



The Digital Manufacturing Institute

MxD REQUEST FOR PROPOSAL TECHNICAL SUMMARY & PROGRAM OVERVIEW

MxD-19-13: Human Workflow Digital Twin

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I. RECORD OF CHANGE

Revision	Date	Sections	Description
1.0	3 rd December, 2019	N/A	Original
2.0	29 th January, 2020	Eligibility	Language regarding the requirement of work being completed inside the U.S. added to the RFP

II. PROJECT OVERVIEW

Deadline for Submitting Interest in Teaming	20 th December, 2019
Proposals Due	28 th February, 2020
Anticipated MxD Funding	\$500,000 - \$700,000
Period of Performance	12 months

III. INTRODUCTION

MxD: The Digital Manufacturing Institute (formerly the Digital Manufacturing and Design Innovation Institute – DMDII) 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 <http://mxdusa.org>. 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 Agile Tech Team, 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

While the digital transformation of the modern manufacturing floor has made our tools more intelligent and interconnected, the human has often been considered an external and unpredictable element in these systems. In order for cyber-physical systems to better serve the needs of industry, it is paramount that human interactions, well-being, and knowledge are all brought into the digital thread. Integrating the human component of a manufacturing system into its digital twin will allow for a manufacturer to maximize both the digital twin's purpose and their ROI. Thus, MxD is releasing a Request for Proposals to develop new technologies for accurately measuring, modeling, scheduling and optimizing human interactions within closed-loop, intelligent manufacturing systems.

This project will focus on the development/deployment of a solution for modeling a human digital twin. Specifically, the project is centered around augmenting the operators with the technologies of Industry 4.0, allowing them to gain further insights into their work through collecting, aggregating and analyzing data in near real time. MxD believes this data is most powerful when put into the operator's hands, allowing them to make more informed decisions on the manufacturing floor. The developed products, systems, and services should take into account the people who will use them in addition to other stakeholders within the company. These additional individuals include but are not limited to: other operators, production planners, manufacturing engineers, data scientists, operations managers and human resource managers. The collected data will be leveraged by an organization as a whole, driving improvements in safety, productivity, scheduling, and/or knowledge base on the manufacturing floor.

To effectively implement a Human Digital Twin, there are a number of key challenges that need to be explored:

- **Culture:** Implementation of a human digital twin system with minimal disruption/intrusion on the shop floor, addressing ethical and privacy concerns
- **Complexity:** Execution of a novel technology/new approach to capture and represent the unique behavioral, physiological, psychological, etc. characteristics of an operator on the floor.
- **Safety:** Ensuring the developed system will have at a minimum a net-zero impact to the safety of the user(s).
- **Comfort:** Ensuring the developed system will have at minimum a net-zero impact on the comfort of the user(s) nor impede them to efficiently complete their job.

MxD believes that this is the time to invest in further development of novel cyber-physical systems that not only connect the operator to the digital thread, but truly allow operators to leverage the advancements of Industry 4.0 for their betterment.



CRITICAL OBJECTIVES AND REQUIREMENTS

While there has been an emphasis placed on increasing levels of automation on the manufacturing floor, it is the stance of MxD and its industry partners that human operators are still the most essential element of manufacturing systems. The increasing degree of factory automation has not necessarily resulted in enhanced operator performance. There is an increasing need to apply the technologies of the Fourth Industrial Revolution; sensors, smart devices, mobile IoT assets and technologies, Augmented Reality/Virtual Reality (AR/VR) technologies, and computer vision systems, to the operator. Bringing about the transformative power of “digital” to the worker will undoubtedly bolster their efficiency, prevent errors, reduce costs and improve lead times in a similar way the introduction of general Industry 4.0 solutions has already done.

There are a broad number of interpretations for the term “Human Workflow Digital Twin”. As such, it is required that the responding team provide their own use case and solution for this project. It is required that the responding team clearly defines how they are interpreting what a Human Workflow Digital Twin is. Similarly, the responding team must clearly state the use-case(s) they plan to address in the scope of this project. It is suggested that use-cases be defined as user stories, framing the problem from the perspective of an end user. A user story describes the type of user, what they want and why they want it. An example format for framing problems as user stories has been included below.

As a < type of user >, I want < some goal > so that < some reason >.

While it is required that the responding team provide a single use case for the development of their solution, the technology being developed must address problems that are faced across the industrial base and must be extensible to additional industry applications. Thus, the project development should, at the very minimum, consider and comment on potential future applications.

Example Human Workflow Digital Twin use-cases, framed around varying Operator 4.0, have been provided below. It is important to note that these have been provided as a guide and that the proposing team may offer use cases beyond those listed below.

Table 1. Example Usecases¹

Operator 4.0 Categorization	Description	Examples
Analytical operator	The application of big data analytics in real-time smart manufacturing	<i>As an Operator, I want to be informed on upstream activities to better understand when there are delays in my line.</i>
Augmented operator	Augmented Reality (AR)-based enrichment of the factory environment. AR improves information transfer from the digital to the physical world.	<i>As an Operator, I want a virtual overlay of defects on a part being reworked to avoid repeating rework.</i>
Collaborative operator	Collaborative robots (CoBots) are designed to work in direct cooperation with operators to perform repetitive and non-ergonomic tasks	<i>As an Operations Planner, I want real-time data on all operators and co-bots to better schedule tasks on the factory floor.</i>
Healthy operator	Wearable trackers are designed to measure activity, stress, heart rate and other health-related metrics, as well as GPS location and other personal data.	<i>As a Safety Manager, I want a tool that can analyze the ergonomics of my team in real-time and provide feedback to maximize safety and longevity.</i>

¹ Ruppert, Tamás, et al. “Enabling Technologies for Operator 4.0: A Survey.” *Applied Sciences*, vol. 8, no. 9, 2018



Social Operator

Enterprise Social Networking Services (E-SNS) focus on the use of mobile and social collaborative methods to connect smart operators on the shop-floor with smart factory resources.

As an Operator, I need to know the fastest ways to resolve equipment outages by being connected with an expert, so I can maximize uptime and minimize time-to-repair.

While advancements in wearable sensors, vision systems, VR/AR solutions and data visualization toolkits have been made, there are still large gaps to be addressed in this space. MxD encourages proposing teams leverage existing work and technologies, such as those developed in MxD projects 15-04-01: “Manufacturing Work Instructions on Wearable and Mobile Devices with Augmented Reality” and 15-04-03: “Authoring Augmented Reality Work Instructions by Expert Demonstration”, where applicable.

With that vision in mind, the project has the following technical objectives and requirements:

Manufacturer Engagement

Engagement with one or more manufacturers on this project is required. The manufacturer should provide a real manufacturing problem/use case for the project, as well as support the team in the development of a solution. It is expected they have a deep understanding of the problem area and are committed to developing a solution that addresses the implementation and technical challenges presented. The manufacturer should provide the appropriate accommodations for the team to test and demonstrate the developed solution at their facility. The manufacturer will drive the requirements, KPIs, and success metrics for the project.

Human Asset Modeling Development

Develop a framework for near-real-time data collection and aggregation of factory floor worker(s). The developed solution should be unobtrusive in the gathering of said data, be it kinematic, dynamic or physiological. Similarly, the technology must be able to be applied to operators of varying physical builds and abilities. The team should employ a human-centered design approach to research end-user needs in order to identify the current gaps. Specifically, it is suggested that the responding team conduct a minimum of twenty-five interviews with the target audience. The project scope should include development, testing and demonstration of one or more system based on this research. Model-based visualization is not a requirement of this project.

Human Asset Feedback Development

In addition to providing real-time information about their actions, operators also require real-time support in their work. Providing operators with the appropriate intuitive sensory feedback, enabling the operator to perform in a way that was previously impossible, is a requirement of this RFP. Methodologies on providing stakeholders (other than the operator) with feedback on the operator should be explored and tackled as well. The proposing team should address the legal and ethical implications/challenges of providing users other than the operator with this information in their proposal. The team should employ a human-centered design approach to research end-user needs in order to identify the current gaps. The project scope should include development, testing and demonstration of one or more system(s) at a TRL of 6-7 based on this research.



Software System Integration

To support the desired functionality of the human workflow digital twin solution, the team is responsible for developing a system architecture and IT/OT integration framework with the proposing team's manufacturer's current software solutions (ERP, MES, SCADA/HMI, etc.). This integration should enable end users to query the data collected by the Human Workflow Digital Twin solution. Similarly, through this integration the team should develop methods for visualizing and reporting the gathered data, taking into consideration the varying stakeholders who may make use of the data. The team must create and provide developer and user documentation for the framework implementation. In the proposal, offerors should provide a clear plan for employing standards for communication, data formation and system/application interfaces in this project.

System Validation and Demonstration

The proposed solution should be demonstrated on at least one scenario that has the potential for broad-based impact to industry. The demonstration must be realized as a pilot in a production relevant environment. The demonstration should consider all real-world environmental conditions, safety hazards, and possible distractions an operator may be exposed to. Similarly, the demonstration should encompass how all potential stakeholders may interact with the developed solution. In the proposal, the team should address their plan to test their developed solution in multiple phases, allowing for iterations and improvements to their system design. There should be a tangible and quantifiable change in how an operator interacts with a manufacturing system after the integration of the Human Workflow Digital Twin Solution. Accordingly, system baseline and target KPIs should be provided in the technical proposal, with the intention of the manufacture on the proposing team to further develop/deploy the teams solution if the target KPIs are achieved.

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 - \$700,000

During the period of performance, a Human Workflow Digital Twin solution must be developed, tested and demonstrated. After initial requirements are sourced directly from key stakeholders, the team should plan to take an incremental approach in the development of their solution. In this approach the team shall develop and then deploy their solution within their proposed environment, demonstrating its performance early in the solution development through tests of increasing complexity. It is necessary for the team to solicit input from key users (potentially outside of the core team) as part of their development strategy. The team should first validate any critical assumptions to showcase the feasibility of the proposed system design. Then, the team must demonstrate success on each test before continuing to more advanced development. The team should plan to design and employ at least six development and test increments during the period of performance with final testing being completed per the success metrics established by the manufacturer.

During the period of performance, the team will produce deliverables that are deployable by manufacturers that will be shared with the MxD membership in accordance with the



Membership Agreement. The recommended deliverables are listed on the following page in Table 2, but the team is encouraged to include additional deliverables or provide value-added changes to the recommended set of deliverables.

IMPORTANT: If proposing changes to the deliverables, the team must provide the reasoning and detail any assumptions to provide context for the changes. The proposed set of deliverables must align with MxD's focus on achieving deployable outcomes and enabling the transition of the research.

Table 2. Technical Deliverables

Deliverable	Description
Playbook for Human Workflow Digital Twin Solution	Playbook for explaining steps and considerations for integration of digital technology for the proposed solution, a framework for implementation
Requirements Document	Documents outlining the requirements (hardware, software) needed to implement the proposed solution
System Architecture	Diagram(s) depicting key hardware and software components with the associated inputs/outputs/protocols at each interface.
Incremental System Test Plan	Test plan for each incremental evaluation that provides details for setup, test steps, success criteria and results
End User Interviews	Record the results from a minimum of 25 end-user interviews utilizing the Customer Discovery framework
Technical Reports	Technical report on testing results for the hardware and software solutions developed and implemented
Human Digital Twin Solution (software/hardware)	Hardware and software resulting from the testbed development, necessary to run/operate the Human Workflow Digital twin solution in accordance with the requirements outlined in this RFP
User Guides	Includes user manuals for all modes of operation; also includes installation instructions and operation and maintenance manuals
Final Training and Demonstration	All materials required to execute a final training and demonstration at the end of the project period of performance

The team is expected to develop a transition plan, which is discussed in Table 3 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. It should be the intention of the manufacturer on the proposing team to further deploy the results of the project if the target KPIs are achieved. During the duration of the project the team is expected to work towards a sustainment plan post project. **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



VI. PROGRAM REQUIREMENTS

COLLABORATION

While not required, it is highly encouraged that teams participating in this program will be comprised 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 a MxD Tier 1 or Tier 2 Manufacturing Member (or a prospective Tier 1 or Tier 2 Member) to drive use case and operational requirements. 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.

Teams are encouraged to seek participation from a small/medium manufacturer (SMM) or a manufacturer within the leading 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. The technology providers should play a leading role. The providers on the team should have experience with the key system components utilized by the proposing team's manufacturer(s).

Teams are encouraged to have participation from academic partners. They should support the team in the development of new algorithms or technologies, building out fundamentals that can inform the decisions of the team.

Where applicable, the proposing team is suggested to collaborate with a standards organization to better inform their draft standards and to 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 the 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 may 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 3. Technical Deliverables

Deliverable	Description
Project Immersion Workshop	Face to face meeting with Pilot Manufacturer 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 twelve months in duration. Please note that projects are initiated once an Enterprise Award Agreement is signed,. For this project MxD intends to enter into an Enterprise Award Agreement with each Project Participant individually such that no Project Participant will be a contracting Lead Organization.



FUNDING REQUIREMENTS

MxD anticipates awarding one project for \$500,000-\$700,000, not inclusive of expected cost share, under the MxD-19-13 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.



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. MxD intends to execute EAAs with every Offeror organization individually (i.e. MxD will function as the Project Prime/Lead) and all EAAs will share the same Statement of Work and Intellectual Property Management Plan. 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.