भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

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Request for Proposal for Implementation of Web based ERP System

Volume II – Technical and Functional Requirements and Solution Scope

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Chapter-1: Introduction

The objective of this tender document is to solicit ERP proposals from the prospective bidders for providing a web based end-to-end ERP system at IIT Hyderabad.

1.**1** Request for Proposal (RFP) Structure

Contents of this RFP have been documented as a set of two volumes explained below.

Volume I: Bidding Instructions and General Terms & Conditions

Volume I of RFP intends to mention all the information that may be required by the potential bidders to understand the evaluation criteria, commercial terms, bid process details, etc. to thereby participate in the bid process for implementation of ERP and Web based ERP-like solutions at IITH.

Volume II: Technical and Functional Requirements, and Solution Scope

Volume II of RFP intends to highlight all the details with respect to functional and technical requirements of the ERP solution along with the necessary scope of work for implementing the solution that IITH deems necessary to share with the potential bidders. This volume has Appendix A which is a separate document.

This document is Volume II.

Chapter-2: IITH Organization Structure and Functions

2.1 Organization Structure

IIT Hyderabad is a premier technical education institute under the aegis of the Ministry of Education (MoE), Government of India. The governing council of the institute comprises the Board of Governors (BoG) that is chaired by an eminent person nominated by the Visitor (the President of India) of the institute. The other members of the BoG are the Director of the institute as ex-officio, one eminent person nominated by the Government from the state of Telangana, four persons having special knowledge or practical experience in respect of education,

engineering or science and two professors of the institute to be nominated by the Senate. The Registrar of the institute is the secretary to the BoG.

Director is the Principal Academic and Executive Officer of the Institute. The Director shall be responsible for the proper administration of the Institute and for the imparting of the instruction and maintenance of discipline therein. The Director has the power to incur expenditure in accordance with the procedure as may be laid by the Board/Ministry of Education from time to time. The Deans shall assist the Director in academic and administrative work and maintaining liaison with the Institution of higher learning and research. The Registrar shall exercise powers and perform duties as may be assigned to him by the Act or the statutes or as assigned by the Director.

The Senate is the custodian of all academic affairs of the Institute. It is empowered to sanction academic programs and courses, approve their contents and any changes thereof, and oversee their conduct. The Senate comprises of all the Professors of the institute, Heads of Departments and some other invited academic members and distinguished persons from the industry, Research & Development, Financial Institutions and any other comparable organizations. The Director is the Chairperson and the Registrar is the secretary of the Senate, respectively.

The key people in the execution of the Institute's activities are the Director who is assisted by Dean Academic, Dean R&D, Dean Faculty, Dean Students, Dean Planning, Dean Administration, Dean Public & Corporate Relations, Dean International Affairs and Alumni, Heads of Departments and Chairpersons of Centers.

IIT Hyderabad has the following supporting sections and offices which take care of the various academic and administrative activities of the institute.

- Academic Section
- Management Services Section
- Human Resources Section
- R&D Section
- Finance & Accounts Section
- Stores & Purchase Section
- Coordination Section
- Internal Audit Section
- Students/Hostels Section
- Construction & Maintenance Division (CMD)
- International & Alumni Affairs Office
- Public & Corporate Affairs Office
- Security Office

More detailed mapping of the organizational structure will be provided during the implementation phase of the ERP project.

2.2 Functional Structure

Academic Section

The Academic Office of the Institute exists to facilitate, initiate and co-ordinate the academic work of the Institute, particularly the teaching and assessment of students. It acts as the repository of grades and academic records of all students, both past and present. It provides administrative support to the Senate, which is the highest academic body of the Institute. The Head of the Academic Section is the Dean of Academic Programmes, who is a senior professor of the Institute. The Dean is helped by a permanent administrative set-up headed by a Deputy Registrar (Academic). The Academic Office closely interacts with the Dean (Students), who looks after all non-academic issues of students.

Academics

IIT Hyderabad offers a wide variety of courses of study in engineering, pure sciences, design and liberal arts with a primary focus on engineering. The Institute conducts educational programmes leading to the degree of Bachelor of Technology (BTech), Bachelor of Design (B Des), Master of Science (MSc), Master of Technology (MTech), Master of Design (MDes), Master in Arts (MA), and Doctor of Philosophy (PhD). We also offer dual degree programs for students to convert from B tech to M Tech (5 years program) and M Tech to Phd (5 years program). For more information, please visit Course of Study booklets of UG, PG and PhD at the following links:

1. https://iith.ac.in/academics/assets/files/pdf/20200227-Courses-of-Study-Bachelors.pdf
2. https://iith.ac.in/academics/assets/files/pdf/20200227-Courses-of-Study-Masters-PhD.pdf

A brief on legacy Academics Information Management System (AIMS) Portal:
AIMS <https://aims.iith.ac.in/aims/> was deployed in August 2013 at IIT Hyderabad. However, some data (not for all the modules) from 2010 had also been migrated to the AIMS system. Presently AIMS allows for updation and entry of data pertaining to the following major modules: Student management (mostly for UG and partial for PG and PhD, course work management (types and number of courses), course registrations (courses, guides etc.) management, Grade management, Feedback management, Scholarship management, Academic masters, Fellowship management, Registration for degrees (Specific degrees such as double major, minor, honors, double degree etc.), Room booking System, Slot booking for high-end research equipment, Reporting module, PG and PhD Admissions modules. Within each of these main modules, there are sub-modules with more specific parameters and requirements.

Any other information on the existing academic activities can also be shared with the bidders on request.

Departments, centers, sections, and incubators

IIT Hyderabad has departments, centers & incubators and offers multi-disciplinary programs

List of departments at IIT Hyderabad are:

- Artificial Intelligence
- Biomedical Engineering
- Biotechnology
- Chemical Engineering
- Chemistry
- Civil Engineering
- Climate Change
- Computer Science and Engineering
- Design
- Electrical Engineering
- Engineering Science
- Entrepreneurship and management
- Liberal Arts
- Materials Science and Metallurgical Engineering
- Mathematics
- Mechanical and Aerospace Engineering
- Physics

List of Centres and Incubators at IIT Hyderabad are

- Center for Healthcare Entrepreneurship
- Center for Interdisciplinary Programme
- Design Innovation Center
- Fabless Chip Design Incubator
- i -TIC foundation
- Research Park
- Rural Development Center (RDC)
- Teaching Learning Center (TLC)
- Center for Continued Education (CCE)
- DST NM-ICPS Technology Innovation Hub on Autonomous Navigation (TiHAN)

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Chapter-3: Proposed ERP System

The complex institute environment at IITH necessitates standardized process flows, real-time reporting, project monitoring and status updates, project planning and execution, maintaining student life cycle, stored and purchases, inventory management, finance and accounting management, HR, funds management, etc which IITH would like to implement as part of a web based end-to-end ERP system to meet its requirements.

3.1 Objectives and Benefits

IITH envisages the following benefits from the proposed ERP system.

- Common integrated system platform across different functions and processes of IITH
- Process standardization across the institute to bring-in unified approach
- Monitor research activities and funds utilization
- Monitoring and governance of the procurement processes
- Mapping of assets and their life cycles
- Analysis of budget and actual data
- A scalable ERP solution that accommodates the expected growth plan
- Data integrity across various IITH functions like departments, centers, administrative units, finance and accounts, etc.
- Facilitate paperless working and provide decision support mechanism
- Automate management controls and approvals to reduce cycle time
- Seamless integration of student information across the institute
- Real-time reporting on the performance of the individual operating departments and a streamlined Management Information System.

3.2 Strategic Considerations

The strategic considerations for the proposed ERP system at IITH are as follows:

Future expansion – The ERP system will be used for automating all the functions of IITH and is required to meet future expansions in terms of programmes, departments, centers, scale of student intake capacity, etc.

Integration – To utilize the current and future investments in the stand-alone IT applications, IITH intends to integrate them with the proposed ERP solution. To ensure this, one of the key elements of the solution strategy is to ensure having solutions with open standards for integration of different third party / legacy / in-house developed applications / solutions.

Proven Solution – Processes of IITH are moderately unique in the areas of finance, human resource, payroll, project management, academics, etc. as compared to general institute practices, but similar in some areas to the ones in public sector / government sectors in India. Keeping this uniqueness and maturity of the processes in mind, IITH will use ERP solutions which have been implemented successfully in the leading higher education institutes in India.

3.3 Implementation Methodology

The methodology to be used by the bidder to implement the ERP solution will have different work elements and activities. All these activities and work elements should coherently focus on achieving the following key results.

I. Quality of the solution deployed
II. User satisfaction while deploying and usage
III. Successful implementation in terms of completeness and timely accomplishment of the outcome

While there are different techniques and tools available as a part of the methodology, followings are expected to be part of the implementation methodology to be adopted by the bidder.

- Workshops with different stakeholders for capturing detailed functional requirements, creating awareness of best practices, communicating the changes, building consensus on process (aka workflow) design, for signing off the deliverables, etc. These need to be organized at different intervals and in different places throughout the duration of the project as demanded by the context.
- Stakeholder consultations other than workshops, with those stakeholders who will be identified by IITH, for the purpose of critical inputs, review, suggestions, process description, etc.
- Review sessions with different stakeholders for signing off the deliverables, walking through the deliverables for facilitating quick understanding, etc.
- Internal review mechanisms of bidder for ensuring the quality of the solution and the deliverables.
- An integrated bug tracking module for the end users to submit any bugs found while using the ERP system
- Adoption of the review comments - effective mechanisms to adopt the changes suggested and fix the bugs reported.
- Documentation of proceedings – recording the developments, discussions, deliverables, using standard methodology and native tools available with the ERP solution.
- Work standards / practices for documentation, configuration, testing, data migration, etc.
- Training different stakeholders on a continuous basis and providing Help manuals for the end users

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Chapter-4: Scope of Work

Following are the key technical and functional requirements for the proposed ERP system of IITH. For details on each functional module of IITH, refer to **ANNEXURE A: BROAD FUNCTIONAL REQUIREMENTS SPECIFICATIONS (FRS) for the proposed ERP system (A SEPARATE DOCUMENT).**

4.1 General Scope

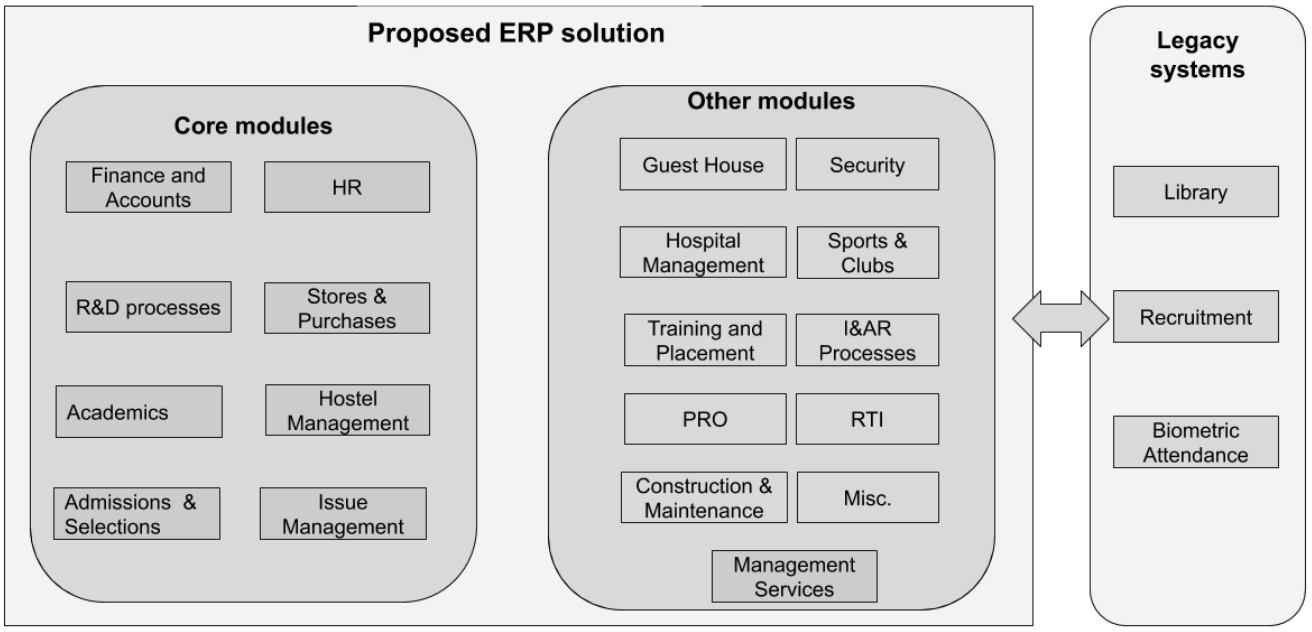
Following are the general features required in the proposed web based end-to-end ERP solution of IIT Hyderabad.

- Web-based ERP application should be hosted in the in-house datacenter of IITH
- Secure web-based access using https
- Supporting biometric, internet banking, and smart card inputs
- Interfacing with third-party payment gateways
- Capability for continuous improvement and upgradation
- Configurability through web-interface and client interface
- Provision for decision support mechanism
- Facilitate paperless working
- Workflow based process approval and archival mechanism
- Digital signatures for selected high level functionaries
- Comprehensive data and application security features
- Adequate security provisions for preventing tampering of the software as well as data
- Archival of information and data
- Audit logs of user sessions
- Provision to define and view rules and regulations of the Institute as per applicable GoI / IITH norms
- Provision for role based access rights
- Provision of interactive validations of data entries
- Provision for data item based access rights
- Provision for reports generation as per requirements

4.2 Functional Scope

IITH has decided to go in for a phased approach to implement the ERP solution across the functional areas listed below. IITH would like the implementing agency to first automate the core back bone processes and functions as listed under Core Modules in Figure 1. The solution will then be extended to include Other Modules in Figure 1 in a phased manner as per the project schedule given in this RFP. The integration, data migration and interfacing needs between existing/legacy applications of IITH, 3rd party applications and the proposed ERP system needs to be considered by the bidder as part of their proposed approach and methodology for ERP enablement.

Figure 1: Indicative list of the core and other modules in the proposed ERP solution.



4.3 Number of Users

Number of regular users (i.e., students, faculty and staff) accessing the ERP portal: 4000 users in 2021. It will be approximately 8000 users by 2025. The proposed system should scale well even for 15000 regular users without requiring any architectural changes. Further, the system should handle 50000 one-time users (Master and PhD applicants) submitting online applications at the time of admissions (twice in a year).

4.4 Technical Requirements and Scope

The non-functional (technical) requirements for the proposed ERP solution are listed below.

4.4.1 Modular Design

The proposed ERP solution should keep the following points in mind for the software architecture of the solution.

A. The proposed solution should be modular in nature. The coupling between different modules should be loose and it should be possible to deploy different modules in different VMs/containers/machines which may be hosted in different physical servers or even be on different networks.
B. Modules should use standard data-exchange protocols such as REST API to communicate between two modules. In addition, various information for which the corresponding module is responsible should be exposed via **authenticated** APIs. These APIs should be rich enough to allow IIT Hyderabad to develop further modules and webapps which may consume information from multiple modules.
C. Every module should be designed in a multi-tiered approach where the rendering of data, application logic, and the code that accesses the database are decoupled from each other. For example, 3-tier architecture and Model-View-Controller (MVC) based architecture follows this design principle.
D. Modules should communicate using standard data-exchange formats such as JSON or XML over a **secure** communication protocol. There should be an option to export various information catered by the module in such standard data-exchange formats.
E. Modules should be scalable. Modules that cater to academic registration, recruitment or admission are likely to encounter heavy traffic in bursts during certain duration. The solution should ensure that the modules have auto scaling feature to cater to surge in traffic while still ensuring fast response times. One such technology that enables such autoscaling is the Kubernetes cluster. Similar free/open source technologies may be used to provide scalability.

4.4.2 Authentication, Authorization and Access Control

A. The proposed solution should have Single Sign On (SSO) facility, with a provision for Two Factor Authentication (2FA), so that the user need not separately login to every module independently. The solution should use Free/Open Source frameworks (e.g., OAuth) to provide SSO functionality.
B. Any communication between the user and the central authentication server must be over a secure communication channel.
C. The proposed solution should allow various modes of authentication such as password based authentication, certificate/key based authentication, etc.

D. A role-based access control (RBAC) has to be set up with the right roles and responsibilities identified and outlined.
E. The proposed solution should follow Unix philosophy for access control. Only a minimal set of privileges should be given to a minimal set of information resources/data to a given user to enable the user to perform the task required as per his/her role.
F. Audit logs must be available for all authentication, authorization and resource access requests. For example metadata like date, time, IP address, user name, how accessed (browser/app), what data was accessed, what data was modified (if any) etc. information should be captured in the audit logs. This is to help tracing against user ID or activity or field level.

4.4.3 Backup and Disaster recovery

A. The bidder must provide a detailed backup strategy plan, Disaster recovery plan, storage recovery plan that ensure minimal downtime of the ERP system while keeping the cost to be minimal.
B. The proposed solution must ensure a high degree of automation of incremental backup, full backup, data recovery, health monitoring of various services, etc. All necessary scripts, code, triggers, training and documentation must be provided with respect to health monitoring, backup and disaster recovery**.**
C. High Availability
    a. The ERP system should be deployed with high availability to ensure zero to negligible downtime in the event of failure of the underlying VM/server.

4.4.4 Frontend Design

A. The user interface (UI) must follow principles of responsive design. The UI for all modules must ensure that the rendering of any pages/forms are aesthetically pleasing as well as ensures better user experience by accommodating flexible designs that can cater to devices of all form factors (laptop/desktop/tablet/mobile). For example, Bootstrap is a frontend design framework that enables responsive design. Similar technology may be used to ensure pleasant user experience across all the user facing interfaces.
B. All user interfaces must ensure compatibility across most of the popular browsers (Google Chrome/Firefox/Opera/Safari/Chromium/Edge/Internet Explorer) for at the least last 3 of their versions.
C. Input data validation/sanitization should be done both at the front end as well as at the back end to ensure security and safety.
D. User interface design along with the back end sanitization should ensure that attacks such as SQL injection, cross site scripting, buffer overflow and any other similar attacks are ineffective against the proposed ERP solution.

4.4.5 General Application/Solution Requirements

A. The solution should support e-mail and AD/LDAP integration.
B. The solution should support the upload and download of multiple types of documents into the Document Management System that include office documents, image files and engineering drawings.
C. Archiving - system should provide a data archival utility to search the archived data to create reports.
D. All functionalities like data entry screens, various reports, batch processing, integration, etc. should use a common unified application platform suite to provide ease of management to avoid compatibility issues.

4.4.6 System Administration and Maintenance

Bidders are required to undertake the following:

A. Formulation of all policies and procedures related to system administration, database management, applications, archives, network management and security, back up, etc.
B. Prepare requisite system landscape and procedures for smoothly implementing the ERP system.
C. Bidder shall assist the IITH team to perform all authorization-related activities (activity group, authorizations, profiles, etc.) till the ERP system stabilizes.
D. Prepare a detailed system administration manual, data administration manual, operational manual and user manual, which shall be used by IITH ERP team to run the ERP system. This shall also include how the various parameters shall be monitored / tuned in a live system.
E. Finalize the archival policies for all the functional areas. All necessary configurations shall be done and tested.
F. Prepare requisite system configuration for disaster recovery management and Fail Over system plan.
G. Round the clock support for troubleshooting in functional and technical areas.

4.4.7 Centralized Database for the ERP System

The backend database will be a centralized database stored at a single location with access and a complete view of the data pertaining to IITH. The database character set should be *unicode* to support several languages.

The database must satisfy the following standard properties that are required of a database:

- **High Availability**: We expect a high availability setup with minimal downtime with ideally real-time replication and a standby database to switch over to in case of faults. The

database must work in clustering environments (e.g., on cloud/VMs) by allowing several database instances to run and access the central database to ensure high availability and also scalability.

- **Latent Capacity:** This database must have the ability to deal with "unexpected peaks in usage workloads" (either long-running batch jobs or concurrent requests) independent of more resources.
- **Performance**: Considering a given system load, we require very low query response times.
- **Scalability:** The capacity to handle a larger range of user requests should be increased (or decreased) without any changes to the original architecture.
- **Serviceability**: The database should come with user-friendly web interfaces to monitor the health of the database and repair it. The system must allow for planned downtimes for critical updates, maintenance, etc. via interfaces.
- **Security:** The database should allow easy setup of authorization and authentication schemes by administrators that are not necessarily database administrators.

4.4.7.1 Audit Logs

- The database must allow for *fine-grained audit control* i.e., it should allow auditing the most granular level data access and user actions.
- We should be able to create security policies based on access to or changes in a column. E.g., we must be able to audit a particular table column to find out *when* and *who* tried to access it or update it during a specified period of time.
- Furthermore, the database should create alerts that are triggered when a security policy is violated and write this data to a separate audit table and audit log file.
- Using the data collected in these audit logs, a report must be generated which gathers statistics about the tables being updated, how many logical I/O operations are performed, or how many concurrent users connect at peak times and what tables or database modules are the most accessed in the system.
- Must have the ability to send email notifications when noticing suspicious activity patterns like unauthorized users accessing database objects that require higher privileges.
- Any sort of data being deleted should also be recorded in a separate audit table along with user details and timestamps to keep track of old data.

4.4.7.2 Role based authentication

- Must have the ability to specify new database roles (via web interfaces) intended to perform a particular set of administrative tasks. A superuser must be able to review all the roles and create/modify/delete roles and have the ability to grant/revoke authorization to roles in a separate web interface.
- Authorizations to access and perform tasks must be given to these roles and not directly to user accounts.

- A user-friendly web interface should display all the roles and authorizations associated with them with the additional ability to generate reports.

4.4.7.3 Data migration from legacy systems

- The bidder must provide a robust data migration strategy using the ETL (Extraction-Transformation-Load) paradigm or such equivalent ones.
- Require an easy-to-use data migration tool that allows migration from legacy backends (e.g., AIMS system of IITH) to the new ERP backend.
- Must allow loading data from flat files.
- The migration will come with an integrated unit testing and reporting tool to show the test results.
- It must have the ability to set up checkpoints and also possess recovery options for each stage in the data migration.
- There should be an option to do secure transfers for sensitive data (such as financial records).
- Post migration, we must have the ability to perform data verification, followed by data cleansing, and check that the data is available, accessible with the right authorizations in place, complete, and in the correct format. This should be automated with either off-the-shelf tools or by scripts written by the bidder.

4.4.7.4 Integration with existing and legacy systems

- The bidder must provide a comprehensive data integration platform which covers a wide spectrum of data integration requirements: from high-volume, high-performance batch loads, to event-driven, trickle-feed integration processes along with SOA-enabled data services.
- Additionally, the system should also support real-time integration.
- The integration toolkit should support all platforms, hardware and OSs with the same toolkit.
- Should be able to interface with other existing systems via standard data interchange file formats like JSON, XML, SOAP, etc.
- The integration toolkit must automatically detect faulty data and repair it, thus not allow its propagation to the target systems.
- As much as possible, the integration tool should allow specification of new data integration workflows via GUIs.

4.5 Scope of Services for Implementing Agency

The scope of services for the successful bidder (aka Implementing Agency) is as follows.

I. Procurement and Supply of software product/s licenses and associated solution components. The bidder must use free/open source components available to the maximum extent possible in the solution.
II. Procurement and supply of database and operating systems
III. Hardware / Infrastructure estimation and sizing and assistance in procurement
IV. ERP Implementation Services till Go-Live of Stable Version of ERP system
    a. Project Preparation
    b. Business Design / Blueprint
    c. Configuration / Customization / Development
    d. Testing & Go-Live of Beta Version of ERP system
    e. Data Migration
    f. Training
    g. Documentation
    h. Go-Live of Stable Version of ERP system
V. Warranty Support
VI. Application Maintenance & Enhancement Services (AMES) Support

4.5.1 Procurement and Supply of software product/s licenses and associated solution components

IITH desires to implement an ERP system that will cater to various classes of users like transactional, management users, self service users. The offered ERP solution shall meet all requirements as specified in the RFP. Bidder will procure and supply any related software / 3rd party applications / accessories required to make the offered ERP solution complete.

Bidder will take responsibility for the following.

i. Procure and supply perpetual licenses for transaction, technical and system administration for the offered ERP system.
ii. Supply tools, accessories and documentation. Tools and accessories shall be part of the offered solution.
iii. ERP documentation to be supplied along with licenses and associated software solutions and shall include but not limited to the following.
    i. Technical manuals

ii. Installation guides
iii. User manuals
iv. System administrator manuals
v. Toolkit guides
vi. Troubleshooting guides

Please note that all the licenses would be in the name of “Indian Institute of Technology Hyderabad” and perpetual in nature.

4.5.2 Procurement and Supply of Database and Operating Systems

Bidder shall take responsibility for the following:

i. Procure and supply of database and server operating systems for the offered ERP system. The operating system will be a stable Linux operating system e.g., CentOS, PureOS, etc. The database has to be open-source. For example, this can either be relational databases like MySQL or Postgres or noSQL databases like MongoDB, Redis etc as long as the database requirements are satisfied. The bidder shall quote the cost for perpetual licenses of database and server operating systems as applicable.
ii. Tools and accessories shall be part of the offered database and server operating system.
iii. Product documentation to be supplied along with licenses of database and server operating system and shall include but not limited to the following.
    i. Technical manuals
    ii. Installation guides
    iii. User manuals
    iv. System administrator manuals
    v. Toolkit guides
    vi. Troubleshooting guides

Please note that all the licenses for database and operating systems (if applicable) would be in the name of “Indian Institute of Technology Hyderabad”.

4.5.3 Hardware / Infrastructure Estimation and Sizing / Installation

The bidder shall identify and provide “Bill of material (BOM)” for IT hardware/infrastructure and sizing requirements with specifications. Bidder shall identify server requirements and specifications based on IITH’s requirement for performance, usage and scalability. IT infrastructure components should be hosted exclusively at IITH Campus (in-house). The bidder also needs to suggest on staggered requirements of hardware / network components as per the implementation plan with required procurement lead time. Procurement of all the components mentioned in BOM shall be carried out by the IITH and made available to the implementing agency for installation and maintenance during the project term.

4.5.4 ERP Implementation Services & Support Services.

4.5.4.1 Project Preparation

Detailed project charter including the detailed project plan, indicating all activities with resources required, their roles and responsibilities and time schedule of deliverables should be prepared at the start of the project including coordination of project implementation plan, approved by the IITH ERP team.

The project charter should also contain brief project description, approach and methodology, milestones, project organization, project risks and mitigation plans, dependencies, etc.

The project charter should include a detailed program for installing and implementing the ERP solution covered under this RFP. The program shall be in the form of a bar chart/master network identifying key phases in various stages of the project.

4.5.4.2 Business Design

The bidder shall perform a study of existing processes at IITH and prepare a Business Blueprint (“As-is”, “To-be”, and “Gaps”) report with required process definition and flow diagrams, process enhancements and gap fitment analysis to map all functional requirements of IITH in the ERP solution. The bidder is expected to conduct workshops, give detailed presentations on the Blueprint, which will include the gap analysis, way forward to fill the gap and specific recommendations for adoption of new improved business processes by IITH.

Simplification and Standardization of Processes: Processes of all IITH functions / areas (Departments, Centers, Sections, Offices, etc.) need to be studied and simplified into logical steps at first. All processes need to be depicted into simple flow diagrams with clear linkages. This will help in reviewing some of the old manual practices in view of the integrated system scenario of the future. Bidder also needs to explore the standardization of processes across all IITH functions / areas.

IITH will constitute a project governance structure with adequate representation from all the stakeholders to review the recommendations of the bidder and accord necessary approval for the Business Design report and the new improved business processes to be adopted.

Detailed design requirements: A detailed description of the data flows between various modules and assumptions surrounding these data flows must be provided. This should include detailed screen mockups of the module front-end interfaces along with messaging and data transfer between the interfaces and their respective interactions to the backend databases. Any data sharing between frontends done via backends should clearly be mentioned in this detailed design document. There should be a functional overview of the data and data type specifications mapping between the frontend and backend connected to each module along with any intermediate data flow specifications (e.g. shared structures, temporary storages, views, etc.). All data migrations and integration strategies should be laid out in detail specifying which database tables and fields are being manipulated.

4.5.4.3 Configuration / Customization / Development

The bidder shall be responsible for installation of ERP software, database, operating systems tools, and any other component (together referred as ERP solution) required for making the ERP solution successfully operational as per the requirements in RFP. Based on the approved business blueprint and detailed design document, the bidder will undertake the configuration and customization of their ERP software or develop the proposed ERP solution.

4.5.4.4 Testing

The bidder shall provide details of tests being carried out during the implementation (e.g. including conference room pilots, unit tests, system integration tests, stress tests and final user

acceptance test). **Details of the testing strategy and approach should be provided in the response.** The bidder is responsible to identify and inform IITH regarding testing requirements and impacts. The bidder shall work in a manner to satisfy all the testing requirements and adhere to the testing strategy outlined. The bidder must ensure deployment of necessary resources and tools during the testing phases. The bidder shall take remedial action based on the outcome of the tests.

The bidder shall create the test strategy document that defines the requirements and goals of ERP configuration, determine the tools and methods used to check that the system responds correctly, determine how and when the test will be performed and recommend how the approval process should occur. The test strategy document shall guide the project team through the implementation to ensure that planning and conducting testing activities in the various phases of ERP implementation are proper. Various testing phases are as follows.

Base Line Testing

The purpose of baseline testing activities is to plan and conduct testing to validate the baseline configuration. Baseline testing shall ensure that Baseline configuration is valid, and shall support the business processes defined in the Business blueprint report.

Baseline testing shall include

a) Unit testing: Testing of transactions and functions within modules and
b) Scenario testing: Testing of all business processes and scenarios

Development Testing

After development and/or customization / configuration of the ERP solution, the bidder shall conduct tests to demonstrate the readiness of the system which meets all the requirement specifications (functional and nonfunctional) as brought out in this RFP. This shall be in accordance with the procedures detailed in the approved business blueprint report.

On the basis of these tests, a report would be submitted by the bidder for review and approval by IITH. The test results and response times should be demonstrated by the bidder during all the testing phases (system preparation, integration and stress and load testing) at IITH location in an environment / infrastructure as mutually agreed upon. The development testing shall cover testing of

- Unit testing of customer-specific development
- Conversions
- Enhancements (User-exits / programming interface and other code enhancements)
- Reports

Development should not only be tested by the developer but also by the process owner to make sure that the test results (output data) are correct, and reflect the business processes defined in the business blueprint report. After unit testing is completed, all customer-specific developments, programs and forms etc. shall be included in the Final Integration Test.

Integration and System Testing

Purpose of the integration test is to execute the integrated components, including simulation of live operations, and analyze the results that are important for the functional verification of the production system.

Integration testing shall be accomplished through the execution of predefined business flows, or scenarios, that emulate how the system will run the processes of IITH. These business flows, using migrated data from the existing systems, shall be performed in a multifaceted computing environment comprising ERP products, third-party software, system interfaces and various hardware and software components. The integration tests shall build the necessary level of confidence that the solution is complete and will perform the business processes of IITH.

Integration testing shall focus on cross-functional integration points, as well as end-to-end business processes. The final integration test plan shall start with the testing of the cross-functional integration points (touch points) and end with the end-to-end testing of critical business processes identified within the business blueprint report.

Integration testing shall be done in two iterations.

- The first iteration (Integration test) shall concentrate on testing all important business processes inside the ERP system. It will be done by bidder's functional consultants. Unit testing shall be carried out for customer specific developments like user-exits /

programming interface and transactions. Authorizations and user roles would also be tested in the Integration Test.

- System Testing, as a second iteration, shall focus on the most important cross-enterprise scenarios with touch points to external components, including testing of conversions, interfaces, reports, and the necessary authorizations. It will be conducted by IITH users with the assistance of the core team.

Integration and system tests need to be an evolutionary process that is driven from the previous testing efforts. The test cases and scenarios that were used for baseline need to be reviewed collectively by IITH and bidder and enhanced for the integrated and system tests. These selected cases will be combined to represent a business process flow such as a project management cycle. Problems encountered during these activities shall also need to be tested under an integrated environment.

Load and Stress Testing

Once the system integration testing has been conducted successfully, load, scalability and stress testing would be conducted prior to release of beta version Go-Live at the institute level. The bidder should use suitable simulation tools in accordance with the agreed test procedures keeping in view IITH's projected future load of transactional users as mutually agreed with IITH. After successful testing and its approval by IITH, the solution would then be considered as ready for beta version Go-Live.

User Acceptance Testing

The bidder will develop user acceptance test (UAT) procedures for IITH approval. The purpose of this acceptance is to ensure conformance to the required process operations, response times, and integrity of the software after installation, and to eliminate any operational bugs. Acceptance has to commence for the successful completion of beta testing Go-Live period for the ERP system.

4.5.4.5 Data Migration from legacy systems & Integration of legacy systems

Data migration will include identification of data migration requirements, collection and migration of user data, master data, open transactions, documents and data from the legacy systems i.e., Academic Information Management System (AIMS) portal of IITH and Tally system used for accounting purposes. Further, the bidder has to integrate legacy systems i.e., faculty and staff recruitment portals, library management system and facial biometric attendance system of staff and students with the developed ERP system as per the business requirements of IITH.

The key requirements for data migration and integration are as follows.

A. Identify and assess data to be migrated from the legacy applications, spreadsheets maintained by various administrative sections, mapping of such extracted data and uploading of data into the proposed ERP solutions including consistency checks.
B. The bidder shall formulate the “Data Migration Strategy Document” which will also include quality assurance mechanism. This will be reviewed and signed–off by IITH prior to commencement of data migration.
C. Specify forms / formats / templates / tools for data inputs and upload
D. Data migrated will be rationalized, transformed and reconciled
E. IITH and the bidder shall mutually conduct the acceptance testing and verify the completeness and accuracy of the data migrated from the legacy systems to the proposed solution and the integration of legacy systems to the proposed solution.

4.5.4.6 Training & Change Management

The bidder is required to train all staff identified as ERP core users to enable them to effectively operate and perform the relevant services using the software. The training content will have to be relevant to the target trainees depending upon the role played by them in IITH. Following kinds of training needs are to be provided by the bidder.

a. **Initial ERP Product Training*:*** Initial training shall be provided to the ERP core team members. The training should provide a comprehensive coverage of the ERP solution and its functionalities. The training shall also highlight the unique requirement of the proposed ERP solution.

b. **ERP Core Functional User Training**: Core team user training shall provide detailed training to ERP core team members, so as to enable them to handle future maintenance of the system and address functional queries, if any.
c. **ERP End user Training**: Functional training shall be provided to all ERP users. This training shall focus on user specific requirements and address the daily working and reporting requirements in the ERP solution. A refresher training of all the functions needs to be provided to update the knowledge of ERP solution users. The refresher course needs to be user specific.
d. **Technical Training*:*** This training shall be given to the technical (IITH ERP) team responsible for carrying out technical activities related to the ERP system programming, maintenance / administration of database and operating system, backups, etc.

The bidder shall mutually discuss and finalize the training plan to impart training to different users at IITH as per their roles and responsibilities. The proposed training schedules, duration, content of training, etc. will be based on the final sign-off from IITH.

The bidder will suggest to IITH issues anticipated in the Change Management process and proposed solutions to overcome the same. The bidder will conduct the change management programs for various levels of personnel covering the entire institute.

4.5.4.7 Documentation

The bidder will provide detailed final system documentation for the reference of IITH. The bidder shall provide ongoing relevant product information for reference purposes and facilitate self-education for IITH personnel.

Documents be supplied by the bidder shall include following (but not limited).

- Configuration document consisting of system setting and parameters for each functional module
- Standard operational procedure (SOP) manuals
- Documents related to data structures / tables
- On-line help manual
- Technical manuals
- Installation guides
- System administration manuals

- Toolkit guides and troubleshooting guides
- User manuals include system instructions and use cases, how to run a program to perform specific tasks in the system with sample reports, screen formats, etc.
- Program flow and descriptions
- Any other documentation required for usage of implemented solution

All documents mentioned above or any other standard documentation for the product to be submitted to IITH as applicable throughout the lifecycle of the project.

4.5.4.8 Go-Live of Stable Version

Once "Certificate of system acceptance" is provided to the bidder by IITH, it will be considered as the Go-Live date for the stable version of ERP solution and warranty period kicks in.

4.5.4.9 Support in Warranty Period and AMES Period

The bidder shall provide support to IITH for a period of four years (one year warranty and three years of AMES) post conclusion of beta testing Go-Live of the ERP system. The bidder shall continue deploying the adequate number of technically qualified personnel on-site till the end of **four** years for system maintenance and enhancement, continual change management and incremental inclusion of **new modules/features** as deemed required by IITH. During the support period, the bidder shall also help IITH users to correct any errors encountered / committed while executing transactions, generating reports, hand holding for quarter closures or month closures. The bidder shall also update the user manuals and configuration manuals, if required.

The application functional support services contemplated herein shall be provided for ERP solutions implemented by the bidder. The bidder shall render on-site maintenance and support services to IITH including back-up and restoring data services, periodic clean-up and archival.

The scope of the services is as below:

Enhancements and defect fixes. The bidder shall incorporate technological changes, and provide enhancements as per the requests made by IITH. The bidder shall also perform minor

changes, bug fixes, performance fine tuning and optimization, error resolutions and minor enhancements that are incidental to proper and complete working of the application.

Routine functional changes. The bidder shall be responsible for user and access management, creating new report formats, and configuration of reports. The bidder shall provide user support in case of technical difficulties in use of the software, answering procedural questions, providing recovery and backup information, and any other requirement that may be incidental/ancillary to the complete usage of the application. The bidder shall perform user ID and group management services. The bidder shall maintain access controls to protect and limit access to the authorized end users of the IITH. The services shall include administrative support for user registration, creating and maintaining user profiles, granting user access and authorization, providing ongoing user password support, etc.

Hardware Maintenance Activities The hardware and other IT infrastructure shall be procured by IITH, but the bidder shall manage hardware troubleshooting, maintenance and upkeep. Repairs would be covered under AMC with the hardware vendors. However, the bidder will have to coordinate with hardware vendor to ensure timely replacements and/or repairs Upgrades, hot fixes, patches to operating system, web server, application server, database server, and antivirus software during the project term. During the warranty and AMES period, the Institute may require enhancements to the implemented modules and the bidder shall develop and deploy the same.

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Chapter-5 Project Management

Other than the management of resources / deployment of experts and management of timelines as per this RFP, the project management by the IA will focus on the work plan containing a detailed set of phases, work packages, activities, and tasks.

Use of project management tool - The IA should use a project management tool to record the entire activities of the project including but not limited to:

i. The design documents with version control review comments
ii. The minutes of meetings
iii. System documentation
iv. Issue lists, resolutions
v. Training materials
vi. Management reporting
vii. Issue management
viii. Scope management
ix. Risk management
x. Work plan for ERP solution implementation

The resource plan containing the resources assigned to the ERP solution implementation should display the planned and actual number of workdays per month, as well as the variance between the two.

The bidder has to propose a detailed work plan to be created for the implementation of ERP solution at IITH. Status reports shall be prepared on a monthly basis to facilitate the timely implementation of the project. These shall be discussed in fortnightly status meetings to ascertain the progress of the project team.

Detailed work plans shall be created for all milestones based on a consistent approach to implementing and tracking their progress against predetermined project milestones. The implementation shall follow a consistent approach, inclusive of a comprehensive project management approach. Project status shall be communicated on a fortnightly basis, based upon

mutually-agreed standards. The IA is expected to present in detail the approach to the following project management parameters but not limited to:

Road Map

The IA shall provide a complete road map for implementation of the project by component and module wise. The IA may also suggest changes to the schedule with justification wherever required. However, IITH shall reserve the right to accept changes in the Project Plan suggested by the IA.

Resource Plan

The resource plan will be prepared by the IA based on the assessment of the skills required during different phases of the project. The IA is required to staff the project so as to complete all the activities within the timelines expected by IITH as per this RFP. Although the IA is free to work out its own resource loading and the skill deployment plan, IITH will use this to judge whether the IA is planning to staff the project to ensure timely completion of the project or not. IITH will have the right to ask for changing the resource plan during the project execution stage, if it finds that the project is either understaffed or overstaffed with inadequate skills (to ensure that inadequate skills are not substituted by more people).

Management Reporting

A management reporting structure has to be proposed by the IA and all deliverables associated with the project shall be categorized and maintained in a system environment (server) so that they are accessible to all the members of the project team. The size, scope and strategic nature of the implementation project, required executive level leadership and sponsorship, as well as an organized and agreed-upon structure that supports the flow of information. This structure shall assist in facilitating many of the process teams' daily activities as well as project and subproject level communications and knowledge coordination activities.

Project related Issue Management

An issue is a formally identified matter that may hinder progress on a project or program and about which no agreement has yet been reached. Those items that require documentation,

formal investigation and approval should be managed as issues and this issue management methodology has to be proposed by the IA.

Scope Management

Scope of the project will be managed through a formal scope change management process. Project management is essential to ensure that changes to the scope of the project do not adversely affect the project objectives. Change management documentation of project scope and approval procedures provide a visible decision-making process for the project and provide a clear audit trail of scope changes and the corresponding cost benefit appraisal and has to be proposed by the IA in the Project Management Methodology.

Risk Management

An ERP implementation project, like other projects, has some risks associated with it. Identifying and managing the risks is very important to the critical success of the project. During the detailed scoping exercise, the risks shall be identified and a mechanism to manage such risks shall be defined by the IA. Risk management is a continuous iterative process and shall be established when the project begins and continuously performed until the project ends. Risks shall be defined at the project level. It will be the responsibility of IITH and the IA Project Management Team to address the project risks from milestone-to-milestone and make sure the respective responsibilities are managed.

5.1 Proposed Project Period

The timeline for the implementation including beta testing is 24 months. In addition, there is a 12-month warranty period and a 3-year AMES period. The IA is expected to submit their project plans and milestones as per this timeline.

5.2 Project Deliverables

The IA shall submit a schedule for the below mentioned milestones and deliverables (but not limited to) that would be delivered during the course of the project plan. The IA shall be bound

with the proposed and finalized (after discussion with IITH) project plan and timelines for submission of deliverables.

i. The table gives a set of high-level activities and corresponding deliverables which will be in project scope.

ii. The IA should use this list only as a guideline in terms of expected deliverables. The IA is required to furnish detailed information regarding each deliverables of every step of activities proposed during and after the implementation of the project.

Following are the list of key activities and deliverables (but not limited to) for the project phases as a part of ERP implementation at IITH by the Implementing Agency.

Activities	Deliverables
1. Project Preparation	• Project Charter • Project Plan and Team
2. Detailed Design / Blueprint	• Detailed Architecture of ERP system • Detailed Project Plan for Blueprint • As-Is report • To-Be report • GAP assessment report • Change management workshop for new processes • Detailed design document of ERP system
3. Hardware / IT Infrastructure Estimation and sizing	• Detailed BOM with technical specifications and services required with estimated expenditure • DR plan document, Backup strategy document • Storage strategy document
4. Configuration / Customization / Development of Core and Other Modules as per RFP	• Configuration documents for all processes and modules • Customization-design, development and technical documents • Roles and Authorization Matrix

5. CRP Demos and Testing of ERP modules	• Conference Room Pilot (CRP) Demos of Core and other modules • Testing Strategy document -Testing Plan, Test data and results • Load testing report • System acceptance testing report • Baseline testing report • Development testing report • Integration testing report • Beta testing at the institute level and its report • Issue Logs for all testings done
6. Data Migration & Integration with legacy systems	• Data collection templates • Data migration strategy report • Data migration tools and conversions • Data migration and sanity check • Integration of legacy systems with the ERP system
7. Training	• Training Plan with schedules and content • User Plan • Delivery of User Training as per the matrix
8. Go-live of Stable version of ERP system	• User acceptance test (UAT) at the end of beta testing and commissioning of stable version og-live at the institute level
9. Post Go-live warranty support	• Go-live warranty support till the end of 3rd year
10. AMES support for three Years	• AMES support for Three (3) years (After post Go-live warranty support)

Deliverables Acceptance Criteria

The acceptance criteria shall be specified for all the project phases proposed by the IA. A list of standard deliverables (indicative) for each phase is listed above. The formal acceptance of the phase wise deliverables by IITH constitutes completion of the phase and approval to launch the next phase.

5.3 Governance Structure and Project Team Requirements

IA Project Team during development of the ERP solution

The IA shall deploy a project team with the following profiles that would be involved in the development phase of the project. The minimum expected experience and other required details of the personnel are mentioned below. The supporting documents need to be furnished as per Annexure-IX. IITH reserves rights to interview and approve / reject the project team size and its member(s) proposed for implementation from time to time.

Project Manager: Minimum twelve years of experience, including ERP Project Management experience of minimum two Projects and implementation experience in minimum three ERP implementation lifecycles which includes at least one implementation experience in a Higher Education Institute in India. Excellent client management, communications and leadership skills.

Functional Integration Manager or Integration Lead: Minimum ten years of experience, including ERP Project Implementation experience of minimum two Projects which includes at least one implementation experience in a Higher Education Institute in India. Should understand different modules of ERP system and effect of change in parameters in one module how the same will affect the system. He / she should be in charge of all the integration issues during implementation.

Technical Leads: Minimum eight years of experience in the technical domain including Technical Lead experience of minimum two ERP implementation projects, implementation experience of minimum three ERP implementation cycle experience.

Functional Consultants: Minimum five years of professional experience in handling some of the Core Modules of the proposed ERP system of IITH.

Application/ERP Developers: Minimum four years of experience in the development of ERP modules.

Application/ERP Testers: Minimum two years of experience in ERP implementation projects as testers/developers.

Technical Consultants: Minimum five years of professional experience including two years of experience in ERP technical domain including minimum two ERP implementation lifecycle experience on different modules, implementing interfaces to legacy applications, report customization, system architecting and Database management, etc.

IT Infrastructure Lead: Should have prior experience in server sizing and planning for disaster recovery for ERP systems.

IA/Bidder Project Team during Warranty Period

During the warranty period, the IA should deploy adequate technical personnel to carry out various activities as listed out in Chapter 4.5.4.9.

IA/Bidder Project Team during AMES Period

During the AMES phase, the IA should deploy at least one technical lead, three developers and one software testing personnel to carry out various activities as listed in Chapter 4.5.4.9. In Annexure-XV, the IA/bidder should provide the monthly billing rates for each of these personnel. We would like to point-out here that the billing rates will not be considered in the financial evaluation. However, if additional resources are required during the AMES phase, the rates mentioned in Annexure-XV would be applicable.

The bidder shall not change any member of the Project Team during the course of the project. However, in the unlikely event of a change being required, the procedure for replacement of the personnel can be detailed by the bidder in their response.

5.4 Help Desk Support

i. The Implementing Agency shall provide support in addressing general queries of users, logging requests, assigning requests to specific help desk individuals, recording resolution, tracking overall time taken for resolution, etc.

ii. Technical Support: The Implementing Agency shall provide technical support, in a suitable on-site and off-site combination, from 8AM to 7PM for all working days (considering six days a week

- from Monday to Saturday) of IITH. If off-site support model is proposed by the Implementing Agency, total (fixed & variable) cost of network connectivity (leased line/ VPN) between IA's Support Centre and the data center (DC) hosting the application has to be borne by the Implementing Agency.

iii. Technical support shall include, but not limited to, installation of new versions/ releases (including next generation release) upgrades, bug fixes, functionality enhancements, patches to cater to changes (including tax, legal, statutory and policy requirements), any modification or enhancement to existing Institute, changes to configurations, customizations, database administration, data back-up and archiving, security and other technical assistance.

APPENDIX A: BROAD FUNCTIONAL REQUIREMENT SPECIFICATION (SEPARATE DOCUMENT)

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