AO Digital Transformation of Book Content: RFP Requirements Specification

Authors:
Matthias Schmidt, Mike Redies, Sasi Chodagam, Carl Lau

V 1.0

AO Foundation
Clavadelerstrasse 8 | 7270 Davos | Switzerland
Phone: +41 81 414 21 11 | E-mail: foundation@aofoundation.org | www.aofoundation.org

Information about this document

Common information

Title	**AO Digital Transformation of Book Content: RFP Requirements Specification**
Description	The purpose of this document is to provide potential solution providers with the necessary requirements to submit a proposal for the development of an AI-powered online resource based on the AO Principles of Fracture Management book, 3rd edition, volume 1.

List of abbreviations

Abbreviation	Description
AO F	AO Foundation
AO EI	AO Education Institute
PFxM	AO Principles of Fracture Management book
AI	Artificial intelligence
MCQ	Multiple choice question
PPT	MS PowerPoint
SSO	AO Single Sign-On
UAT	User acceptance test
UX/UI	User experience/user interface

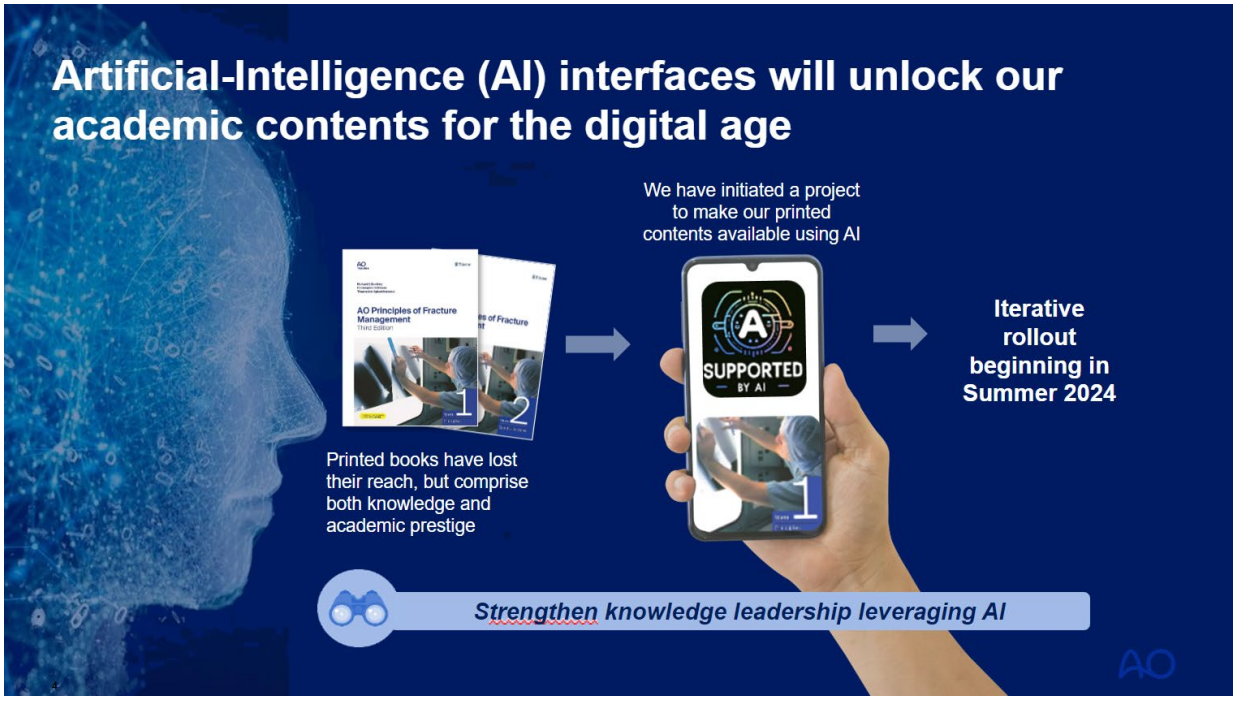
Contents

1 General information

1.1 Summary/Overview

The AO Foundation is a medically guided, not-for-profit organization, a global network of surgeons, and the premier education, innovation, and research organization for the surgical treatment of trauma and musculoskeletal disorders. The AO's world-leading institutes drive development, innovation, and research, across the AO by delivering value-added products and services to the AO's clinical divisions, clinical unit, global network of surgeons and operating room personnel, and to its partners. They produce new concepts for improved fracture care, deliver evidence-based decision-making, guarantee rigorous concept and product approval, and ensure the timely and comprehensive dissemination of knowledge and expertise.

The AO PFxM has served many generations of surgeons around the world as the source of knowledge and essential reference in the field of orthopedic trauma surgery. The fundamental principles of fracture surgery have not changed in 60 years, but the biological and clinical knowledge, as well as technological advancements have extended new possibilities in surgical treatment and offered surgeons the opportunity to explore new ways of applying the AO principles.



The AO Education Institute (AO EI) is pursuing the Digital Transformation of book content from hardcopy print into an AI-powered online resource. This project aims to transform volume 1 of the renowned PFxM into a dynamic, AI-enhanced digital platform. The existing print-content will be migrated to an interactive, multimedia-rich format, incorporating adaptive AI technologies to personalize learning experiences. The platform will include a user-friendly interface, ensuring wide usability.

Simultaneously, this project serves as a strategic exploration into AI's potential within AOEI projects. It encompasses planning, development, implementation, and evaluation phases, aiming to revolutionize the way formerly-printed contents are presented and to position AOEI as a leader in digital learning solutions. It represents a strategic blend of technology and education, reflecting our commitment to innovation and excellence.

1.2 Project objectives

Objective 1: Digitization and Enhancement of PFxM

- Transform the "AO Principles of Fracture Management" from a traditional print format into an interactive, AI-powered digital resource.
- Enhance the learning experience for orthopedic surgeons through personalized, adaptive learning paths and integrated content.

Objective 2: Exploratory AI Discovery for AO EI

- Assess and demonstrate the potential of AI in enhancing educational resources and professional training.
- Explore and identify new opportunities for AI application within the broader scope of AOEI offerings.

1.3 Aim and value of this document

The AO EI is seeking proposals from potential partners providing delivery of AI services, tools, and expertise. We are looking for one or more partners with AI design and software engineering expertise from prototype to market, as well as guidance on best practices and opportunities to deliver great quality and engaging education to our learners.

The purpose of this document is to provide potential solution providers with the necessary information to estimate and implement the Digital Transformation of the PFxM

1.4 Scope of the proposal

The scope of this project comprises of two key implementations:

1. Development of the frontend and backend of custom software application, which surgeons will use to access the solution and admins from AO Foundation will setup and track at the backend.

2. Development of the AI engine which will ingest the available AO Foundation information and resources in different formats and provide access to users in a conversational format.

The following activities will be carried out for application development.

- Design - UI/UX design will be created
- Development & testing - building and iteratively testing the application frontend, backend and AI engine
- Deployment - making the application live for users

In scope:

- Conversion of PFxM3 vol.1 content into digital format.
- Development of AI-driven features for personalized learning and user engagement.
- Integration of existing multimedia elements like videos, etc.
- Implementation of user feedback and assessment tools.
- Deliverables:
  - Digital Content Conversion: Convert PFxM content into a digital format that is responsive and compatible with various devices (tablets, smartphones, computers). This includes all text, images, diagrams, charts and links to linked-in contents.
  - AI Features:

- AI-assisted query response: An AI system to answer specific queries from the text, providing detailed explanations or related information.
- AI-assisted learning paths: AI algorithms that support the user on a pre-defined learning path.
- Personalized learning paths: AI algorithms that adapt the content based on the user's profile, learning pace and style.

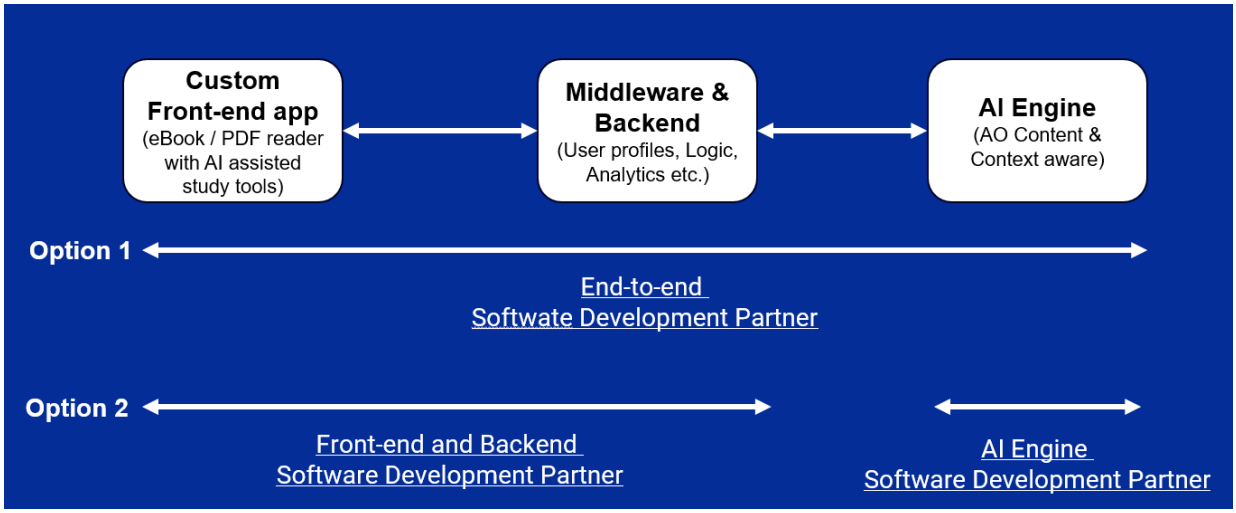
- User interface model
- Operational and running costs: To plan and ensure longer term financial sustainability of the project, along with the design and development of the custom software application, it is envisaged that we would have a detailed overview of the operational and maintenance costs (Cloud infrastructure costs / SAAS licenses / LLM token costs based on usage etc.) split into fixed and variable costs.

Out of scope:

- Creation of new PFxM contents ("PFxM4").
- PFxM vol.2
- Creation of additional contents (such as assessments, etc.).

1.5 Partner expectations

AO EI is looking for one or more partners with software development (front end and backend), custom-content based Generative AI engineering expertise from prototype to market, as well as guidance on best practices and opportunities to deliver high quality educational offerings to AO's learners.



Given the complex scope of the project and specialist skills requirement, AO reserves the right to split and award the work contract in 2 separate work packages, each awarded to different partners.

Work Package 1: Frontend and Backend development

Work Package 2: AI engine development

Therefore, we request invited partners to bid for the entire scope of the project (Option 1: Frontend, Backend and AI engine) and for the two separate work packages (Option 2), based on their technical

expertise and competencies. The AO is looking for a collaborative approach where the AO team is involved in giving feedback. Feedback collected from AO surgeons in different stages of development is also an essential part of the process. AO's expectation is that the chosen software development partner/s will bring AI expertise, cross-industry know-how but also has knowledge of medical technology, elearning environment and education.

The partner/s should have experience in one or more of following fields (or involve partners/subcontractors):

- Enterprise / Custom content based AI engine design and development
- Software development (Frontend and Backend)
- Device/System engineering
- UX/UI design
- Product Development and Project Management

1.6 Development mode and communication

- Initial workshops to finalize the technical scope, user requirements for phased development and launch.
- Mode of development: Agile, sprints with online demonstrations to AO on weekly / bi-weekly basis
- Iterative development of the AI engine to optimize performance, costs based on A/B testing with early-adopters from our surgeon community subject-matter experts.
- Concise regular project progress meetings/reports, including demonstrations (scheduled depending on project state).
- Milestone based project execution and payments (e.g. concept phase; dev iterations 1,2,3; testing phase; 0-series production)

2 Requirements

1. *AI and Machine Learning Capabilities*: Suitable technology for implementing AI features.
2. *Software deployment / development:* Software application for converting and hosting PFxM contents.
3. User interface design that is intuitive and user-friendly on both mobile and desktop.
4. *Multimedia Integration:* Tools and technology for integrating multimedia elements such as video,
5. Ensure that platform access is compatible with AO Aure SSO login

2. User Experience Requirements:

1. *Interactive and Engaging Design*: An engaging user interface that promotes easy navigation and interactive, AI-assisted learning.
2. *Personalization Features:* Ability to tailor the learning experience to individual users' needs and preferences.
3. *Feedback and Assessment Tools*: Implementing tools for user feedback and assessments. At a later stage, tracking user progress and learning outcomes should be possible.

3. Compliance and Security Requirements:

1. *Ethical AI Use*: Ensuring the ethical use of AI in accordance with relevant guidelines and standards.
2. *Data Privacy and Security*: Compliance with data protection laws (like GDPR) and robust security measures to protect user data, where collected.

2.1 Phased development plan:

It is envisaged that the application will be developed in two phases. At initial product launch in early December 2024, it is expected that features listed in Phase 1 below will be made available for surgeon users and administrators. Subsequently, the software application will be updated to implement the Phase 2 set of features, along with other features based on user feedback post Phase 1 launch.

Phase 1

Platform	Module	Feature
Admin Panel	User Management	Create, edit, and delete user accounts
Admin Panel	User Management	Assign user roles and permissions
Admin Panel	User Management	Monitor user activity and logs
Admin Panel	Content Management	Upload and manage ebooks (PDFs & ePUBs)
Admin Panel	AI Model Management	Monitor AI model performance and usage
Admin Panel	Analytics and Reporting	Track user engagement and interaction with ebooks
Customer App	Login	MS Azure / AO login SSO integration
Customer App	Authentication	User login with email and password
Customer App	Ebook Viewer	Display ebook content (PDFs) with navigation controls
Customer App	Ebook Viewer	Support text selection and highlighting
Customer App	Ebook Viewer	Enable bookmarking and personalized AI assisted note-taking
Customer App	Ebook Viewer	PDF & Epub book version storing
Customer App	Ebook Library	Epub Support
Customer App	Ebook Interaction	Text to text Translation / Similar to Chatdoc.ai & Kortext
Customer App	Ebook Interaction	Text to speech Translation / Similar to Kortext

Customer App	AI Interaction	Text selection to Query Insertion / Similar to Chatdoc.ai
Customer App	AI Interaction	Chatbot interface for asking questions and receiving answers / Similar to Chatdoc.ai UI
Customer App	AI Interaction	Contextual retrieval of relevant content from the ebook
Customer App	AI Interaction	Hyperlinked page no. citations in response that when clicked scroll the PDF / ePUB to relevant place where the response is inferred from / Similar to Chatdoc.ai UI
Customer App	PPT Generation	Content for PPT
Customer App	AI Interaction	Generate MCQs with reasoned explanation of answers / similar to Kortext UI
Customer App	AI Interaction	Enable Prompt Template library / Similar to Chatdoc.ai UI
Customer App	UI / UX Features	Reference to Kortext, Chatdoc.ai UI interface & features

Phase 2

(For information purposes only. Only Phase 1 features are planned for initial product launch in December 2024)

Platform	Module	Feature
Admin Panel	Learning Analytics	Generate reports on user learning progress and outcomes
Customer App	Ebook Viewer	Export reference
Customer App	Video Library	Access to existing video content
Customer App	Ebook Interaction	Reference and share video in query
Customer App	Ebook Interaction	Multi-modal responses
Customer App	Ebook Interaction	Voice Cloning
Customer App	AI Interaction	Image snipping and inserting in query
Customer App	AI Interaction	Multimodal input support (text, images)
Customer App	Video	Enhanced video capabilities
Customer App	PPT Generation	PPT creation
Customer App	Ebook Interaction	Export Study Cards (eg. Anki)
Customer App	AI Interaction	Mouseover hover AI-assisted keyword explanations

As the AO EI eventually plans to expand usage of the AI engine to serve as centralized hub for all AO published knowledge in the field trauma and musculoskeletal disorder (books, videos, medical illustrations, webinars, courses, educational programs, online educational courses etc.), the architecture of the AI engine would be engineered for this multi-format content storage and retrieval, scalability and access via an API based Backend As A Service (BAAS) design that can fully leverage such an AI engine for use in other AO digital educational products and programs as a part of the AO digital education learning ecosystem.

2.2 Key features of the AI engine will include:

1. Intelligent search and retrieval: Users can perform complex searches across multiple books and resources, with the AI engine understanding the context and intent behind their queries to deliver the most pertinent results.

2. Interactive query resolution: The platform will provide a conversational interface where users can ask specific questions and receive accurate, context-aware responses drawn from the available research materials.

3. Personalized content generation: Based on user preferences, interests, and learning goals, the AI engine will curate and generate customized content, such as summaries, flashcards, and quizzes, to support individual learning styles and objectives.

4. Granular reference identification: Users will be able to quickly locate specific references within books, down to the chapter, section, sub-section, and page number level, making it easier to cite sources and explore related content.

5. Collaborative learning: The AI engine will foster a community of learners by enabling users to share insights, discuss topics, and collaborate on research projects within the platform.

2.3 Suggested technical scope of AI engine design and development:

1. Architecture Considerations: Develop an efficient and accurate custom knowledge based information retrieval system.

- Implement a Hybrid Search RAG system
- Develop a Hybrid GraphRAG system
- Incorporate retrieval re-ranking functionality.

Technical Considerations:

- Vector Embedding technique selection
- Graph database integration (e.g., Neo4j) for Semantic Knowledge Graph

2. Metadata-rich Document Parsing and Ingestion: Create a backend system to handle and process large documents with metadata extraction.

- Handle large document files (>200MB) and various file formats (multiple document formats like PDF, ePUB, MS Office, images, videos, audio etc.)
- Extract metadata and perform metadata-enriched parsing

Technical Considerations:

- Utilize meta-data rich, file type aware, input file parsing and processing libraries
- Implement a scalable EU GDPR compliant, secure storage system (e.g., Amazon S3, HDFS)

3. Multimodal Inputs and Responses: Enable text, image, and video-based queries with multilingual support.

- Support text, image, and video-based queries

- Provide multiple language support for input and output

Technical Considerations:

- Implement NLP techniques for text-based queries and responses
- Utilize computer vision libraries (e.g., OpenCV, TensorFlow, GPT4) for image analysis

4. Cost Management: Implement cost optimization and management features.

- Implement query caching, summarization, and compression
- Develop query intent-based routing to appropriate LLM models
- Implement user-based cost management features (e.g., Bring own LLM API keys, User query credit system, rate limiting max. nos. of daily queries per user etc.)

Technical Considerations:

- Implement a query and response caching mechanism.
- Train machine learning models for query intent classification and routing

5. Accuracy, Contextual, and Comprehensive Responses: Investigate Agentic Query Reasoning for comprehensive responses to complex questions.

- Divide complex questions into sub-questions using Agentic Query Reasoning

Technical Considerations:

- Research and implement Agentic Query Reasoning algorithms
- Develop techniques for sub-question extraction and parallel processing

6. Explainable AI: Provide citations and thought process explanations for explainable AI.

- Include citations (document, chapter, section, sub-section, page number) in responses
- Display the thought process used to reach the response

Technical Considerations:

- Implement a citation extraction mechanism
- Develop a structured format for representing the thought process and making it visible in the query response.

7. Observability and Monitoring: Implement user feedback, logging, and analytics features for system monitoring.

- Implement user answer rating (upvote/downvote)
- Maintain chat logs, question ratings, and escalation records
- Develop advanced AI topic clustering and analytics

Technical Considerations:

- Implement a user feedback mechanism and data storage
- Design a logging system for chat logs, question ratings, and escalation records

- Implement machine learning on user queries to suggest recommended content etc.

8. Semantic Search and Clustering: Incorporate advanced semantic search and clustering functionalities.

- Implement semantic search functionality
- Develop clustering, topic modeling, and classification capabilities

Technical Considerations:

- Implement semantic search algorithms (e.g., word embeddings, semantic similarity Measures, Knowledge Graph architecture)
- Develop clustering algorithms (e.g., hierarchical clustering, K-means)

9. AI Guardrails: Implement safeguards and cost tracking for AI system reliability.

- Implement safeguards against hallucinations, prompt injections, and off-topic questions
- Track LLM costs for monitoring and optimization

Technical Considerations:

- Develop techniques to detect and mitigate hallucinations, prompt injections, and off-topic queries
- Integrate cost tracking and monitoring mechanisms into the LLM integration pipeline

3 Submission guidelines

The following process will be implemented for RfP response by selected vendors who are interested in participating in the RfP:

- RfP distribution to closed set of vendors: (Wednesday, 1st May 2024)
- Invited vendor ZOOM presentations, PoC demos and question period (Monday 13th May, 2024)
- Vendor RfP submission (Deadline: Friday 17th May 2024)
- Proposal evaluation and shortlisting (Deadline: 31st May 2024)
- Contract negotiation and signing (Deadline: 7th June 2024)
- Project kickoff (Monday 10th June 2024)

Deadline for all submissions will be Friday 17th May 2024. Proposals should be submitted by email to the designated points of contact listed in the section “Contact information”.

Please submit your proposal as a PPT presentation (PDF version is acceptable, with a maximum of 10–15 slides) covering the following points:

- Summarize your understanding of the project requirements
- Highlight your qualifications, previous experience, and similar completed projects

- Include other relevant examples, case studies, and reference contacts to support your proposal
- Present your proposal for scalability, financial and operational sustainability after the prototype and Phase 1 launch.
- Show how your proposal would further the development of AO staff in the area of emerging technologies and platforms
- Include contact information for your primary point of contact

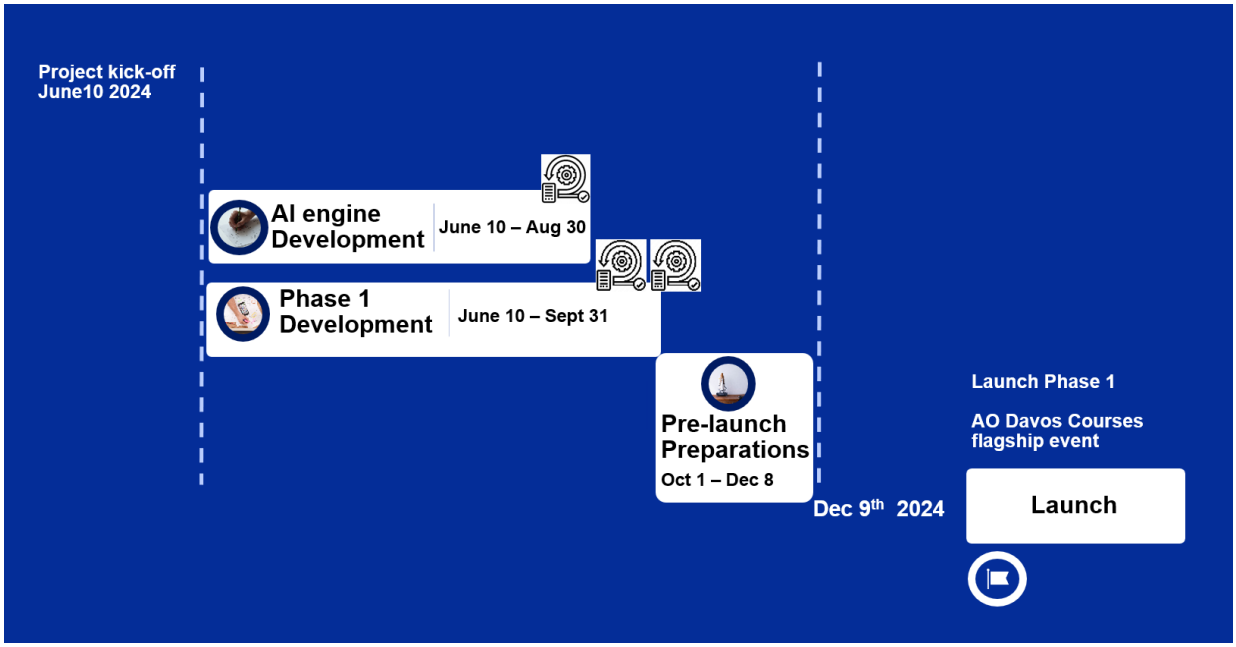
Any questions or requests for clarification regarding the RFP should be submitted in writing to the designated points of contact no later than Friday 10th May, 2024.

4 Evaluation criteria

Proposals will be evaluated based on the following criteria:

- Technical approach and methodology:
  - Clarity and comprehensiveness of the proposed technical approach to addressing the project requirements.
  - Feasibility and effectiveness of the proposed methodology in achieving the project objectives.
  - Innovation and creativity demonstrated in the proposed solution.
- Qualifications and experience:
  - Relevant experience in similar projects or industries.
  - Expertise and qualifications of key personnel assigned to the project.
  - Track record of successfully delivering similar projects on time and within budget.
- Cost and value for money:
  - Reasonableness and competitiveness of the proposed pricing.
  - Overall value proposition, considering both cost and quality factors.
  - Transparency and accuracy of cost estimates provided in the proposal.
- Support and maintenance
  - Approach to providing ongoing support and maintenance of the solution
  - Availability and responsiveness of support services
  - Any additional services or resources offered to ensure long-term success of the project
- Scalability and flexibility
  - Ability of the proposed solution to scale and adapt to future growth or changes in requirements
  - Flexibility in accommodating customization or integration with existing systems or future upgrades

5 Timeline



Project Kick off		10th June 2024
Prototype Development	1. AI feature design & development plan	June-July 2024
	2. User interface prototype complete (UX, AI)	June 2024
Implementation & Testing	3. Launch of first iteration of platform / iterative launches	July 2024
	4. Integration of AI features	Aug 2024
	5. Initial user testing, AI training and feedback collection completed	Aug-Sept 2024
Evaluation and Iteration	6. Analysis of initial user feedback	Sept 2024
	7. Iterative improvements	Oct 2024
Deployment	8. Final platform release	Dec 2024
	9. Product launch	Dec 8th 2024

6 Contact information

Designated point of contact for this RfP is Mike Redies and Sasidhar Chodagam

Matthias Schmidt	Head Education Design	matthias.schmidt @aofoundation.org	+41 79 766 38 44
Michael Redies	Head of Education Portfolio Trauma / Recon / Sports / ORP	michael.redies @aofoundation.org	+41 79 338 80 02
Sasidhar Chodagam	Senior Project Manager AI & Simulation	sasidhar.chodagam @aofoundation.org	+41 79 558 65 17
Carl Lau	Manager Medical Editing	carl.lau @aofoundation.org	+41 79 240 92 01

7 General terms and conditions

By responding to this RfP, you

- accept all the RfP terms, conditions, provisions and requirements, except as expressly and specifically stated in your response. Any exceptions to the terms, conditions, provisions, and requirements delineated in the submission must be specifically noted and explained in writing.
- accept that AO Foundations's frame contract template for services will be applied and used to govern the relationship with the selected party. Please note that AO Foundation's frame contract template is non-negotiable.
- certify that the information has been independently prepared and submitted and that you have not exchanged, nor will you exchange any pricing, cost or other competitively sensitive information about any RfP product and/or service with any other company responding to this RfP.
- accept that this RfP shall not be construed in any manner to create an obligation on the part of AO Foundation to enter into any contract, or to serve as a basis for any claim whatsoever for reimbursement of costs that you have incurred.
- accept that this RfP may, at the discretion of AO Foundation and at any time be revised, withdrawn or cancelled. AO Foundation shall not be bound by any of its oral or written responses, statements or representations. AO Foundation reserves the unqualified right to reject any or all submissions submitted hereunder for any reason whatsoever.

8 Public statements

You may not issue any public statements or otherwise disclose any information concerning this RfP, the RfP process, or their participation in the process without prior written approval of the AO Foundation.

9 Confidentiality

You must treat all information, whether oral or written, every template, content of discussions or contact with AO Foundation in relation to the invitation to submit offers, and any contract negotiations as strictly confidential and must not pass this information to third parties.

By accepting this RfP, you agree to keep confidential all information provided by AO Foundation to you in connection with this RfP. Please notify AO Foundation immediately as to whether you are planning to respond to this RfP. In the event that you are not going to respond, please send back all hard copies of this RfP and/or delete electronic copies.