MIAMI UNIVERSITY

SIGHT: SAFETY IMMERSION AND GAMIFIED HAZARD TRAINING FOR INDUSTRY 5.0 WORKERS

WSIC26-250206-009

Project Risk Mitigation Plan

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Miami University

Version 1.0

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VERSION HISTORY

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason
1.0	Arthur Carvalho, Jay Shan, Mohammad Mayyas, Reza Abrisham Baf, Ibrahim Yousif, Mo Farrag, Fadel Megahed	09/26/2025	Fadel Megahed	09/26/2025	First version

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1 INTRODUCTION

1.1 PURPOSE OF THE PROJECT RISK MITIGATION PLAN

The Project Risk Mitigation Plan describes the approach for identifying, analyzing, managing, and mitigating potential events or conditions that could positively or negatively impact the objectives of the SIGHT project. It outlines methods for conducting, documenting, monitoring, and updating risk management activities throughout the project lifecycle. The primary audience for this document includes 1) the project leadership team: the Project Manager (PM), Dr. Mohamed Farrag; the Principal Investigator (PI), Dr. Fadel Megahed; and the Co-Principal Investigators (Co-PIs), Dr. Arthur Carvalho, Dr. Jay Shan, and Dr. Mohammad Mayyas; 2) the project sponsor, the Ohio Bureau of Workers' Compensation, Workforce Safety Innovation Center (BWC/WSIC); 3) senior personnel and research team, including Dr. Reza Abrishambaf, postdoctoral researcher Dr. Ibrahim Yousif, and graduate and undergraduate student researchers; and 4) our industry partners MaxByte Technologies and MeetKai, Inc.

1.2 SCOPE

The scope of this Risk Mitigation Plan (RMP) covers all risk management activities associated with the design, development, testing, and deployment of the SIGHT project deliverables, namely 1) a web-based virtual reality (VR) hazard-recognition training platform, and 2) an augmented reality (AR)–enabled, on-the-job safety coaching system underpinned by artificial intelligence (AI) and Industrial Internet of Things (IIoT) integration. As we elaborate throughout this document, this plan applies to the following activities and processes:

1. *Risk identification*: Early and continuous recognition of risks across technical, organizational, external, and project management categories.
2. *Risk analysis*: Both qualitative and quantitative analyses to assess probability, impact, and prioritization of risks.
3. *Risk mitigation and response*: Development and implementation of mitigation, contingency, and response strategies tailored to project-specific risks.
4. *Risk monitoring and reporting*: Ongoing review of risks through bi-weekly project meetings, updates to the centralized risk log, and reporting to key stakeholders.

The stakeholders included in the scope of this plan are:

1. Project leadership team: Principal Investigator (Dr. Fadel Megahed), Co-Principal Investigators (Dr. Arthur Carvalho, Dr. Jay Shan, and Dr. Mohammad Mayyas), and Project Manager (Dr. Mohamed Farrag), who are responsible for documenting, monitoring, and mitigating risks.
2. Senior personnel and research team: Including postdoctoral and student researchers, responsible for executing technical tasks and potentially identifying risks.
3. Industry partners: MaxByte Technologies, Inc. and MeetKai, Inc., responsible for AR/IIoT integration and VR platform development, respectively, and providing input on risk identification and mitigation in their domains.
4. External stakeholders: The independent evaluator (Miami University Discovery Center), safety consultant (Dr. Lora Cavuoto), and the project sponsor (Ohio BWC/WSIC) will review and provide oversight on risk-related processes.

Outside the scope of this plan are risks unrelated to the approved project deliverables, such as expansion into non-manufacturing training domains or unapproved commercialization activities. Likewise, operational risks external to project activities (e.g., institutional financial management systems or unrelated university-level risks) as well as long-term commercialization or deployment risks beyond the project period (June 2027) are outside the scope of this risk plan.

1.3 OBJECTIVES

The primary objective of this RMP is to ensure that risks associated with the SIGHT project are identified, analyzed, and managed in a structured and proactive manner. The plan seeks to establish processes for early identification of risks across technical, organizational, external, and project management domains, so that potential issues can be addressed before they impact project outcomes. It also aims to support comprehensive analysis by applying both qualitative and quantitative techniques to evaluate the probability, impact, and prioritization of risks, thereby enabling evidence-based decision-making.

Another key objective is to implement effective mitigation and contingency strategies tailored to the severity and likelihood of each risk. This includes defining clear response approaches while ensuring that contingency plans are in place to minimize negative impacts on scope, schedule, cost, or quality. To sustain this effort, the plan emphasizes continuous monitoring and reporting, supported by a centralized risk log, bi-weekly team reviews, and formal updates to the project's sponsor.

The plan further seeks to promote clear ownership and accountability by assigning responsibilities to designated risk owners and the risk manager, ensuring that risks are actively tracked and managed throughout the project lifecycle. Finally, this RMP underscores the importance of engaging stakeholders, including internal team members, industry partners, evaluators, and external sponsors, in risk management activities to ensure that diverse expertise informs proactive decision-making.

2 RISK MANAGEMENT PROCEDURE

Our risk management process outlines the structured approach for identifying, assessing, responding to, monitoring, and reporting risks throughout the project. That process includes the following steps for how the project team will systematically manage risks: 1) risks are first identified through continuous engagement with project documentation, technical assessments, stakeholder input, and environmental scans to capture potential threats or opportunities; 2) once identified, each risk is analyzed to determine its probability of occurrence and potential impact on project objectives, using both qualitative techniques such as probability–impact matrices and, when appropriate, quantitative methods such as decision tree analysis to generate data-driven insights; 3) next, risks are prioritized and appropriate response strategies are developed, which may include avoiding the risk entirely, mitigating its likelihood or impact, transferring responsibility to another party, or accepting the risk with contingency planning in place; 4) following the development of response strategies, risks are actively monitored through a centralized risk log that is reviewed in bi-weekly project meetings. Updates to the log capture the status of mitigation actions, changes in likelihood or impact, and any new risks that emerge. High-priority risks are escalated to the PI, Co-PIs, PM, and funding agency as required, while all risks are tracked until they are resolved or closed; 6) the process concludes with formal reporting to stakeholders.

2.1 ROLES

Dr. Arthur Carvalho (Co-PI) will assume the role of *risk manager* for this project. The risk manager is responsible for overseeing the identification and monitoring of the project's risks, developing mitigation plans, establishing strategies for leveraging opportunities, and facilitating informed decision-making throughout the project lifecycle.

Each risk is assigned a dedicated *risk owner* who holds the technical expertise necessary to understand the causes, consequences, and appropriate mitigation strategies and actions for the assigned risk. The risk owner works closely with the risk manager to identify, assess, and prioritize risks, and to coordinate risk response actions among responsible parties.

<Grant/Program Manager's name> collaborates with the risk manager to establish expectations and validate proposed risk management procedures and status updates. They ensure critical risks are escalated appropriately and oversee the tracking, updating, and periodic review of the project RMP during project meetings.

Besides the above roles, senior personnel and student researchers will contribute to day-to-day risk identification by flagging emerging technical or operational issues during system development, data collection, and integration activities. Their observations feed into the centralized risk log and are reviewed during regular meetings. Moreover, industry partners will serve as both risk owners and subject-matter contributors for risks in their respective domains. They provide updates on integration challenges, resource availability, and technical feasibility, ensuring that risks external to the university research team are captured and addressed. Other external stakeholders will also play an important role in the risk management process. The independent evaluator, Miami University's Discovery Center, will provide objective oversight of project performance and highlight risks that may affect deliverables or evaluation outcomes. The safety consultant, Dr. Lora Cavuoto, will ensure that risks related to occupational safety standards and ergonomic design are addressed, offering expertise to validate that mitigation strategies meet safety best practices. Finally, the project sponsor, BWC/WSIC, shall review risk reports and provide guidance or approvals when risks require adjustments to scope, budget, or schedule.

Engagement of all stakeholders is achieved through structured bi-weekly meetings, regular updates to the centralized risk log, and transparent reporting channels. The aforementioned input from technical staff, partners, and evaluators will be systematically incorporated into risk discussions, ensuring that the plan reflects both operational realities and strategic oversight.

2.2 RISK ASSESSMENT PROCESS

Dr. Arthur Carvalho, in collaboration with the project team, will ensure that project risks are proactively identified, analyzed, monitored, and managed throughout the duration of the project. Early and continuous identification of risks is essential to mitigating their potential impact and ensuring project objectives are met. The following subsections describe the risk assessment process, including tools and techniques used to support informed decision-making.

2.2.1 Risk Identification

Risk identification will involve active participation from the project team and relevant stakeholders. It will include an evaluation of environmental factors, organizational culture, and the project management plan, including the project scope. Careful attention will be given to the project deliverables, assumptions, constraints, work breakdown structure, project costs, effort requirements, resource allocations, and other key project documentation.

2.2.2 Risk Analysis

All risks identified will be assessed to determine their potential impact on project objectives. Qualitative analysis will be employed to gauge the significance of each risk, prioritizing those requiring immediate attention and response. Less critical risks will be managed accordingly, ensuring a balanced approach to risk mitigation and project stability. For risks determined to be critical, quantitative analysis will be performed to generate data-driven insights to support contingency planning, resource allocation, and informed decision-making throughout the project lifecycle.

2.2.3 Qualitative Risk Analysis

As the risk manager, Dr. Arthur Carvalho will assess the probability and impact of each identified risk with input from the project team and stakeholders. A structured approach will be used to categorize and prioritize risks based on their likelihood and potential impact, combining descriptive categories with corresponding numerical ratings for consistency. These are the risk categories:

- *Technical*: Risks related to technological aspects, including software development, hardware integration, technical feasibility, etc.
- *External*: Risks originating from external factors outside the project team's direct control, such as market conditions, regulatory changes, environmental factors, etc.
- *Organizational*: Risks associated with internal organizational factors, including governance, organizational culture, resource availability, etc.
- *Project management*: Risks related to project planning, execution, monitoring, or control activities, such as scheduling issues, scope changes, or communication gaps, etc.

The following table displays the risk impact-probability matrix, which we shall use to evaluate and prioritize risks.

Table 1. Risk Impact Probability Matrix.

Risk Impact-Probability Matrix				
Impact \ Probability	**Unlikely (1)**	**Possible (2)**	**Likely (3)**	**Almost Certain (4)**
Catastrophic (4)	Low (4)	Moderate (8)	High (12)	Very High (16)
Severe (3)	Low (3)	Moderate (6)	High (9)	High (12)
Moderate (2)	Low (2)	Low (4)	Moderate (6)	Moderate (8)
Minor (1)	Low (1)	Low (2)	Low (3)	Low (4)

In what follows, detailed explanations are provided about the content of Table 1.

Probability:

- Almost Certain (4): The event is almost guaranteed to occur. The probability of occurrence is very high, i.e., it lies in the range [80%, 100].
- Likely (3): The event is likely to occur. The probability of occurrence is high, i.e., it lies in the range [50%, 80%).
- Possible (2): The event has a reasonable chance of occurring. The probability of occurrence is moderate, i.e., it is inside the range [20%, 50%).
- Unlikely (1): The event is unlikely to occur. The probability of occurrence is low, within the range [0%, 20%).

Impact:

- Catastrophic (4): The event could cause severe and widespread consequences that could lead to project failure, substantial financial loss, or irreversible damage. The impact is urgent and crippling to the project. Priorities and resources supporting the project will be shifted to mitigate and overcome the risk. Coordination with BWC will be required.
- Severe (3): The event could cause significant disruption to the project and affect project aims. The impact is serious, and mitigation would require schedule adjustments and reallocation of resources.
- Moderate (2): The event could impact project cost, schedule, or performance. The impact may cause project delays or require additional resource management, but it will not jeopardize overall project aims.
- Minor (1): The event could cause minor inconvenience or disruption with minimal or negligible impact on the project.

Impact Probability Result Categories:

- Very High (16): Risks in red are critical and require immediate attention and coordination with BWC.
- High (9-12): Risks in orange are significant and require urgent attention and active mitigation efforts.
- Moderate (6-8): Risks in yellow require active monitoring and appropriate mitigation strategies, especially if likelihood or impact increases.
- Low (1-4): Risks in green can be monitored with minimal intervention, though efforts should be made to reduce likelihood where feasible.

Risks categories identified as Very High (red), High (orange), or Moderate (yellow) must have a documented risk response plan, including mitigation and contingency actions tailored to the risk's severity or likelihood.

2.2.4 Quantitative Risk Analysis

Quantitative analysis will be used to estimate the potential impact of prioritized risk events identified through qualitative analysis on project activities. Each critical risk will be assigned a numerical rating based on this analysis, and the results will be documented in the project's risk assessment. The three-point estimation technique will be applied to risks that affect project schedules and resource requirements, such as potential delays in equipment acquisition and setup or industry partner availability. By considering optimistic, most likely, and pessimistic scenarios for each risk, the project team can generate expected values and ranges of impact, which will inform the allocation of time buffers and resource contingencies.

2.3 Risk Mitigation

Each major risk identified in the Very High (red), High (orange), and Moderate (yellow) zones will be assigned to a designated project team member for ongoing monitoring to prevent oversight. For each major risk, the selected response strategy will include both mitigation actions, which reduce the likelihood or impact before the risk occurs, and a contingency plan, which outlines the steps to take if the risk event does occur despite mitigation efforts:

- Avoid: Eliminate the threat by addressing its root cause.
- Mitigate: Implement measures to reduce the probability or impact of the risk.
- Accept: Acknowledge the risk and monitor it, taking no proactive measures beyond contingency planning.
- Transfer: Shift the risk's impact or responsibility to a third party (e.g., through insurance, outsourcing, contractual agreements, etc.).

For risks requiring mitigation, the project team will define specific actions to reduce the risk's impact or likelihood. These actions may include prototyping, adjusting tasks or milestones in the project schedule, or allocating additional resources.

For all major risks being mitigated or accepted, a documented contingency plan will outline the actions to be taken if the risk occurs, to minimize negative impact on project objectives.

2.4 Risk Assessment Table

The following table represents the initial risk assessment at the time of submission.

Table 2. Risk Assessment

Risk Assessment Table							
Sequence	**Risk Description**	**Risk Owner**	**Risk Category**	**Probability of Occurrence**	**Risk Impact**	**Risk Approach**	**Timeframe**
1	IRB approval delays due to additional info requests, delaying participant recruitment.	Co-PI (Dr. Jay Shan)	External	Possible (2)	Moderate (2)	Mitigate	Near (now-1 month)
2	Industry partner unavailability, e.g., MaxByte/MeetKai staff capacity issues, thus causing delays in solution development.	PI (Dr. Fadel Megahed) with Partner Liaisons	External	Possible (2)	Severe (3)	Mitigate	Mid (2-6 months)
3	Data quality issues in the image database (e.g., incomplete metadata, poor lighting), thus affecting AI accuracy.	Co-PI (Dr. Jay Shan)	Technical	Likely (3)	Moderate (2)	Mitigate	Near (now-1 month)
4	LLM/third-party API latency or availability undermines AR/VR real-time performance.	Co-PI (Dr. Arthur Carvalho)	Technical	Likely (3)	Severe (3)	Mitigate/Transfer	Mid (2-6 months)
5	IIoT sensor reliability and network bandwidth constraints at AM Hub limit AR coaching functionality.	Co-PI (Dr. Mohammad Mayyas) with Dr. Reza Abrishambaf	Technical	Likely (3)	Severe (3)	Mitigate	Far (>6 months)
6	Procurement delays for equipment due to supply chain/university policies.	Project Manager (Dr. Mohamed Farrag)	Organizational	Possible (2)	Moderate (2)	Mitigate	Near (now-1 month)
7	Personnel turnover (grad/postdoc attrition), which will disrupt the solution development.	PI (Dr. Fadel Megahed)	Organizational	Possible (2)	Severe (3)	Mitigate	Far (>6 months)

8	Integration failure between AR/VR modules and AI analytics layer during the proof-of-concept stage.	PI (Dr. Fadel Megahed)	Technical	Possible (2)	Severe (3)	Mitigate	Far (>6 months)
9	Budget constraints due to inflation or unforeseen costs requiring scope trade-offs.	PI (Dr. Fadel Megahed) with PM (Dr. Mohamed Farrag)	Project Management	Possible (2)	Severe (3)	Accept/Mitigate	Mid (2-6 months)
10	Participant recruitment shortfalls for pilot testing.	Evaluator (Dr. Yue Li)	External	Possible (2)	Moderate (2)	Mitigate	Far (>6 months)

2.5 Risk Response

For each risk event identified in the SIGHT risk assessment, the following risk mitigation strategy table is proposed to reduce the project's risk exposure, minimize the impact, and facilitate clear decision-making throughout the project.

Table 3. Risk Mitigation Strategies

Risk Mitigation Strategy Table			
Risk Description	**Risk Trigger**	**Risk Mitigation Strategies**	**Risk Owner**
1. IRB approval delays	IRB requests additional clarifications or revisions beyond the expected review cycle.	*Mitigation*: Submit complete documentation early; engage experienced faculty in review before submission. *Contingency*: Modify timeline for data collection tasks to comply with IRB requirements.	Co-PI (Dr. Jay Shan)
2. Industry partner unavailability	Partner representatives (MaxByte/MeetKai) miss scheduled milestones or status updates; Key contact points transfer to another company	*Mitigation*: Establish secondary points of contact; create parallel development tasks independent of partners. *Contingency*: Engage Miami University's advisory boards to find alternative partners.	PI (Dr. Fadel Megahed) with Partner Liaisons
3. Data quality issues in the image database	AI model testing reveals classification accuracy below acceptable levels	*Accept*: Implement dual review of images *Contingency*: Expand the dataset with new images and conduct targeted retraining.	Co-PI (Dr. Jay Shan)
4. LLM/third-party API latency or unavailability	API latency exceeds tolerable times, or a service outage occurs.	*Mitigation/Transfer*: Benchmark APIs regularly; cache frequent queries. *Contingency*: Switch to backup providers or local AI models.	Co-PI (Dr. Arthur Carvalho)
5. IIoT sensor reliability and bandwidth constraints	AR system fails to receive timely sensor data.	*Mitigation*: Stress-test network; implement local edge processing to reduce dependency on cloud. *Contingency*: Deploy redundancy (backup sensors, wired connections) at AM Hub.	Co-PI (Dr. Mohammad Mayyas) with Dr. Reza Abrishambaf
6. Procurement delays for equipment	Procurement office requests additional clarifications or revisions beyond the expected review cycle.	*Mitigation*: Pre-identify multiple suppliers; initiate early purchasing requests. *Contingency*: Rent/borrow equipment or re-sequence tasks not dependent on delayed items.	Project Manager (Dr. Mohamed Farrag)
7. Personnel turnover	Graduate student or postdoc resigns before completing critical deliverables.	*Mitigation*: Document all work in shared repositories (GitHub, Notion); cross-train student team members.	PI (Dr. Fadel Megahed)

		Contingency: Reallocate tasks temporarily to faculty or industry partners until replacement is hired.	
8. Integration failure between AR/VR modules and analytics layer	System integration tests show persistent data mismatches or crashes.	*Mitigation*: Conduct phased integration testing after each module is complete; assign dedicated integration lead. *Contingency*: Build simplified fallback prototype with reduced features to maintain testing schedule.	Co-PIs (Dr. Jay Shan and Dr. Arthur Carvalho)
9. Budget constraints due to inflation or unforeseen costs	Actual procurement costs exceed budget line items.	*Accept/Mitigation*: Track expenditures bi-weekly; negotiate discounts with vendors. *Contingency*: Scale back non-essential features or reallocate from discretionary budget categories with sponsor approval.	PI (Dr. Fadel Megahed) with PM
10. Participant recruitment shortfalls for pilot testing	Fewer than expected participants enrolled by mid-pilot period.	*Mitigation*: Expand recruitment pool to include additional student cohorts and industry partners. *Contingency*: Extend testing window or reduce participant balance requirements while maintaining statistical validity.	Evaluator (Dr. Yue Li)

3 RISK MONITORING, CONTROLLING, AND REPORTING

Risk levels will be continuously tracked, monitored, and reported throughout the project lifecycle. A *risk log* (see Section 3.1) will be maintained internally by the project team to capture current risks and status updates; it will be included in bi-monthly project team meeting minutes/updates and status reports. A *risk management log* (see Section 3.2) will document risk resolution activities and will be included in both Interim and Final project reports submitted to BWC.

All project change requests will be analyzed to assess their impact on existing and potential risks. Any changes in risk status will be reported to the project sponsor in quarterly progress reports. Risks falling in the Very High impact-probability category will be reported to BWC immediately upon detection.

3.1 RISK LOG

The *risk log* serves as a dynamic tool for improving risk management practices, providing a current snapshot of all identified risks and their statuses. It supports informed discussions, timely decision-making, and proactive updates during bi-monthly project team meetings. Maintained by Dr. Arthur Carvalho (Co-PI), the risk log ensures all team members are aware of current risk assessments and actions being taken to manage them effectively. The risk log will be reviewed regularly as a standing agenda item for bi-monthly project team meetings to enable proactive risk management and timely adjustments to project strategies as needed. The risk log for the project will be kept up to date and stored electronically at https://modern-carrot-878.notion.site/25ed922af5438011897fd3ce814c6bf2?v=25ed922af5438085b1d2000cc9e10e49.

3.2 RISK MANAGEMENT LOG

The *risk management log* serves as a comprehensive historical record to track risks from initial assessment through mitigation and resolution. It documents actions taken to address each risk and ensures that any newly identified risks are promptly added and managed throughout the project lifecycle. The project's risk management log will be maintained in Notion, a collaborative workspace platform that is widely used for project management. We will use Notion's version history feature, which automatically records every change made to the risk log page. While version history cannot be made publicly accessible due to platform limitations, all project leaders can view it by logging into Notion.

APPENDIX A: PROJECT RISK MITIGATION PLAN APPROVAL

The undersigned acknowledge they have reviewed the SIGHT Project Risk Mitigation Plan and agree with the approach it presents. Changes to this Project Risk Mitigation Plan will be coordinated with and approved by the undersigned or their designated representatives.

Signature:		Date: 09/26/2025
Print Name:	Fadel M. Megahed	
Title:	Raymond E. Gloss Professor in Business	
Role:	PI	
Signature:		Date: 09/26/2025
Print Name:	Arthur Carvalho	
Title:	Associate Professor	
Role:	Co-PI	
Signature:		Date: 09/26/2025
Print Name:	Jay Shan	
Title:	Associate Professor	
Role:	Co-PI	
Signature:		Date: 09/26/2025
Print Name:	Mohammad Mayyas	
Title:	Professor and Chair of Engineering Tech	
Role:	Co-PI	

Signature:  Date: 09/26/2025

Print Name: Mohamed Farrag

Title: Visiting Assistant Professor

Role: Project Manager

APPENDIX B: REFERENCES

The table below summarizes the key reference documents for the Project Risk Mitigation Plan.

Table 4. Referenced documents.

Document Name and Version	Description	Location
Risk Management Log: Notion Page	A Notion Page to log discovered risks and mitigation strategies	https://modern-carrot-878.notion.site/25ed922af5438011897fd3ce814c6bf2?v=25ed922af5438085b1d2000cc9e10e49

APPENDIX C: KEY TERMS

The table below provides definitions for terms relevant to this Project Risk Mitigation Plan.

Table 5. Key Terms.

Term	Definition
SIGHT	Abbreviation for our project's name: SAFETY IMMERSION AND GAMIFIED HAZARD TRAINING FOR INDUSTRY 5.0 WORKERS
AR	Augmented reality
VR	Virtual reality, web-based
IIoT	Industrial Internet of Things, i.e., sensors connected to the internet

APPENDIX D: RISK MANAGEMENT LOG TEMPLATE

[The Risk Management Log is used to track the occurrence and resolution of risks throughout the project period. This log must be included in the Interim and Final Reports, but is not required to be submitted with the Project Risk Mitigation Plan.]

Risk Description	Risk Category	Occurrence	Impact to the Project	Corrective Actions Taken
[Example: 1. IRB approval delays]	*[External]*	*[August/September 2025]*	*[Moderate]*	*[Consulted with more experienced subject matte experts to ensure actions were correct and submitt appropriate supporting documents.]*
<add more rows as needed>				