successful project. MxD's recommended set of requirements are included under each objective, but the team is encouraged to make value-added changes to the requirements as they see fit. These changes should be justified in their proposal. The objectives below are listed in a rough chronological order based on a general concept of project execution but accomplishing tasks in this specific order is not a requirement. MxD encourages agile development on its projects to ensure that the deliverables are shaped and validated by customers and key stakeholders throughout the period of performance.

Additionally, teams are not expected to provide an all-encompassing solution that covers an organization's entire supply chain and all the downstream interactions between suppliers of suppliers. This is unrealistic. While it is MxD's larger vision that a single system could integrate data from all stages in the supply chain, our expectation for this project is to provide one specific portion of that vision which is demonstrably scalable. Teams are expected to focus their proposals to a scope that is realistic, achievable, and aligned with their unique subject matter expertise. A wider range of expertise is preferable to MxD, but teams will be evaluated based on their proposed approach and its potential impact on advancing the collaboration of digital twins across organizations with the potential to make a broad impact on industry.

The key objectives are defined below:

1. **Development of a framework for integration:** The core of this project is centered around data integration. The digital twin can be small in scope so that the project team can focus primarily on the data exchanges. Data exchanges will not only need to be integrated from OT and IT networks within an organization but also securely across organizations in a supply chain.

There are at least three types of relationships that can be demonstrated in this project:

- a) **Hierarchical**, in which digital twins can be grouped together into increasingly complex assemblies, such as when the digital twins for several pieces of equipment are grouped into a larger digital twin for a whole production line.
- b) **Associational**, where a virtual twin for one system is connected to a virtual twin in another system, in the same way that their physical counterparts are interrelated, such as wind turbines connected to a power grid.
- c) **Peer-to-peer**, for similar or identical equipment or systems working together, like the engines of a jet airplane.

The requirements for this objective are as follows:



- Develop a plan for securely ingesting data from different sources, at different points in time, and in different formats.
- The solution should use real-time data coming from one organization within a supply chain to another: either upstream or downstream between manufacturer and supplier.

2. **Implementation with a manufacturer:** Engage with a manufacturer to identify a product or process to initiate and track a pilot deployment.

The requirements for this objective are as follows:

- The manufacturer will drive the use cases, KPIs, and other success metrics
- The Proposal Team should target use cases and manufacturers where sufficient data is present to provide meaningful insights and for which data is sufficient to be utilized during the project period of performance.
- Determine an appropriate manufacturing use case based on data availability and suitability towards demonstrating improvements in defined KPI.
- Protect proprietary information by defining which data are sensitive/contain IP and determine a strategy for securing this data.
- The Proposal Team can choose any digital twin product or process if the outlined objectives and requirements are met, and adequate data is available to inform the solution.

3. **Demonstration and documentation:** Create a detailed case study, implementation playbook, and executive summary report that provides success stories and help other manufacturers build confidence about what to expect when implementing a solution that shares digital twins

The requirements for this objective are as follows:

- Using a commercially available, modified, or originally developed tool, the Proposal Team should demonstrate and document the implementation process of a digital twin collaboration tool
- Provide documentation on what framework was chosen and why and how it can be used to satisfy the larger goal of creating a single system that could integrate data from all stages in the supply chain.
- Record both tangible and intangible ROI, best practices, and identify common pitfalls to avoid when deploying these solutions. Though it can be difficult to calculate ROI and translate it across different companies, improvements in relevant metrics such as throughput, efficiency, productivity must be clear.
- If applicable, detail the change management process and the experience proactively managing and overcoming resistance.

Through these objectives, the project primarily seeks to address the following general use cases. Furthermore, it is expected that the Proposal Team will identify and propose with a manufacturer to provide their own relevant use cases.

- As a **supply chain manager**, I want to collaborate with my suppliers in real-time using digital twins to ensure that any new parts or process will not interrupt production.





- As a **quality manager**, I want to virtually test and trial digital twins from my vendors before they go into production.
- As an **operations manager**, I want to know if a revision is made to a design, how that will impact the supplier's delivery time so that I can factor any delays into my own factory floor scheduling.

## RFP SCOPE OF WORK

The above objectives must be completed within the following project constraints:

**Period of Performance:** 12 months

**Anticipated MxD Funding:** \$500,000

**Minimum Cost Share Contribution:** \$500,000

During the period of performance, the Proposal Team should engage the manufacturer(s) early on to gain a deeper understanding of their needs, determine relevant metrics and KPIs, and further refine the requirements for their deliverables. The Proposal Team can choose to implement and validate a commercially available, modified, or originally developed solution. They will need to conduct initial market research and document the criteria used for choosing an off-the-shelf solution from the numerous options commercially available or justify their use of a modified or originally developed tool.

The development process should employ agile methodology. Thus, the Proposal Team should have active engagement from manufacturing partners throughout the period of performance to ensure the development is headed in a value-added direction. To support their solution, a Proposal Team may choose to leverage relevant outcomes of previous MxD projects. This includes:

- 19-04-04 Digital Twins Testbed for Process Manufacturing, which created a digital twin of a process testbed to demonstrate the “mobile worker” proof of concept.
- 19-04-03 Digital Twins for Process Manufacturing: Open Architecture, which created an open-source digital twin platform for process manufacturing.

Based on the timeline and funding amount, it should be noted that data integrity and retrofitting of a manufacturer’s environment with sensors are considered outside the scope of this project and should not be the focus. The Proposal Team is expected to focus its proposal on a scope that is realistic, achievable, and aligned with its unique subject matter expertise.

During the period of performance, the Proposal Team will produce deployable deliverables that will be shared with the MxD membership in accordance with the Membership Agreement. The recommended deliverables are listed below in Table 1, but **the Proposal Team is encouraged to include additional deliverables or provide value-added changes to the recommended set of deliverables.**

**IMPORTANT:** If changes are made to the deliverables, the Proposal Team must provide the reasoning and detail any assumptions to provide context for the changes. Their proposed set of



deliverables must align with MxD's focus on achieving deployable outcomes and enabling the transition of the research.

**Table 1. Technical Deliverables**

Deliverable	Description	Deliverable Due Date (Month #)
<b>Landscape Assessment</b>	Conduct an asset audit of equipment and enterprise systems, data collection mechanisms (e.g. sensors), and define baseline KPIs / metrics.	Month 2
<b>System Architecture and Integration Framework</b>	Documentation of the system architecture and integration framework including approach and diagrams.	Month 3
<b>Network Architecture</b>	Documentation of the network architecture including approach, diagrams, and considerations for compliance and security.	Month 4
<b>Implementation at Pilot Manufacturer and Supplier</b>	Implement a commercially available, modified, or originally developed digital twin collaboration solution in a manufacturer's supply chain to validate its effectiveness.	Month 6
<b>Guidebook</b>	A general guidebook detailing best practices for other manufacturers to follow when choosing a similar digital twin collaboration technology stack and common pitfalls to avoid. As well as Provide documentation on what framework was chosen and why and how it can be used to satisfy the larger goal of creating a single system that could integrate data from all stages in the supply chain.	Month 10
<b>Detailed Case Study</b>	A case study providing a detailed account of the implementation with a focus on ROI and lessons learned.	Month 12
<b>Technical Demonstrations at MxD</b>	Demonstration of technical research and development outcomes in MxD's factory or via remote presentation.	Month 12
<b>Developer Documentation</b>	Includes software documentation, integration documentation, documentation for modifications to software, documentation of known bugs and issues.	Month 12

The Proposal Team is expected to develop a transition plan, which is detailed in Table 2 in Section V. MxD is focused on supporting the transition of project outcomes to its membership in the form of pilot integrations on their factory floors, follow-on research projects or commercialized products



available for use. Proposal Teams are expected to tailor their deliverables to their transition goals in order to provide outcomes that have continuing impact after the period of performance is complete. **Pilot deployments and actionable transition plans are a priority for MxD to help maximize the benefits of funded research to the membership and ultimately, help increase the competitiveness of the US manufacturing base through new technological advancements. Thus, it is important that proposals emphasize not just technical merit but transition and deployment.**



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# PROGRAM OVERVIEW



## V. PROGRAM REQUIREMENTS

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### COLLABORATION

Participation in this program requires collaboration with a team of organizations with diverse capabilities. Competitive teams should include representation from the manufacturing base, academia, solution/service providers and standards bodies.

Each Proposal Team must include participation by a manufacturer to drive use case and operational requirements. The manufacturer(s) are expected to define technical requirements, drive the business case for project outcomes and serve as a pilot manufacturer for test and validation of the solution. It is encouraged that the Tier 1 or Tier 2 Manufacturing Member provide the research testbed site, but this is not required if an alternative location aligns better with the team's transition plan.

There is no requirement for a standards organization to be included on the Proposal Team, but the Proposal Team is required to collaborate with industrial standards bodies to better inform their draft standards and help popularize their work to increase the potential for endorsement in the future.

The Proposal Preparation Information section outlines the opportunities that MxD provides to facilitate proposal team development:

- Teaming List: MxD will collect contact information from parties interested in teaming during the first weeks of the proposal period and will then disseminate the compiled list of contacts to the responders via email.
- Pitch Session: MxD will host a Pitch Session to provide organizations and/or teams the opportunity to share a snapshot of their solution approach and allow them to identify synergies with other interested parties.
- Participation in the Teaming List and Pitch Session is optional and NOT required to submit a proposal.

### PROGRAM MANAGEMENT

MxD will be responsible for managing the project to ensure the team meets all the technical objectives and requirements proposed within the project's period of performance and budget. The MxD Project Manager will coordinate with Principal Investigators (PIs) of the Proposal Team to manage the program following MxD's project processes. The Director of R&D Projects, in coordination with the assigned MxD Project Manager, will monitor technical performance and project costs of the associated Enterprise Award Agreement (EAA), the agreement that governs a project awarded by MxD to the Proposal Team Lead. Proposal Teams will submit the reports listed below in Table 2 to their identified Project Manager to fulfill their reporting requirements. These reports will be internally accessed by the MxD Director of R&D Projects, the Government, the Project Manager and other authorized MxD staff members in the course of their official duties. Technology advancements will be summarized at least annually to support reporting to the Executive Committee, Technical Advisory Committee, MxD Members, and the Government, when applicable.

***Table 2. Program Deliverables***



Deliverable	Description
<b>Project Immersion Workshop</b>	Face to face meeting with manufacturer(s) including stakeholders from key business units to review project transition plan and define pilot requirements.
<b>Transition Plan</b>	Written plan for successful transition of project outcomes after period of performance including technology integration, educational distribution, and potential commercialization.
<b>Monthly Technical and Financial Reports</b>	Monthly report from the Project Team Lead including the financial and technical status of the project
<b>Member Technical Reviews</b>	Presentation encompassing all technical advancements made prior to key milestone and presented to the MxD Project Manager, members of the Technical Advisory Committee, and other interested MxD members.
<b>Presentations at MxD</b>	Presentation and demonstration of developed technology presented in person at MxD
<b>Annual Patent Reports</b>	Report of inventions and subcontracts
<b>Intellectual Property Reports</b>	Participants must promptly notify the MxD Project Manager apprised of Project IP created, filing status, claims against the Project IP, and BIP licensed to other Members.
<b>Safety Accident/Incident Report</b>	Participants must report any major accident/incident (including fire) resulting in any one or more of the following situations: one or more fatalities or one or more disabling injuries; damage of Government property exceeding \$10,000; impact to Project planning or production schedules or degradation of the safety of equipment under contract. Such report will also identify potential hazards requiring corrective action.
<b>Draft Final Technical Report</b>	Draft report must include a comprehensive, cumulative, and substantive summary of all technical advancements and significant accomplishments achieved during the project.
<b>Final Technical Report</b>	See above
<b>Project Team Lead Release</b>	Release by Project Team Lead confirming scope of work to be complete
<b>Property Report</b>	List of all MxD funded equipment and planned disposition
<b>Final Patent Report</b>	Report of inventions and subcontracts

### TRAVEL REQUIREMENTS

Proposals should include funding for four (4) trips per year for two (2) people for each member of the Proposal Team. These trips will be used for face-to-face meetings and presenting to the MxD membership. These trips may be for travel to MxD or to another location at the request of MxD (e.g., a conference, workshop, showcase, etc.). For estimation purposes, use Chicago, IL as the destination. Proposals may include additional funding for travel to pilot site for implementation and testing with proper justification.

### PERIOD OF PERFORMANCE REQUIREMENTS

Proposed projects should be no more than twelve months in duration. Please note that projects are initiated once an EAA is signed, therefore, the project duration must include the subcontracting of all project participants between the Proposal Team Lead and each member of the Proposal Team.

### OWNERSHIP OF DELIVERABLES AND INTELLECTUAL PROPERTY



To accelerate digital adoption, cybersecurity, and workforce development across the U.S. manufacturing sector and to support the increased priority from our funding partners to transition project technology, MxD desires to own or co-own all the rights to intellectual property (IP) created during the project (Foreground IP or Project IP). It is the expectation that a member of the Proposal Team will co-own or will have a non-exclusive, non-transferable license to use the Foreground IP it creates. MxD will negotiate in good faith to achieve this result. MxD expects that the IP Management Plan (Attachment 1b) submitted with this proposal will reflect this position. MxD will have no rights to pre-existing intellectual property (Background IP) belonging to any member of the Proposal Team except as may be expressly agreed to in the Project documents. It is important to note that MxD will consider proposals that do not meet this request; proposals with IP Management Plans that reflect this will be favorably reviewed.

### **FUNDING REQUIREMENTS**

MxD anticipates awarding one project for no more than \$500,000 of Federal Funding, not inclusive of required cost share, under the MxD-21-12 RFP. MxD reserves the right to fund all, some or none of the Technical Proposals received under issued RFPs. Final award amounts will be adjusted accordingly based on proposals received and subsequent evaluations.

This project requires a minimum 1-to-1 Cost Share in aggregate by the Proposal Team. For every dollar of Federal funding awarded, the Proposal Team must contribute at least a dollar of in-kind effort or cash. Thus, the Proposal Team in aggregate will need to provide at minimum 50% of the total project cost (inclusive of labor, equipment, materials, indirect, etc.) in cost share. This cost share can be in-kind or cash and can be distributed among the members of the Proposal Team however the team decides. Cost share must be accounted for in the cost proposal, as described in the Cost Development Guide found in the Proposal Preparation Kit.

Neither MxD nor the U.S. Government has any responsibility for costs associated with Technical Proposal or Cost Proposal development, submissions, or pre-award negotiations.

If down selected, the Proposal Team must submit substantiating documentation for all Proposal Team Member costs (including cost share) and MxD will complete a comprehensive cost analysis (including cost reasonableness and cost realism) prior to award. In addition, the Government Agreements office may conduct a cost analysis of all submitted cost proposals to approve the project. Approval of the Cost Proposal and Technical Proposal by the Government Agreements office and the DoD Program Manager is required for all MxD projects.

**NOTE:** Project award timelines are subject to approval of the project plan by the government and the allotment of funds from the government.



## VI. ELIGIBILITY

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### **MxD MEMBERSHIP**

This RFP is open to the public; any organizations regardless of membership status may submit a Technical Proposal and Cost Proposal in response to this RFP. However, the MxD Membership Agreement must be fully executed with every Proposal Team member within 30 days of notification of project down select; acknowledgement of this is required in the Technical Proposal submission. Any non-MxD members are strongly encouraged to conduct a legal pre-review of the Membership Agreement prior to submission as this is a common source of delay during negotiations with proposal teams that have been chosen during down selection. Please direct questions to MxD's Director of Business Development, Tony Papke (tony.papke@mxdusa.org). For more information on how to become a MxD Member, please visit the MxD Membership page on our website.

Federally Funded Research and Development Centers (FFRDCs) and Government entities (Government/National laboratories, military educational institutions, etc.) are subject to applicable direct competition limitations and cannot propose to RFPs in any capacity unless they address the following conditions:

- FFRDCs or Government entities may not exclusively team on any specific proposal team.
- FFRDCs must clearly demonstrate that the proposed work is not otherwise available from the private sector and must also provide a letter on letterhead from their sponsoring organization citing the specific authority establishing their eligibility to compete with industry and propose to solicitations utilizing Government funding.
- Government entities must clearly demonstrate that the work is not otherwise available from the private sector and provide written documentation citing the specific statutory authority, as well as, where relevant, contractual authority, establishing their ability to propose to solicitations utilizing government funding.

Government agencies interested in participating in MxD RFPs as part of Proposal Team should notify MxD in advance of Proposal submission. For RFPs utilizing Federal funding, special agreements and considerations may need to be implemented to enable participation.

### **NOTIFICATION OF PARTICIPATION BY FOREIGN FIRMS & NON-U.S. CITIZENS**

Membership in MxD shall be granted only to U.S. companies, firms, organizations, institutions, or other entities organized or existing under the laws of the United States, its territories, or possessions (as defined in Section 120.15 of International Traffic in Arms Regulations, 22 CFR § 120 et. seq. ("ITAR")).

Membership and project participation (or participation in projects without membership status) will be granted on a case-by-case basis at the sole discretion of the MxD Senior Leadership Team upon approval of the U.S. Government for any of the following:

- Any agency or instrumentality of a foreign government.
- Companies, firms, organizations, institutions, or other entities not organized or existing under the laws of the United States (as defined in Section 120.16 of the ITAR); and
- Non-U.S. Citizens.

In such event, all Members will be notified immediately of the foreign entity's role.





If a Member is a Corporation with subsidiaries or affiliates, its membership will include its wholly owned and controlled and majority-owned and controlled U.S. subsidiaries and affiliates who qualify as a U.S. person under Section 120.15 of the ITAR.

It is a requirement that work related to the project must be completed in the U.S. by people legally authorized to work in the U.S. All proposed project participation by non-U.S. Citizens must be disclosed to MxD on Attachment 2c MxD Foreign Firms, Travel, & Non-U.S. Citizens at least 60 days prior to proposed participation. Written approval of foreign firms and/or non-U.S. Citizens must be received by the member of the Proposal Team from MxD prior to commencing work.

## VII. TECHNICAL & COST PROPOSAL EVALUATION

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### EVALUATION PROCESS

An MxD Evaluation Board (EB) will review and evaluate each submitted Technical Proposal utilizing the evaluation criteria specified in the following section.

The EB may consist of recognized experts from industry and academia and key government stakeholder representatives (when appropriate). MxD representatives, such as the Director of R&D Projects, and respective Project Managers, may participate in and lead EB meetings. All members of the EB will need to meet strict standards of personal and organizational conflict of interest. The evaluators may be supported by subject matter experts to review and comment upon the proposed work.

Through its deliberations, the EB will determine “selectability” of each submission. Selectability determination incorporates average EB score, judgement of market impact, and budget availability. The EB will identify a list of all proposed Technical Proposals that are “selectable for negotiation” leading to a sub agreement award, along with their associated evaluation scores, to the Project Manager. The Director of R&D Projects, with the consultation of other MxD representatives, will determine which subset of the proposed Technical Proposals deemed “selectable for negotiation” will be down selected for negotiations. This determination will consider the EB’s recommendation, funding availability, alignment with MxD’s SIP as well as external stakeholder requirements (when applicable).

### EVALUATION CRITERIA

MxD’s primary goal is to apply digital manufacturing technologies to solve business problems. To this end, successful proposers must demonstrate an understanding of both the business needs as well as the technology solutions. Proposals should provide a clear explanation of how the solutions address business problems and technical requirements outlined in the RFP, any assumptions, and considerations for deployment of developed solution through a pilot.

Each proposal is evaluated by a specific set of criteria. Below are the Proposal Evaluation criteria for this RFP:



Proposal Evaluation Criteria	Order of Importance
<b>Requirements Compliance</b> <ul style="list-style-type: none"><li>Clearly articulates how the team will meet all the capabilities required by the RFP</li><li>Proposed solution clearly addresses problem statement and use cases identified in RFP</li><li>Clear identification of assumptions, risks, and mitigations; proposed deliverables align with requirements</li><li>Program management plan meets requirements in the RFP and is reasonable for the scope of work described in the technical proposal</li></ul>	1
<b>Methodology</b> <ul style="list-style-type: none"><li>Clear and concise work effort scope targeted at problem statement</li><li>Proposed effort of direct relevance to RFP</li><li>Clear identification of barriers to implementation and explanation of how they will be overcome</li><li>Innovative methodology with high potential for market impact</li><li>Significant and impactful use of external resources</li><li>Methodology demonstrates scientific and technical merit</li><li>SMART metrics and KPIs identified and described and demonstrate clear understanding of proposed work</li><li>Provides a maturity level assessment of both current and future state of technology with substantiation of assessed levels</li><li>Deliverables are fully described and identified</li></ul>	2
<b>Transition Plan</b> <ul style="list-style-type: none"><li>Transition plan clearly articulates all project results and application into commercial and/or government products, systems, and applications</li><li>Plan includes detailed descriptions of project results, risks/assumptions/mitigations, all required actions and timing, detailed funding and ROI strategy, key milestones, schedule, and go/no-go decision points</li><li>Proposed team includes appropriate representation from supply chain, researchers, and industrial partners</li><li>Transition tasks and partners identified and thoroughly defined, both to MxD members and the broader industry</li><li>Solution and strategy to rapidly enable the adoption of the new technologies across the US manufacturing base is presented</li><li>Clearly defined IP ownership and innovative licensing strategies designed for rapid adoption of the new technologies</li><li>Discussion of future transition and/or commercialization demonstrates a clear understanding of the industry and possible markets for the technology</li><li>Benefits of technology are clearly defined and substantiated.</li></ul>	3



<b>Team Qualifications</b> <ul style="list-style-type: none"><li>• <i>Members of proposed team are highly qualified to accomplish project tasks with clear delineation of roles and responsibilities</i></li><li>• <i>Solid evidence of commitment by team members, such as letters of commitment from their companies</i></li><li>• <i>Team members have unique capabilities that are directly associated with the target technology</i></li><li>• <i>Team includes a broad mix of capabilities and experiences to ensure success along with the commitment of top-tier facilities to accomplish all project tasks.</i></li></ul>	4
<b>Cost Factors</b> <ul style="list-style-type: none"><li>• <i>Proposed cost estimates are reasonable and realistic for the proposed work effort</i></li><li>• <i>The minimum cost share proscribed in the RFP has been met or exceeded</i></li><li>• <i>Cost share is clearly defined and directly applicable to the performance and success of the project</i></li><li>• <i>Cost share value is readily discernable</i></li><li>• <i>Cost share from partners is documented with letters of commitment.</i></li></ul>	5

## VIII. PROJECT AWARDS

### CONTRACT

MxD projects will be funded under the MxD Technology Investment Agreement (TIA), Contract Number W15QKN-19-3-0003 between MxD and the Government. All contractual negotiations related to RFPs will be executed by MxD. Funds will be distributed to the Proposal Team Lead selected through the evaluation/selection process utilizing an Enterprise Award Agreement (EAA). EAAs are usually Cost Reimbursement/Cost Share agreements; Milestone Payment/Cost Share based EAAs will be considered upon request.

MxD has provided an EAA template within the PPK for Proposal Teams to **review** prior to proposal submission. **The EAA should not be submitted with the proposal.** After receiving a notification of down selection, MxD will request the down selected Proposal Team to officially begin contract review and negotiations. **The EAA must be fully agreed with the proposal team lead within 60 days of down selection notification;** acknowledgment of this is required in the Technical Proposal submission. MxD would prefer to execute an EAA only with the Proposal Team Lead. Once the EAA is executed, the Proposal Team can begin working on the project. When applicable, it is the sole responsibility of the Proposal Team Lead to issue contracts with applicable flow down clauses outlined in the EAA to any subcontractors, consultants, and any suppliers.

### FINAL TECHNICAL PROPOSAL & COST PROPOSAL REVISIONS

MxD reserves the right to negotiate the cost and scope of the proposed work with the Proposal Team that has been down selected prior to award. MxD will facilitate the creation of a Statement



of Work with the Proposal Team including technical scope modifications and program management aspects. All members of the down selected Proposal Team who intend to pursue selection are required to participate in the proposal revision process prior to award. For example, MxD may request that the organizations revise the technical scope to better align to RFP requirements.



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# PROPOSAL PREPARATION INFORMATION



## IX. PROPOSAL PREPARATION INFORMATION

This Proposal Preparation Information section offers detailed instructions on how to respond to this RFP; the Proposal Preparation Kit (PPK) includes the required proposal templates and reference documents on how to complete the templates. Together, the Proposal Preparation Information and PPK are intended to provide the basic information necessary for assembling complete proposals.

**NOTE: MxD recommends Proposal Teams review the Request for Proposal Technical Summary & Program Overview prior to the PPK.**

## X. TEAMING OPPORTUNITIES

### PITCH SESSION

MxD will host a **Pitch Session** on October 20, 2021 to provide organizations and/or teams the opportunity to share a snapshot of their solution and receive preliminary feedback from the MxD community. It will also serve as an excellent teaming opportunity for individuals and groups to identify synergies between their pitches. Pitch Session registration information will be posted at [www.mxdusa.org/projects](http://www.mxdusa.org/projects). Participation in the Pitch Session is not required to submit a Technical Proposal and Cost Proposal.

## XI. SUBMISSION INSTRUCTIONS

### SUBMISSION DETAILS

Each Proposal Team must submit their Technical Proposal and Cost Proposal no later than 5:00PM Central Time, December 16, 2021. All submissions must be made electronically to [projects@mxdusa.org](mailto:projects@mxdusa.org). Please include the RFP designation (e.g., "MxD-<XX>-<XX> - <RFP Title> - <Proposal Team> - <Proposal Title>") in the subject line of the email.

### REQUIRED PROPOSAL DOCUMENTATION

The following section provides guidance on the necessary documentation, templates and submission formats required to submit a Technical Proposal and Cost Proposal in response to this RFP. Below are the documents (organized by PPK folder) that must be completed and submitted by the due date:

Required Proposal Documentation			
Title	Document	Template	Submission Format
Technical Proposal  ONE PER PROPOSAL TEAM	Technical Proposal	Attachment 1a MxD Technical Proposal Template.docx	PDF
	Resume(s) of the Principal Investigator and Key Technical Personnel	N/A	PDF
	Letter(s) of Commitment	N/A	PDF



	Intellectual Property Management Plan (IPMP)	Attachment 1b MxD IP Management Plan.xlsx	XLS
<b>Cost Proposal and Participant Certification</b>  ONE PER PROPOSAL TEAM	Cost Proposal	Attachment 2a Project Cost Proposal Template.xlsm	XLS
	Cost Narrative	Attachment 2b Cost Narrative Template.docx	PDF
	Certification of Foreign Firms, Travel and Non-U.S. Citizens	Attachment 2c Foreign Firms, Travel, & Non-U.S. Citizens.docx	PDF

- Each Proposal Team must submit **one Technical Proposal** (Attachment 1a). The instructions for completing the Technical Proposal are in the Technical Proposal template provided in the PPK folder. All questions are required, and attachments should be included.
- Each Proposal Team must submit **one completed IP Management Plan** (Attachment 1b) for the entire team with the Proposal. Instructions for completing the IPMP are provided in the template. The IPMP must contain Background Intellectual Property (BIP), Project (Foreground) IP, and assertions of limited rights to the Government.
- Each Proposal Team must submit **one Cost Proposal** (Attachment 2a) **including the Cost Narrative** (Attachment 2b) that is a summary or “roll-up” of all Proposal costs including cost share. Please reference the MxD Cost Proposal Development Guide for instructions on how to develop the Cost Proposal. An example Cost Proposal Excel Sheet and Cost Narrative are provided for reference. **Proposal Teams should be prepared to provide substantiating documentation for all Proposal Team Member costs within two weeks of down selection if the proposal is down selected. Additionally, if the proposal is down selected, the Proposal Team Lead must provide single audit results or other audited financials if Proposal Team Lead is not subject to single audit requirements.**
- Each Proposal Team must submit **one Certification of Foreign Firms, Travel and Non-U.S. Citizens** (Attachment 2c) with information from every Proposal Team member. If there is personally identifiable information, separate certifications may be submitted
- The EAA is provided for review prior to submission. **The EAA should not be submitted with the proposal.**

Proposals that do not include the minimum requirements identified in the RFP will be deemed non-responsive and will not be evaluated.