

Preliminary Market Consultation - PMC

For

**Development and Continuous Maintenance & Support of
a Tool to assist eLearning through a Digital Bilingual
Dictionary, Maltese Language Corpus, Spellchecker,
Grammar and Syntax Checker, and Bilingual Translator**

Issued by:

Ministry for Education, Sport, Youth, Research, and Innovation

REF: MEYR/1037/2024

Issue Date: 13/01/2025

Response/Submission Date and Time: 03/02/2025 at 12:00 (noon) (CET)

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Section A: Instructions

1) Response to this PMC is to be submitted online through the ePPS (electronic Public Procurement System) as per the instructions given in Article 8 in Section B of this document.

All submissions will be dealt with in strictest confidence.

Section B:

General Information

1) Purpose

The purpose of this Preliminary Market Consultation (PMC) is to determine if there are Economic Operators who can develop and continuously maintain and support a Digital Bilingual Dictionary, Maltese Language Corpus, Spellchecker, Grammar and Syntax Checker and Bilingual Translator.

This issuance of this PRELIMINARY MARKET CONSULTATION does not constitute a commitment to issue a request for bids, award a contract, or pay any costs incurred in preparation of a response to this PMC.

Any information received in response to this PRELIMINARY MARKET CONSULTATION will assist the Contracting Authority's project team in finalizing the scope of work and requirements which may be used at a future date in the issuance of a call for tenders. Submitting a response to this PRELIMINARY MARKET CONSULTATION is not a guarantee in any way that an Economic Operator will be selected for any subsequent call for tenders, nor does it preclude any Economic Operator from responding to future procurement opportunities.

2) Issuing Office

The issuing office, being the Ministry for Education, Sport, Youth, Research, and Innovation, is the point of contact for this PMC.

Any PRELIMINARY MARKET CONSULTATION addenda/updates/clarifications and will be made available through the ePPS.

3) Scope

This Preliminary Market Consultation is being conducted to identify if there are economic operators who are interested in providing such services, to determine cost estimates and to also identify any potential limitations and risks.

Interested economic operators are invited to provide feedback and outline their capabilities to meet these requirements.

4) Information Requested from Economic Operators

Economic Operators are to respond to the questions listed in Section D. Economic Operators are encouraged to recommend changes to the project if it is determined, based on their experience, that there is a better approach. The Contracting Authority is seeking best practices in this area.

5) Economic Operators Presentations

The Contracting Authority may request Economic Operators to provide a presentation on the information provided in response to this PMC. All costs associated by such presentations will be borne by the Economic Operator.

6) Confidentiality and PRELIMINARY MARKET CONSULTATION Ownership

This PRELIMINARY MARKET CONSULTATION is both confidential and proprietary to the Contracting Authority and the Contracting Authority reserves the right to recall the PRELIMINARY MARKET CONSULTATION in its entirety or in part. Economic Operators agree that they will not duplicate, distribute, or otherwise disseminate or make available this document or the information contained in it without the express written consent of the Contracting Authority.

Economic Operators shall not include or reference this PRELIMINARY MARKET CONSULTATION in any publicity without prior written approval from the Contracting Authority, which, if granted, shall be granted by the Contracting Authority. Economic Operators accept all of the foregoing terms and conditions without exception. All responses to the PRELIMINARY MARKET CONSULTATION will become the property of the Contracting Authority and will not be returned.

7) Disclosure of Proposal Contents

Cost and price information provided in information proposals will be held in confidence and will not be revealed or discussed with competitors, except to the extent required by law.

All other material submitted becomes the property of the Contracting Authority and may be returned only at the Contracting Authority's option. Information proposals submitted to the Contracting Authority may be reviewed and evaluated by any person other than competing Economic Operators at the discretion of the Contracting Authority.

The Contracting Authority has the right to use any or all ideas presented in any reply to the RFI.

Where confidential or proprietary information is required, or should the Economic Operator deem it necessary to submit such matter, mark each page/section in large bold type **(PROPRIETARY INFORMATION)**.

If any response to the Preliminary Market Consultation contains a trade secret or confidential commercial/proprietary information, one should include with the response a separate signed written statement to that effect.

8) Submission Instructions

The Contracting Authority is using the electronic public procurement system for its solicitations. In order to receive and submit a response to this PMC, Economic Operators must register through www.etenders.gov.mt.

This Request for Proposals may be found through typing the PMC reference number; MEYR/1037/2024 in the 'Search' tab.

Important: Economic Operators should contact the Contracting Authority if they are unable to register correctly, or if they experience difficulty in uploading/downloading documents from the ePPS.

Economic Operators may upload a single electronic file or if uploading multiple electronic files, they may upload one zipped folder containing those files. Current upload file size limit is 100MB. If the submission was submitted properly, an Economic Operator will receive an automated acknowledgement that the proposal has been successfully uploaded.

Section C

1) Description of the Contracting Authority and Background information

This initiative is being spearheaded by the Ministry for Education, Sport, Youth, Research and Innovation, a key governmental body dedicated to shaping Malta's future through robust education systems, the promotion of active lifestyles, youth empowerment, and fostering research and innovation. The Ministry plays a central role in advancing national priorities while embracing modern tools and methodologies to enhance learning and communication.

2) General objectives and strategic planning of the Contracting Authority relating to this Preliminary Market Consultation (PMC)

As part of its mission to uphold and promote the Maltese language as a vital component of Malta's heritage, the Ministry is seeking the Development and Continuous Maintenance & Support of a Tool to assist eLearning through a Digital Bilingual Dictionary, Maltese Language Corpus, Spellchecker, Grammar and Syntax Checker, and Bilingual Translator. This initiative aims to provide users with reliable tools to write accurately and effectively in Maltese. The solution will contribute to the continued evolution, research, and standardization of the Maltese language in the digital age.

Section D

Details of information being requested

1) General Economic Operator Information

The Contracting Authority is asking interested Economic Operators to submit a response containing, at a minimum, the following information related to their firm:

1. Description of the reason for their interest in possibly providing the requested services.
2. Brief history of your firm.
3. Brief description of experience providing similar services/supplies.

2) Specific Project Overview

The solution being sought must include the following components and functionality:

- I. A Digital Bilingual (Maltese/English) Dictionary,
- II. A Maltese Language Corpus,
- III. A Spell Checker for the Maltese Language,
- IV. A Grammar and Syntax Checker for the Maltese Language, and
- V. A Bilingual (Maltese/English) Translator

Information of each can be found hereunder.

I. A Digital Bilingual (Maltese/English) Dictionary

The dictionary, in the context of language processing and tools like spell checkers, must be a structured database of words in both Maltese to English and English to Maltese, where English is used solely for searching for English words to find their Maltese counterparts. It should include the associated properties of Maltese words, such as meaning, part of speech, pronunciation, and grammatical attributes. Unlike a traditional print dictionary, the digital dictionary must be designed for machine readability, efficient lookups, and computational linguistics.

For a Maltese-English and English-Maltese dictionary, special attention must be given to:

- The Semitic roots of Maltese and how they interact with Romance and other language influences.
- Loanwords from Italian, English, and Arabic in both directions.
- Complex morphology including inflected forms, pluralization, clitics, and other aspects in Maltese.
- The dictionary should support reverse translation, allowing users to search Maltese to English and English to Maltese, with English searches limited to finding Maltese counterparts.

The Maltese dictionary must serve as the foundation for multiple linguistic tools, including spell checkers, syntax checkers, and grammar tools.

Technical Requirements for the Digital Bilingual (Maltese/English) Dictionary

1. Word List:

- The solution must provide a comprehensive list of Maltese words in all their forms and their English equivalents, including:
 - Base forms (lemmas), such as *kitba* (writing) and *kuntest* (context).
 - Inflected forms, such as *kitbu* (they wrote) and *kitbiet* (writings), and their corresponding English translations.
 - Loanwords and foreign phrases frequently used in Maltese.
- The solution must include specialized vocabulary from technical, scientific, and colloquial domains, with appropriate translations into English.

2. Morphological Information:

- The solution must include detailed information about each word's morphology, including:
 - Root words, such as *kiteb* (write) for *kitba* (writing), with English equivalents where applicable.
 - Prefixes and suffixes, such as in *preżent* → *preżentazzjoni* (presentation).

- Clitics and contractions, such as għandek (you have) in Maltese, which combines għand (have) with the clitic -ek (you).

3. Part-of-Speech Tags (POS):

- The solution must include part-of-speech information for each word entry, specifying whether it is a noun, verb, adjective, etc., in Maltese.
- The solution must provide additional details for nouns, including gender (masculine, feminine) and number (singular, plural).

4. Orthographic Variants:

- The solution must account for alternate spellings, regional variations, or older forms of words in Maltese, and how they correspond to English counterparts.

5. Hierarchical Word Relationships:

- The solution must establish relationships between words, including:
 - Synonyms, such as kuntest (context) and sfond (background) in Maltese.
 - Antonyms, such as kbir (big) versus żgħir (small) in Maltese.
 - Hypernyms and hyponyms, such as għasfur (bird) as a hypernym of pitirross (robin) in Maltese.
- The solution must enable these relationships to support tasks such as semantic search or language teaching tools.

6. Search Functionality:

- The solution must include the ability to search for English words to retrieve their Maltese counterparts.
- The solution must also include the ability to search for Maltese words to retrieve their English counterparts.
- No detailed grammatical or morphological analysis is required for English words, as the focus is solely on enabling lookup for Maltese translations. For Maltese words, however, the search must support retrieving detailed grammatical and morphological information along with the English translation.

II. A Maltese Language Corpus

The corpus must be a structured collection of text or spoken language data that represents how a language is used in real-world contexts. It must serve as the foundation for linguistic analysis and computational applications. In the context of Maltese, the corpus must provide the raw material for developing language tools such as spell checkers, grammar and syntax checkers, and dictionaries. It must enable the study of linguistic patterns, word frequencies, and syntactic structures, while also reflecting the hybrid nature of the Maltese Language, incorporating elements from Semitic, Romance, and English origins.

Technical Requirements for a Maltese Language Corpus

1. Data Collection

- Responsibility for Data Collection: The supplier must independently handle the identification, acquisition, and collection of corpus sources. The Contracting Authority (CA) will neither provide data sources nor allocate resources for this collection.
- Source Diversity: The solution must gather text from diverse sources, including but not limited to the categories listed below. Social media must not be included as a source.
 - Academic documents (thesis and papers)
 - Biographies
 - Culture, art and folklore
 - Education including policies and strategies
 - Encyclopaedia and reference books
 - Environment, agriculture, fishing and articles about nature
 - European Laws and laws of Malta
 - Fiction, i.e. novels, short stories, poems, plays etc. (Maltese literature)
 - Food and nutrition including recipes
 - Health and medicine
 - History of Malta, Europe and the world
 - Newspapers and magazines including opinion blogs
 - Parliamentary debates
 - Religious writings
 - Science and technology including IT, AI etc.
 - Sports
 - Tourism and travelling

The solution must record and transcribe spoken language to capture formal, informal, and dialectal variations.

1. Annotation and Labelling Tools

- The solution must provide tools for Part of Speech (POS) tagging to assign grammatical categories (e.g., noun, verb, adjective) to each word, accommodating Maltese's unique morphological and syntactic properties.
- The solution must support Named Entity Recognition (NER) to identify and label proper nouns, locations, dates, and other entities in the text.
- The solution must enable morphological and lemma annotation, capturing details such as tense, gender, and case, while lemmatizing words to their root forms (e.g., kittieba → kiteb).
- The solution must use syntactic parsing to identify relationships between words (e.g., subject, verb, object).

- The solution must add semantic annotations to provide contextual meanings for words and phrases.
2. Corpus Size and Balance
- Corpus Size: The Corpus size must ensure robust linguistic coverage, meaning it should be large enough to capture the diversity and complexity of the target language, including variations in vocabulary, syntax, and usage patterns across different contexts.
 - Corpus Balance: The solution must ensure balance by including a proportional mix of text sources across Genres:
 - For example written (e.g., books) vs. spoken (e.g., transcriptions of conversations).
 - Time Periods: For example, historical texts (e.g., 18th-century literature) vs. contemporary materials (e.g., modern news articles).
 - To achieve representational accuracy, the solution must conduct frequency checks to include both common word usages (frequently used words and phrases) and rare word usages (specialized or less common terms).
3. Digitization and Processing
- The solution must implement tokenization and segmentation to break text into tokens (words or sentences), structuring data for analysis and handling unique Maltese linguistic features.
 - The solution must standardize and normalize data by converting text to lowercase, removing punctuation, and handling contractions, ensuring uniformity for NLP models.
 - The solution must perform lemmatization and stemming to reduce words to base forms and minimize variations caused by complex morphology.
 - The solution must remove noise, such as irrelevant data, foreign language sections, HTML tags, or special characters, to maintain high-quality linguistic data.
4. Corpus Storage and Database Management
- The solution must offer organized data access through a well-structured storage system, allowing users to navigate the corpus easily.
 - The solution must support scalability to handle growth in corpus size while maintaining efficient data storage and retrieval.
 - The solution must enable efficient querying capabilities, allowing users to perform advanced searches based on linguistic features (e.g., all sentences containing a specific verb or phrases from a particular genre).

- **API Connectivity:** The solution must provide API connectivity to allow external systems and applications to interact with the corpus. The API must be designed for secure and efficient access to the corpus data.
- **Authentication Mechanism:** The API must include a robust authentication mechanism, such as OAuth, API keys, or similar methods, to ensure secure and authorized access to the corpus.

III. A Spell Checker for the Maltese Language

The spell checker tool must be designed to identify and correct spelling errors in each text. It must work by comparing words in the input text against a dictionary of correctly spelled words. The spell checker must be able to be used in word processors, web browsers, email clients, and other text-editing software to help users avoid or correct misspelled words.

In the case of the Maltese language, which has unique orthographic rules and includes loanwords from other languages like Italian and English, the spell checker must account for these language-specific characteristics. This must include the rules set out in the following two Decisions, and any other decisions published in the future:

<https://kunsilltalmalti.gov.mt/decizjonijiet-1/>

<https://kunsilltalmalti.gov.mt/decizjonijiet-2/>

Technical Requirements for a Spell Checker for the Maltese Language

1. Dictionary/Word List

- The solution must provide a comprehensive Maltese dictionary that includes all correctly spelled words, including variations such as plural forms and conjugations.
- The solution must include loanwords from Italian, English, Arabic, and other languages to accurately handle foreign terms commonly used in Maltese.
- The solution must support morphological variations to account for how words change in Maltese, such as plural forms and verb conjugations.

2. Morphological Analysis

- The solution must implement a morphological analyser to decompose words into their base forms (lemmas), enabling the spell checker to recognize and process derived words like conjugated verbs, plural nouns, and compound words.
- The solution must incorporate knowledge of Maltese morphology to process prefixes, suffixes, and inflections effectively.
- The solution must utilize tools for morphological analysis, which may include:
 - Morphological analysers developed for related Semitic or Romance languages.

- Custom-built Maltese morphological parsers, potentially created by linguists with expertise in Maltese grammar.

3. Language Rules

- The solution must implement grammar-based rules to recognize typical spelling patterns in Maltese, such as handling double consonants, vowel combinations, and stressed syllables.
- The solution must incorporate Maltese's unique orthographic features, including the handling of the apostrophe (') used in contractions and compound words.
- The solution must cater for inflection rules detailing conjugations for verbs, pluralization of nouns, or diminutive formations.

4. Contextual Analysis

- The solution must go beyond individual word checking and analyse word context to identify errors that may not be detected by a simple dictionary lookup.
- The solution must perform context-based spelling correction to identify homophones or similarly spelled words used incorrectly in each sentence.

5. User Interface Integration

- The solution must integrate with software applications such as word processors or web browsers, enabling users to use the spell checker seamlessly.
- The solution must support developing plugins or APIs for common text editing platforms like Microsoft Word, Google Docs, or browser-based applications.

6. Error Detection and Suggestions

- The solution must identify misspelled words and suggest correct alternatives by matching the incorrect word with similar correctly spelled words from the dictionary.
- The solution must rank these alternatives by relevance, utilizing algorithms such as Levenshtein distance or other similarity measures.

7. Performance and Scalability

- The solution must be optimized for fast processing to handle long texts without significant delays, ensuring efficient dictionary lookups, contextual analysis, and error suggestion algorithms.
- The solution must be scalable to accommodate use in larger software systems, ensuring performance even with high user demand.

8. Key Performance Metrics

- The solution must achieve an accuracy rate of at least 95% for identifying and correcting misspelled words in texts of varying complexity.

IV. A Grammar and Syntax Checker for the Maltese Language

The grammar and syntax checker tool must be designed to identify and correct errors related to the structure, rules, and composition of sentences in a language. Unlike the spell checker, which focuses on individual words, the grammar and syntax checker must be able to analyse sentences and larger text structures to ensure linguistic accuracy.

For Maltese, the grammar and syntax checker must handle:

- Complex morphosyntactic rules, such as agreement between subject and verb, or noun and adjective.
- Unique Semitic root-based patterns combined with Romance-style syntax.

Technical Requirements for the Grammar and Syntax Checker for the Maltese Language

1. Error Detection

- Subject-Verb Agreement
 - The solution must ensure that the subject and verb match in gender, number, and person. Example:
 - Incorrect: Il-bniet jikteb (The girls writes).
 - Correct: Il-bniet jiktbu (The girls write).
- Noun-Adjective Agreement
 - The solution must check that adjectives match the nouns they modify in gender and number. Example:
 - Incorrect: Ktieb sabiħa (Nice book).
 - Correct: Ktieb sabiħ (Nice book).
- Prepositions and Clitics
 - The solution must identify issues with prepositions and attached pronouns. Example:
 - Correct usage of għandhom (they have) vs. għandek (you have).

2. Contextual Corrections

- The solution must address errors based on the context of the sentence, not just isolated grammar rules. Example:
 - Incorrect: Nara inti għada. (I see you tomorrow.)

- Correct: Narak għada. (I'll see you tomorrow — correct conjugation and phrasing).

3. Syntax Analysis

- The solution must ensure proper sentence structure, avoiding errors like missing verbs or misplaced modifiers.
- The solution must detect awkward word order or constructions, especially in longer sentences.
- The solution must ensure the correct usage of verb tense, aspect and subject agreement.

4. Suggestions for Corrections

- The solution must offer suggestions for fixing errors, including explanations where possible to aid language learners.

5. Performance and Scalability

- The solution must correctly identify and suggest corrections for at least 90% of grammatical and syntactical errors, based on benchmark tests with annotated Maltese texts.

Grammar rules in a grammar and syntax checker must be implemented using a combination of formal rule-based systems and data-driven approaches. Rule-based systems must explicitly encode grammatical rules, such as subject-verb agreement, tense consistency, and syntactic structures, using algorithms or finite-state automata. Rule-based systems must explicitly encode Maltese-specific rules, such as subject-verb agreement in gender, number, and person (il-bniet jiktbu – the girls write), and noun-adjective agreement (kelb kbir – big dog, masculine singular).

Syntax must be analysed through tools like dependency parsers, which must map relationships between words (e.g., identifying subjects, objects, and modifiers) to detect structural errors. For more nuanced corrections, statistical and machine learning models, such as neural networks must be used and trained on annotated corpora to learn patterns of correct grammar and syntax. These models will enable the checker to handle complex or ambiguous constructions, recognize context-dependent errors, and provide intelligent suggestions. Hybrid systems often combine these approaches, with rules handling predictable errors and machine learning models addressing variability and edge cases.

V. A Bilingual (Maltese/English) Translator

The bilingual translator must facilitate accurate and natural translation between Maltese and English in both directions. The solution must handle a wide range of linguistic and contextual variations, reflecting the hybrid nature of the Maltese language, which incorporates Semitic, Romance, and English influences. It must also provide robust support for formal, informal, and dialectal expressions, enabling use in diverse applications such as education, professional communication, and casual exchanges.

The translator must integrate state-of-the-art natural language processing (NLP) techniques to ensure high-quality translations, with features such as context-aware translations, idiomatic expressions handling, and cultural nuances.

Technical Requirements for the Bilingual (Maltese/English) Translator

1. Translation Quality

- Contextual Understanding: The solution must account for the context of sentences to produce translations that are not only literal but also semantically accurate. Example:
 - Maltese: *Ħassha ħazin*
 - English: *She fainted*
- Idiomatic Expressions: The solution must correctly handle idiomatic phrases, ensuring that their meaning is preserved during translation.
 - Maltese: *Il-għajn thares lejn il-baħar, imma s-saqajn jinsabu fl-art*
 - English: *Having one foot in both worlds*
- Politeness Levels: The solution must respect formal and informal language distinctions, providing appropriate translations for both contexts.

2. Morphological and Syntactic Accuracy

- Morphology: The solution must handle Maltese morphology, including clitics, inflections, and pluralizations, ensuring translations maintain grammatical integrity.
- Syntax: The solution must preserve proper word order and syntactic structures, particularly when translating complex sentences.

3. Machine Translation Models

- Training on Maltese-Specific Data: The translator must utilize a corpus tailored to the Maltese language to train machine translation models effectively.
- Hybrid Approach: The solution must combine rule-based translation systems for structured grammatical rules with data-driven approaches for nuanced and context-dependent translations.
- Neural Networks: The solution must leverage neural machine translation (NMT) models to improve fluency and coherence in translations.

4. Domain Adaptability

- The translator must support translations across a variety of domains, including but not limited to:
 - Legal and administrative documents
 - Academic and technical texts

- Everyday conversation and informal communication

5. User Interaction and Customization

- Interactive Suggestions: The solution must allow users to choose between multiple translation options for ambiguous phrases, enhancing usability.
- Customization: The translator must support the addition of custom terminologies and phrases, enabling users to adapt the tool for specific industries or contexts.

6. Speech-to-Text and Text-to-Speech Integration

- The solution must support real-time speech-to-text and text-to-speech capabilities for spoken translations. This feature must accommodate formal, informal, and dialectal variations in Maltese.

7. Integration with Other Components

- The translator must seamlessly integrate with the Maltese Language Corpus and Digital Bilingual Dictionary to improve accuracy and consistency in translations.
- Grammar and Syntax Checker: The solution must incorporate grammar checking functionalities to refine translations before output.

8. Performance and Scalability

- Real-Time Translation: The solution must be optimized for real-time or near-real-time translation without compromising quality.
- Scalability: The system must handle high volumes of translation requests, ensuring reliability under heavy usage.

9. API and Developer Support

- API Connectivity: The solution must provide APIs for external systems to leverage its translation capabilities.
- Authentication and Security: The API must incorporate robust authentication mechanisms to ensure secure access, such as OAuth or API keys.
- Integration with Third-Party Tools: The solution must support plugins for popular applications like Microsoft Word, web browsers, and messaging platforms.

10. Evaluation and Continuous Improvement

- User Feedback Loop: The translator must provide a mechanism for users to report errors or suggest improvements, ensuring continuous refinement of the system.

11. Performance and Scalability

- The translator must achieve a minimum BLEU score of 50 for general texts and higher for domain-specific translations.
- Response times for real-time translation must not exceed 1 second for texts of up to 500 words.

By combining linguistic accuracy, domain adaptability, and seamless integration with other tools, the bilingual translator must serve as a cornerstone for advancing the accessibility and usability of the Maltese language in digital and global contexts.

Section E

Additional Information

- i. **Future Updates** - Updates to linguistic rules and dictionaries must be incorporated efficiently through automated mechanisms or manual configurations. A version control system must be in place to track updates and facilitate rollbacks if necessary. Updates must first be tested in the staging environment to ensure stability.
- ii. **Consultation with recognised bodies** - Whilst building the various components of the solution the Economic Operator must continuously consult with the following bodies to ensure that the various components of the system are built and continuously updated to adhere to the rules and standards issued by them. All costs associated with such consultation must be borne by the Economic Operator.
 - The National Council for the Maltese Language: This body is tasked with overseeing and promoting the Maltese language. It is responsible for standardizing the language's spelling, grammar, and vocabulary. The Council works on matters like ensuring the correct use of the language in public and educational spheres.
 - The Department of Maltese Language: Part of the University of Malta, this department is a key academic and research body focused on the Maltese language. It is involved in linguistic studies, research, and the development of language resources and teaching materials.
 - The Institute of Maltese Linguistics: Part of the University of Malta, this institute plays a role in the study and research of Maltese linguistics and language policy.
- iii. **Accessibility** - The solution must be accessible both online and offline. The latter will facilitate the deployment of the Spellchecker and Grammar and Syntax checker into word processors.
- iv. **Intellectual Property Rights** - The Contracting Authority shall retain full ownership of all Intellectual Property Rights (IPR) of all components of the solution developed under this contract, including any related materials, data, software, or documentation produced during its creation.

An eventual Economic Operator must acknowledge that all work carried out, deliverables provided, and outputs resulting from this project shall be the exclusive

property of the Contracting Authority. The contractor shall have no claim over the intellectual property of the solution, either during or after the contract period.

All source code, linguistic resources, compiled dictionaries, and any other components of the solution must be delivered to the Contracting Authority in their entirety upon completion or termination of the contract.

- v. **Access Control and Authentication** - The solution must include robust authentication mechanisms to ensure that access is restricted to authorized users only. This must include:
- **API Security:** Any Application Programming Interfaces (APIs) exposing the data, functionalities, or services of the solution must be secured. APIs shall not be publicly accessible and must require authentication credentials to access. The design should prevent unauthorized access and include measures such as rate limiting, token-based access, and encryption to safeguard data and functionality.
 - **Role-Based Access Control (RBAC):** The system should provide configurable role-based access control to define and enforce different levels of access permissions for users, ensuring compliance with the Contracting Authority's requirements.
 - **Audit and Monitoring:** The solution must include logging and monitoring features to track access and usage of the system and APIs, providing the Contracting Authority with oversight of authentication and data usage activities.
- vi. **Live and Staging Instance** - The solution must include both a staging instance and a live instance. The staging instance shall be used exclusively for testing, quality assurance, and verification purposes before any updates, changes, or new features are deployed to the live instance. This ensures that all modifications are thoroughly tested in a controlled environment to minimize risks and ensure the stability and reliability of the live system. The live instance will be the operational version, accessible by authorized users defined by the Contracting Authority.
- vii. **Response Times** - All components must process inputs and return results within 1 second for texts of up to 500 words to ensure usability.

3) Questions

From their experience the Contracting Authority requires Economic Operators to answer the following questions in their response to this PMC:

1. Do you think that the Contracting Authority has managed to identify all the major components necessary to achieve the requested functionality? If not, please provide information on any other required components and indicate interdependencies between such components.
2. Kindly identify any limitations that could impede any of the components/functionality from being achieved.
3. Kindly indicate any risks that you think could be encountered during the implementation and ongoing maintenance and support of this project and provide potential mitigations.

4. What would an estimated timeframe for completing the project be? Kindly provide a distinct estimated timeframe for the completion of each component.
5. Kindly provide a cost-estimate for each requested component, including lowest estimate to highest estimate?

4) Response Format

Responses are to be straightforward, clear, concise and specific to the information requested. In order for submissions to be considered complete, Economic Operators must provide all the requested information mentioned in this document as well as any other comments, observations or suggestions which potentially may assist the Contracting Authority in the Preliminary Market Consultation stage.