TERMS OF REFERENCE FOR THE R&D (PROJECT 2 - LITD 34)

(*Refer to the Guidelines on R&D Projects issued vide note SCMD/R&D dated 09-09-2023*)

1. **Title of the Project**: Use case compilation for Smart manufacturing in India.

2. **Background:**
   a) Smart manufacturing refers to the use of advanced technologies and data-driven intelligence to enhance and optimize the entire manufacturing process. It involves the integration of cutting-edge technologies, such as the Internet of Things (IoT), artificial intelligence (AI), machine learning, data analytics, and automation, into traditional manufacturing systems. The goal of smart manufacturing is to create more efficient, agile, and adaptable production processes that can respond quickly to changes in demand and market conditions.
   b) India, with its diverse industrial landscape, is poised to leverage Smart Manufacturing technologies to enhance efficiency, productivity, and global competitiveness. Recognizing the potential benefits and challenges of this technological transition, there is a growing need to systematically document and analyze real-world use cases within the Indian manufacturing context. The absence of a centralized repository hampers the dissemination of best practices, lessons learned, and insights gained from implementing Smart Manufacturing solutions across different sectors.
   c) This project endeavors to capture a spectrum of use cases, ranging from small and medium enterprises to large-scale manufacturing units, across various domains such as automotive, electronics, pharmaceuticals, and more. By compiling and categorizing these use cases, the repository will serve as a valuable resource for industry stakeholders, policymakers, researchers, and technology providers seeking to understand, replicate, and advance Smart Manufacturing practices in the Indian context.
   d) The repository will also help in identification of aspects of smart manufacturing which require standardization on priority.

3. **Objective:** To collect technical data, assess the landscape, and create a use-case repository for smart manufacturing in the context of Indian industries.

4. **Scope**:
   a) Study and comparative analysis of existing literature which would include use-case repositories created by countries, consortiums, industries etc., Study of these repositories may be done specifically to assess the suitability of use-case for utilization in Indian context.
   b) Collection of following data regarding industries where Smart manufacturing practices have been implemented in India in addition to the parameters mentioned in the template provided by BIS:
      a. Clear and detailed descriptions of the use case.
      b. Categorization of use cases based on industry sectors, such as automotive, electronics, pharmaceuticals, etc.

c. Detailed information on the technologies and solutions employed in each use case, including IoT, AI, robotics, data analytics, and automation.
d. Identification and documentation of challenges encountered during the implementation of Smart Manufacturing solutions in each use case.
e. Strategies and innovative approaches adopted to overcome challenges and ensure successful implementation.
f. Quantifiable data on the operational impact of Smart Manufacturing, including improvements in efficiency, productivity, cost savings, and sustainability.
g. Measurement of performance indicators used to evaluate the success of Smart Manufacturing initiatives in each use case.
h. Insights and lessons learned from each use case, including what worked well and what could be improved for future implementations.
i. Assessment of the scalability and replicability of the Smart Manufacturing solutions, considering factors like company size, industry type, and geographic location.
j. Details on how Smart Manufacturing solutions were integrated with existing systems and processes within the organizations.
k. Information on how each use case adhered to regulatory standards and compliance requirements (if any applicable).
l. Documentation of collaborations and partnerships that played a role in the success of the Smart Manufacturing initiatives.
m. Evaluation of the costs associated with implementation versus the benefits achieved in terms of increased efficiency and ROI.
n. Inclusion of visuals, such as diagrams, photos, or videos, to enhance understanding and showcase the practical application of Smart Manufacturing technologies.
o. Insights into the future plans and roadmaps for Smart Manufacturing within each organization, highlighting potential expansions, upgrades, or additional use cases.

c) Feedback and testimonials from end-users, operators, and other stakeholders involved in the Smart Manufacturing processes.

5. Research Methodology:

a) Review and analyze the literature as per the details mentioned scope.
b) Collect feedback/information through circulation of structured questionnaire.
c) During the visit to smart manufacturing industries and solution providers:
    a. Observe the facilities/solutions for collection of data.
    b. Conduct focused group discussion in a structured format.

6. Sampling Plan:

a) At-least 50 use-cases should be compiled.
b) Three large, medium and small scale each industry shall be visited where smart manufacturing practices have been implemented.
c) Atleast two smart manufacturing solution providers should be visited.
d) Feedback from at-least five users shall be sought.

7. **Deliverables**: The following should be submitted in hard copy and digital format to BIS:

a) Study report covering all the aspects mentioned in the scope.
b) Questionnaire and response received to them.

8. **Requirement for the CVs:** CVs of the following members to be shared by the organization conducting the research:

a) Project leader for the R&D project.
b) Team members to be engaged for the project.

9. **Timeline and Method of Progress Review:**

a) The timeframe for completing the study and submission of the final report is 4 months from the date of award of the project.
a) Mid-term review of the project: Mid-term report covering the review of the literature, industries, solution providers identified to be visited and survey conducted to be submitted within 45 days from the date of award of the project.
b) Draft report: To be submitted with 90 days from the date of award of the project.
c) In case of delay in submission of final draft report, the justification shall be given by the project proposer for consideration by the Sectional Committee.
d) d) The proposer shall comply to the provisions given in the BIS guidelines for Research & Development Projects for Formulation and Review of Standards, i.e., **doc no. SCMD/R&D Guidelines/20230909.**
e) e) The proposer taking up the project shall clear all doubts on provisions of research including ToR and BIS guidelines before acceptance of the project and signing agreement.

10. **Support BIS will Provide:** Following will be provided by BIS on request

a) Any national/international standard relevant to the project.
b) Assistance by introducing researchers to third parties wherever suitable.
c) Template for use-case compilation (to assist in data compilation in addition to the details mentioned in the scope)

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