



The Digital Manufacturing Institute

MxD REQUEST FOR PROPOSAL

TECHNICAL SUMMARY & PROGRAM OVERVIEW

MxD-20-05:

Achieving Resilience through Proactive

Supply Chain Risk Management

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I. RECORD OF CHANGE

Revision	Date	Sections	Description
1.0	14 July 2020	N/A	Original
2.0	1 September 2020	Contact Information	Change of PM at MxD
3.0	7 October 2020	Project Overview	Proposal Due date change

II. PROJECT OVERVIEW

Deadline for Submitting Interest in Teaming	14 July, 2020
Proposals Due	19 November 2020
Anticipated MxD Funding	Up to \$600,000
Period of Performance	Up to 18 months

III. INTRODUCTION

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. As a result, our nearly 300 members increase their productivity and win more business.

MxD has invested approximately \$90 million in more than 60 applied research and development projects in areas including design; product development; systems engineering; future factories; agile, resilient supply chains; and cybersecurity.

MxD operates from a nearly 100,000-square-foot innovation center near downtown Chicago. Its 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 Request for Proposals (RFP) are issued to address research and development needs in digital design and manufacturing technology that are aligned with the technical objectives of MxD and directly support the Institute's vision of developing digital manufacturing systems that make every part better than the last.

This RFP contains the following elements:

1. Request for Proposal Technical Summary & Program Overview: a description of a specific technology objective and technical and program requirements
2. Proposal Preparation Kit (PPK referenced as the Kit): includes a PPK overview document and attached proposal templates and references. The PPK Overview provides background and guidance for the preparation of required forms and instructions needed to submit to a MxD Request for Proposal. The PPK Overview offers detailed

instructions on how to respond to this RFP and provides attachments with the required proposal templates. It is intended to provide the basic information necessary for assembling complete and compliant proposals and to help explain those areas that usually generate the most questions from Offerors.

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

The RFP is available on the MxD website at <https://mxdusa.org/projects/>. Notices announcing MxD competitions and due dates will also be posted on the MxD website. Amendments to a MxD RFP may be used to extend due dates, clarify procedural requirements or modify technical requirements. An updated RFP may be issued and the previous RFP will be rescinded. Offerors should carefully monitor the MxD website subsequent to 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 Offeror 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.

Any questions regarding this solicitation must be provided to 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.

IV. PURPOSE

MxD will periodically solicit proposals for applied research and technology development to meet the goals outlined in its Strategic Investment Plan (SIP) or complementary goals specified by key external stakeholders that align with MxD's core mission. The process by which this achieved is through an RFP.

An 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. The purpose of an RFP is to solicit proposals for projects in technology areas that are of interest to MxD membership and external stakeholders such as the U.S. Government. MxD will initiate and coordinate development of the RFP topics by engaging Technology Advisory Committee (TAC) members, MxD's Technical Call participants, Department of Defense (DOD) affiliates, and other relevant stakeholders. Once the RFP topics are developed and approved the MxD RFP will be posted to the MxD website and represents the official notification to Offerors of a request to submit the required documents.



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REQUEST FOR PROPOSAL TECHNICAL SUMMARY



V. TECHNICAL SUMMARY

PROBLEM STATEMENT

How do manufacturers **proactively manage supply chain risk** in an increasingly complex and dynamic global network **in order to achieve resiliency**? To do this, industry must shift to focus on **sense and response**¹ capabilities – sense potential supply chain risks, predict future risks, and respond with agility. In order to support this digital approach, MxD has previously funded projects to develop standards-based frameworks for aggregating supply chain data and overlaying data with AI-based predictive analytics systems to provide advance warnings of supply chain risk⁵. There is a need to **demonstrate value of proactive sense-and-response frameworks** through technology pilots to encourage wide-spread adoption of the methodology. Further **development of artificial intelligence/machine learning-driven (AI/ML) decision support systems is needed to enable deployment in pilots.**

Supply chain resiliency is limited by timely access to supply chain data. According to DHL's Resilience360 2020 Annual Risk Report, "Most companies are not adequately prepared to foresee or manage supply chain disruptions. Research shows companies with limited network visibility to dynamic risks experience significant challenges in planning and execution, resulting in high economic and reputational cost."² In a 2020 survey of MxD's manufacturing ecosystem, MxD found that the most common factors inhibiting supply chain connectivity and transparency were a lack of trust and fear of sharing competition sensitive data or intellectual property. Supply chain participants don't see the business case for sharing their data. **They lack concrete examples of how and why sharing data will benefit them.** Increasing supply chain transparency results in clear economic, product quality, and reputational benefits for manufacturers (Figure 1). But manufacturers often lack standard methods for quantifying and measuring these benefits and resiliency metrics are nonexistent. This project seeks to break down the systemic cultural barriers to supply chain transparency through **demonstration of connected, AI-driven supply chain risk management (SCRM) decision support systems.**

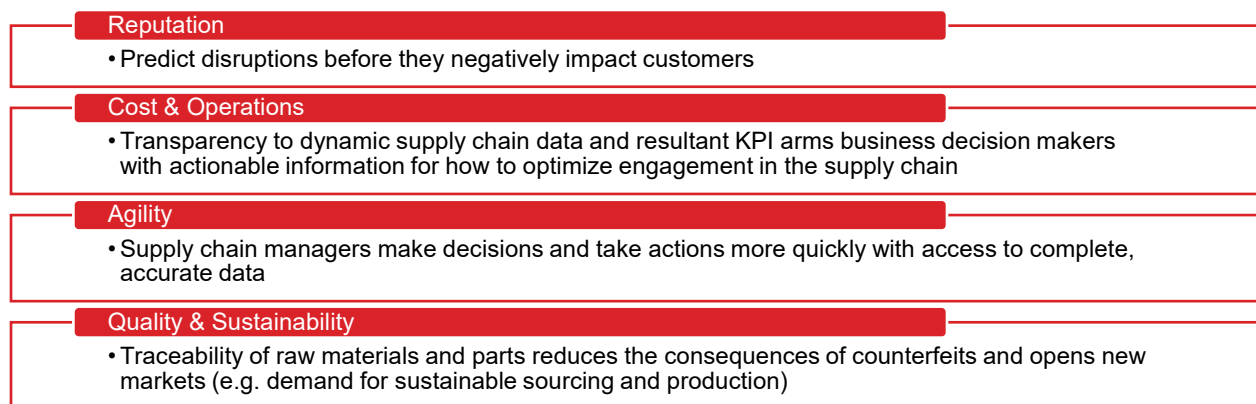


Figure 1. Benefits of Supply Chain Transparency

¹ "Sense and response" commonly used in military applications to define systems that are designed for strong information flow of data across a network for the purpose of predicting unanticipated needs and promoting agile, precise responsiveness.

² Larsson, Tobias, and Shehrina Kamal. "Annual Risk Report 2020." DHL Resilience360, Mar. 2020.



Even though many large manufacturers are adopting digital platforms, various data sources are often still unified manually or physically in the form of control rooms or ‘war room’ meetings for risk assessment and mitigation. These processes are time consuming and, as seen during the coronavirus crisis, they are further inhibiting when physical distancing is required. The challenge broadens for small and medium manufacturers (SMMs) who are earlier in their digital transformation journeys. Industry needs digital solutions that connect existing SCRM datasets and joins them with AI/ML technology to drive proactive action. However, industry faces many challenges in adoption of these decision support systems:

(1) SCRM tools are often insufficient on their own because they must be used in connection with internal manufacturer data and other data sources. Normally each supplier is managing risks on their own, without reference to their supply network. And furthermore, internal datasets are frequently siloed in multiple systems that make it difficult to use for rapid risk assessment/mitigation or by AI/ML engines. There is a need for adoption of standards-based, secure integration frameworks for connecting, labeling, and processing this data in a way that can be leveraged by both humans and AI/ML engines.

(2) Manufacturers rarely have expertise or availability of structured, historical SCRM data needed to train and test AI/ML engines. There is a need for anonymized training datasets as well as simple AI/ML configuration procedures so that systems can be easily configured by different manufacturers within their own environments.

(3) Above all, utility of these decision support systems is constrained by their ability to transform insights into action through system integration with existing business processes and proper workforce development.

NOTE: For the purposes of this call, “supply chain” is to be construed as invoking at least one intercompany relationship.

OBJECTIVES & CRITICAL REQUIREMENTS

This project builds upon past MxD research and technology in the area of supply chain management and data connectivity.³ These past projects laid a foundation including understanding of the current state the supply chain in digital transformation and creation of lead time visibility solutions, a framework for connecting SCRM data, and a proof-of-concept AI-predictive analytics engine. Moving forward, MxD will expand on this past work through a series of project calls, as detailed in the MxD Strategic Investment Plan. **Project Call 20-05 will focus on demonstrating proof-of-value of connected, AI/ML-driven SCRM decision support systems for manufacturer-defined risk and resiliency scenarios.** The demonstrations should leverage existing technology and research, when possible, and may optionally leverage past MxD projects. Any development and configuration work shall be done in support of these pilot demonstrations in order to make a more extensible, deployable system.

³ Reference MxD Project Calls 15-12: Technologies Enabling Supply Chain Visibility, 17-01: Digitally Enabling the Supply Chain, 17-02: Advanced Analytics for Supply Chain Operations



The two primary objectives of this RFP are as follows:

Objective 1. Pilot Deployments

Deploy solution pilots in operational environments of a supply chain consisting of at least two participants as a proof-of-value for addressing manufacturer-defined SCRM problems of interest.

Objective 2. Enabling Development & Configuration

In order to support deployment in the first objective, develop and configure a robust AI-based predictive analytics decision support solution that can be overlaid on any manufacturer's standards-based data store and technology stack to drive insights and proactive action for risk scenarios.

Through these objectives, the project principally seeks to address the following use case:

As a supply chain manager, I want to deploy a modular solution that brings together predictive analytics tools and datasets that are integrated such that risk alerts and relevant data are communicated to me in advance of disruptions in order to efficiently and proactively mitigate supply chain risks.

Objective 1. Pilot Deployments

This project intends to provide concrete examples of how and why connecting data for SCRM will benefit manufacturers. To do this, **teams should deploy an AI-driven solution(s) for SCRM in small-scale pilots in live operational environments of a supply chain consisting of at least two (2) manufacturing participants for proof-of-value studies.** These pilots should target high-impact use cases selected by the manufacturers (e.g. logistics, planning, sourcing, etc.). The scale of the pilot deployments shall be determined by the team but must leverage live datasets, enable testing by end users, and be implemented at minimum for two different manufacturers to demonstrate extensibility. It is encouraged that manufacturers have a supplier relationship.

Teams should leverage business process automation and secure data exchange technologies to drive proactive risk mitigation action by stakeholders (decision support). **Pilot deployments should focus on delivering insights to end users that enables a proactive, rapid, and agile response to risk.** Teams must evaluate and validate the system's ability to address the manufacturer's target supply chain risk management and resiliency business problem(s). While specific key performance indicators (KPI) will depend on each team's problem of interest, teams are at minimum expected to study proof-of-value through impact to cost, including ROI and P&L metrics.

Additional questions to be explored and demonstrated through this project include:

- How do we quantify and measure resiliency and associated benefits?
- How do we proactively identify and mitigate systemic vulnerabilities to a supply chain before a potential impact using risk management principles?
- How do we incentivize transparency (data sharing) through the supply chain?
- How do we secure connected data in order to support transparency?
- How do we use data to take action proactively?

Proposals must identify one or more risk scenarios of interest to the manufacturers based on impact to critical business measures. Proposals should also define risk measures of interest and any potential interrelationships with other risk factors. Some examples of risk scenarios include:

- Advance warning of logistics delays
- Advance warning of risk impacts and mitigations from global health crises
- Insight into material and part quality to avoid downstream non-conformances
- Prediction of production lead time for increased planning accuracy
- Supplier opportunity discovery for agile sourcing processes
- Climate change risks and opportunities analysis
- Demand prediction and supply network risk impact analysis

This project shall develop and test AI/ML-driven predictive analytics decision support system that provide users advance warning of supply chain risks. Such a decision support system consists of three layers (Figure 2): (1) a data architecture, (2) a robust AI-based predictive analytics engine, and (3) a means for leveraging data to inspire action.

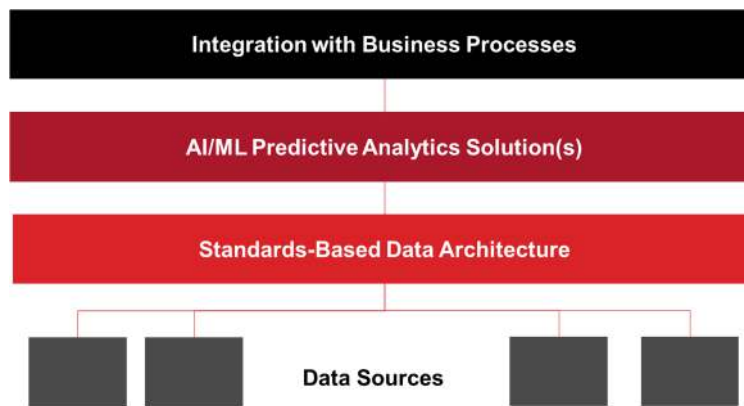


Figure 2. High-Level System Diagram

(1) Standards-Based Data Architecture

A connected, digital control-tower approach is needed that integrates data from multiple sources and displays critical supply chain data to inform rapid decision making by stakeholders. The project must use existing standards-based⁴ integration frameworks to securely connect supply chain data from various sources. It is encouraged that manufacturers utilize common ontologies to classify data for increased flexibility for digital consumption. Data may come from a manufacturer's internal facing environment, supply network environments, customer environments, and publicly available datasets. The scope should focus on using the following target supply chain datasets: sales, inventory, operations planning, sourcing, production, logistics, warehousing, transportation, point-of-sale, consumer/demand.

NOTE: Engineering data (e.g. Technical Data Packages) is not a focus of this project scope.

⁴ Examples of relevant standards: Supply Chain (OAGIS, IPC-1754), Integrated Logistic Support (S1000D, S2000M, S3000L, S4000P, S5000F, S6000T, SX001G, SX002D), Information Exchange/Interoperability (ISO 10303-239, 10303-242, ISO 10303-209, 10303-232, 10303-233, 10303-243), Maintenance and Support (ATA Spec 2XXX, MIMOSA)



(2) AI/ML Predictive Analytics Solution(s)

Manufacturers need systems that provide advance warning of supply chain risks to promote an agile response. An AI/ML-driven predictive analytics engine should be overlaid on an integrated data architecture. The solution should, to the greatest extent possible, leverage existing AI/ML methodologies. Interoperability and modularity are key so that the solution can adapt to different manufacturing environments and risk scenarios.

(3) Integration with Business Processes

Cultural adoption of these systems is reliant on integration with existing business processes, in consideration of end user requirements and education/training needs. The decision support system must be adaptable to support an evolving workforce, including adapting to users who are not AI/ML experts.

Objective 2. Enabling Development & Configuration

Development and configuration efforts under this project should focus on enhancing existing solution capabilities, quality, extensibility, and deployability metrics such that the system meets requirements for pilot deployments by manufacturers. The solution should build upon existing technologies (TRL 4 and greater), and may optionally leverage the data architecture and Predictive Transit Model⁵ developed in [MxD 17-02-01: Supply Chain Risk Alert](#). The system should be tested prior to deploying in the pilots to ensure requirements are met. If needed, the system enhancements may include:

- **Scale quantity of data sources** securely integrated in the data architecture for training, testing and operating supply chain risk models in order to improve model accuracy and extensibility to various use cases.
 - Risk assessment data: Leverage, when possible, pre-existing SCRM technology stacks in manufacturers' regular operations and standard risk frameworks (e.g. red, yellow, green or sliding scale analysis data).
 - Disruption/Event data: Leverage publicly available datasets, when possible (e.g. weather, social media, news, health data).
 - Manufacturer's supply chain data: Risk and event data must be put in context with manufacturing business datasets. To enable rapid adoption, the system should be configurable such that manufacturers may train/test/operate AI system in-house, without sharing sensitive manufacturing data externally. (e.g. shipment numbers, customer IDs, purchase orders, etc., BOM, lead times, costs)
- **Integrate solution and automate data communications with business systems** (e.g. ERP) or processes through standards-based Application Programming Interfaces (APIs). Solution design should include considerations for secure data exchange between authorized users.
- **Expand risk detection capabilities of existing solutions** to meet pilot deployment requirements for manufacturer-defined use cases (e.g. For outbound logistics use case, expand geographic region and modes of transportation to meet manufacturer's objectives).

⁵ MxD 17-02-01 developed an application including a user interface and a machine learning engine that leveraged a standards-based data architecture to predict transit time for outbound logistics shipments. Please reference the project final report in the PPK for more information. The application can be licensed for free from Indiana University for research purposes on this project.



- **Develop or enhance existing user interfaces (UI)** to meet user-defined needs through user-experience (UX) design approach. Teams are encouraged to use innovative UI approaches to promote adoption in existing workforce cultures.

RFP SCOPE OF WORK

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

Period of Performance: Up to 18 months

Anticipated MxD Funding: Up to \$600,000

Tasks

Detailed project scope and tasks shall be determined by each team within the following guidelines. Proposed project duration and cost must reflect scope of work.

- Task 1.** Define and implement standards-based data architecture for integrating datasets such that data can be used AI/ML systems.
- Task 2.** Implement AI/ML analytics system with training and testing datasets.
- Task 3.** Conduct analysis for live operational technology implementation for pilot deployments. Map current state and future state data communications flow for comparison pre- and post-pilot.
- Task 4.** Deploy small-scale pilots of decision support solution from Task 1 and Task 2 in live operations for two or more manufacturers in a supply chain.
- Task 5.** Evaluate performance of pilots over time based on risk management business metrics specific to each manufacturer. The project period of performance must include a period for test and validation of the pilot, as the outcomes of the project (such as case studies) will rely on those metrics.
- Task 6.** Report on results of proof-of-value through development of case studies that MxD can disseminate and leverage in future projects. Report on recommendations for future technology development/ enhancement, overcoming challenges, and next steps.

Deliverables

During the period of performance, the 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, but the team is encouraged to include additional deliverables or provide value-added changes to the recommended set of deliverables.

The team is expected to develop a transition plan, which is detailed in Table 2 in Section VI. 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. 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.

IMPORTANT: If changes are made to the deliverables, the 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
AI/ML Predictive Analytics Solution	Predictive analytics software module that can be overlaid on any manufacturer's standards-based data store and configured without expert AI knowledge. Consists of source code and executables for backend algorithms and front-end UIs.
Case Studies	Detailed case studies explaining what technology was piloted, profile of supply chain participants, and resulting benefits for each participant. These case studies should have an end to end view of what it takes to go from investment strategy to implementation. Special attention should be given to how to de-risk the process, best practices observed along the way, lessons learned, and most importantly, identify the tangible and intangible returns on the investment.
Pilot Implementations at Manufacturers	Implement the AI/ML-driven decision support solution(s) in live operations for a supply chain consisting of two or more manufacturers in order to validate their effectiveness.
How-To-Get-Started Guides and Readiness Checklist	A user-friendly guide that lays forth a methodology for getting started with system implementation and is a collection of the necessary resources, templates and instructions to do so. Includes a readiness checklist that gives manufacturers an easy way to identify business and technical pre-requisites to begin implementation.
Report on Technology Recommendations	Report on discovered technology gaps and recommendations for future technology development and enhancements.
Technical Documentation	Documentation outlining detailed technical pre-requisites, requirements and constraints, for implementation of solution; Documentation for all software developed
User Guides/Training	User guides for end-users of decision support system and system administrators
Incremental Test Plan	Test plan for each incremental evaluation that provides details for setup, test steps, success criteria and target results
(If applicable) Anonymized Datasets	Anonymized datasets for future research use, particularly for training supply chain AI/ML models
(If applicable) Communications Flow Maps	Maps of data communications flow current state and future state through the supply network to be used for research in bottleneck analysis and risk detection.



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PROGRAM OVERVIEW





VI. PROGRAM REQUIREMENTS

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 team must include participation by two or more manufacturers or other supply chain participants (e.g. government entities, logistics carriers) to drive the use case and operational requirements. The manufacturers should provide the pilot deployment sites (cyber or physical). Teams are encouraged to seek participation from a small/medium manufacturer (SMM) or a manufacturer within the other manufacturer's supply chain. It is encouraged that they provide a complimentary use case for demonstration or provide requirements for an additional deliverable that is crafted to offer tangible value specifically to the SMM community.

Teams are encouraged to have appropriate representation from technology providers, especially those who may have interest in future commercialization of the developed solution.

There is no requirement for a standards organization to be included on the offeror team but the offeror 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.

PROGRAM MANAGEMENT

MxD will be responsible for managing the project to ensure their team will meet all the technical objectives and requirements proposed within the project's period of performance and budget. The MxD Project Engineer will coordinate with Principal Investigators (PIs) of every participant to manage the program following MxD's project processes. The Director of R&D Projects, in coordination with each project's MxD Project Engineer, will monitor technical and cost performance of the associated Enterprise Award Agreement. Project teams will submit the reports listed below to their identified Project Engineer to fulfill their reporting requirements. These reports will be internally accessed by the MxD Director of R&D Projects, the Government, the Project Engineer and other authorized MxD staff members in the course of their official duties. Technology advancements will be summarized at least annually in order to support reporting to the Executive Committee, Technical Advisory Committee, MxD Members, and the Government, when applicable.

Table 2. Program Deliverables

Deliverable	Description
Project Immersion Workshop	Face to face meeting with manufacturer(s) including stakeholders from key business units to review project transition plan and define pilot requirements.
Transition Plan	Written plan for successful transition of project outcomes after period of performance including technology integration, educational distribution, and potential commercialization.
Monthly Technical and Financial Reports	Monthly report from each Project Participant including the financial and technical status of the Project



Member Technical Reviews	Presentation encompassing all technical advancements made prior to key milestone and presented to the MxD Project Engineer, members of the Technical Advisory Committee, and other interested MxD members.
Presentations at MxD	Presentation and demonstration of developed technology presented in person at MxD
Annual Patent Reports	Report of inventions and subcontracts
Intellectual Property Reports	Participants must promptly notify the MxD Project Engineer apprised of Project IP created, filing status, claims against the Project IP, and BIP licensed to other Members.
Safety Accident/Incident Report	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.
Draft Final Technical Report	Draft report must include a comprehensive, cumulative, and substantive summary of all technical advancements and significant accomplishments achieved during the project.
Final Technical Report	See above
Project Team Lead Release	Release by Project Team Lead confirming scope of work to be complete
Property Report	List of all MxD funded equipment and planned disposition
Final Patent Report	Report of inventions and subcontracts

TRAVEL REQUIREMENTS

Proposals should include funding for six (6) trips per year for two (2) people for each Offeror organization. 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 eighteen (18) months in duration. Please note that projects are initiated once an Enterprise Award Agreement is signed, therefore, the project duration must include the subcontracting of all project participants between the Lead Organization and the Project Participants.

FUNDING REQUIREMENTS

MxD anticipates awarding one project for up to \$600,000, not inclusive of expected cost share, under the MxD-20-05 RFP. 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 each Offeror team. This means that for every dollar of MxD funding awarded, the team needs to contribute a dollar of in-kind effort or cash. Thus, the entire 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 participants however the team decides. Cost share must be



accounted for and substantiated in the cost proposal, as described in the Cost Development Guide found in the PPK.

NOTE: Project award timelines are subject to the availability of funds from the government.

VII. ELIGIBILITY

MxD MEMBERSHIP

All organizations selected to participate on projects must be MxD Members, in accordance with the MxD Membership Agreement, prior to project award. This RFP is open to the public; any organizations regardless of membership status may submit a Technical Proposal and Cost Proposal in response to an RFP. MxD, in its sole discretion, may make the Membership Agreement effective upon project selection and require payment of the membership dues. The Membership Agreement must be fully executed with every participant within 30 days of project selection. Any non-members Offerors are encouraged to review the Membership Agreement prior to submission and to direct questions to the MxD 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 project 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 an Offeror team should notify MxD in advance of Proposal submission. For RFPs utilizing Government funding, special agreements and considerations may need to be implemented to enable participation.

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

As required by the Technology Investment Agreement, 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")). All proposed project participation by Non-U.S. Citizens must be disclosed to MxD at least 60 days prior to proposed participation for approval.

Membership & project participation (or participation in projects without membership status) will be granted to 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 on a case-by-case basis at the sole discretion of the Executive Committee upon approval of the U.S. Government. In such event, all Members will be notified immediately of the foreign entity's role. It is a requirement that work related to the project must be completed inside the U.S.

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.

VIII. TECHNICAL & COST PROPOSAL EVALUATION

EVALUATION PROCESS

An MxD Evaluation Board (EB) will review and evaluate each submitted Technical Proposal utilizing the evaluation criteria specified in the following section. Cost Proposals will not be provided to the Evaluation Board for the purposes of evaluation. Cost Proposals will be utilized by MxD and the Government during the cost analysis and project approval process.

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 Engineers, 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 subagreement award, along with their associated evaluation scores, to the Project Engineer. 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 take into account the EB's recommendation, funding availability, alignment with MxD SIP as well as external stakeholder requirements (when applicable). MxD reserves the right to fund all, some or none of the Technical Proposals received under issued RFPs.

If down selected, 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 Cost Proposals. Approval of the Cost Proposal and Technical Proposal by the Government Agreements office and the DoD Program Manager is required for all MxD projects.

Cost share is required for all MxD projects that are executed through the MxD. Cost sharing or matching relates to the portion of project or program costs supported by the Offeror and not by MxD.

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.



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
Requirements Compliance <i>Clearly articulates how the team will meet all the capabilities required by the RFP; Proposed solution clearly addresses problem statement and use cases identified in RFP; Clear identification of assumptions, risks, and mitigations; proposed deliverables align with requirements; program management plan meets requirements in the RFP and is reasonable for the scope of work described in the technical proposal.</i>	1
Methodology <i>Clear and concise work effort scope targeted at problem statement; Proposed effort of direct relevance to RFP; Clear identification of barriers to implementation and explanation of how they will be overcome; Innovative methodology with high -potential for market impact; Significant and impactful use of external resources; Methodology demonstrates scientific and technical merit; SMART metrics and KPIs identified and described and demonstrate clear understanding of proposed work; Provides a maturity level assessment of both current and future state of technology with substantiation of assessed levels; Deliverables are fully described and identified.</i>	2
Transition Plan <i>Transition plan clearly articulates all project results and application into commercial and/or government products, systems and applications; 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; Proposed team includes appropriate representation from supply chain, researchers and industrial partners; Transition tasks and partners identified and thoroughly defined, both to MxD members and the broader industry; Solution and strategy to rapidly enable the adoption of the new technologies across the US manufacturing base is presented; Clearly defined IP ownership and innovative licensing strategies designed for rapid adoption of the new technologies; Discussion of future transition and/or commercialization demonstrates a clear understanding of the industry and possible markets for the technology; benefits of technology are clearly defined and substantiated.</i>	3
Team Qualifications <i>Members of proposed team are highly qualified to accomplish project tasks with clear delineation of roles and responsibilities; Solid evidence of commitment by team members, such as letters of commitment from their companies; Team members have unique capabilities that are directly associated with the target technology; 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>	4



Cost Factors <i>Proposed cost estimates are reasonable and realistic for the proposed work effort; The minimum cost share proscribed in the RFP has been met or exceeded; Cost share is clearly defined and directly applicable to the performance and success of the project; Cost share value is readily discernable. Cost share from partners is documented with letters of commitment.</i>	5
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IX. PROJECT AWARDS

CONTRACT

MxD projects will be funded under the MxD Tech Investment Agreement 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 those offerors selected through the evaluation/selection process utilizing Enterprise Award Agreements (EAAs). EAAs are Cost Reimbursement/Cost Share agreements.

MxD has provided an EAA template within the PPK for Offerors 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 all down selected project participants to officially begin contract review and negotiations. Once the EAA is executed the project team can begin working on the project. When applicable, it is the sole responsibility of Offeror organizations to issue sub-awards to any subcontractors and to ensure team members are abiding by the terms and conditions within the EAA.

FINAL TECHNICAL PROPOSAL & COST PROPOSAL REVISIONS

MxD reserves the right to negotiate the cost and scope of the proposed work with the project participants that have been down selected prior to award. MxD will facilitate the creation of a Statement of Work with all participants including technical scope modifications and program management aspects. All down selected organizations 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. Neither MxD nor the U.S. Government has any responsibility for costs associated with pre-award negotiations.