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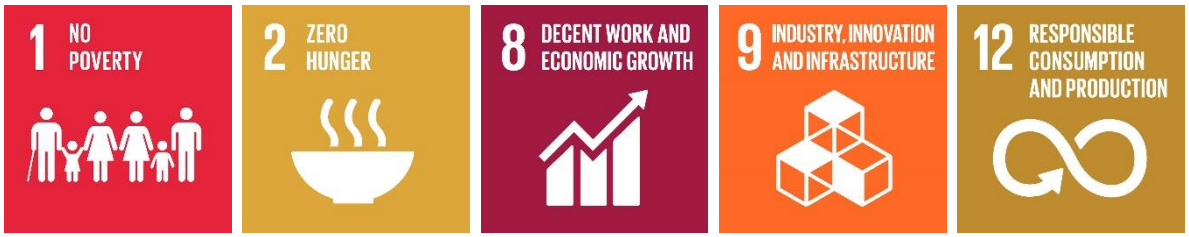

REQUEST FOR PROPOSAL
for
Digital Transformation of Ankara, Bursa, Kayseri and Konya Model Factories

RFP No.: UNDP-TUR-RFP(MF)-2021/02 (E-tendering Event ID: TUR10-RFP-21-02)

Project: Applied SME Capability Center

Country: Turkey

Issued on: 27 May 2021

CONTENTS

SECTION 1. LETTER OF INVITATION

The United Nations Development Programme (UNDP) hereby invites you to submit a Proposal to this Request for Proposal (RFP) for the above-referenced subject.

This RFP includes the following documents and the General Terms and Conditions of Contract which is inserted in the Bid Data Sheet (BDS):

Section 1: This Letter of Invitation
Section 2: Instruction to Bidders
Section 3: Bid Data Sheet (BDS)
Section 4: Evaluation Criteria
Section 5: Terms of Reference
Section 6: Returnable Bidding Forms
- Form A: Technical Proposal Submission Form
- Form B: Bidder Information Form
- Form C: Joint Venture Information Form
- Form D: Qualification Form
- Form E: Format of Technical Proposal
- Form F: Financial Proposal Submission Form
- Form G: Financial Proposal Form
- Form H: Form of Proposal Security

If you are interested in submitting a Proposal in response to this RFP, please prepare your Proposal in accordance with the requirements and procedure as set out in this RFP and submit it by the Deadline for Submission of Proposals set out in Bid Data Sheet.

Please be informed that this procurement process is being conducted through the online tendering system of UNDP. Please acknowledge receipt of this RFP by utilizing the "Accept Invitation" function in eTendering system. This will enable you to receive amendments or updates to the RFP. Should you require further clarifications, kindly communicate with the contact person/s identified in the attached Bid Data Sheet as the focal point for queries on this RFP.

UNDP looks forward to receiving your Proposal and thank you in advance for your interest in UNDP procurement opportunities.

Issued by:

_____

Name: Murat OZERDEN
Title: Procurement Administrator
Date: **May 27, 2021**

Approved by:

_____

Name: Usame YALCIN
Title: Assistant Resident Representative (Operations)
Date: **May 27, 2021**

SECTION 2. INSTRUCTION TO BIDDERS

A. GENERAL PROVISIONS	
1. Introduction	1.1 Proposers shall adhere to all the requirements of this RFP, including any amendments in writing by UNDP. This RFP is conducted in accordance with the UNDP Programme and Operations Policies and Procedures (POPP) on Contracts and Procurement which can be accessed at https://popp.undp.org/SitePages/POPPBSUnit.aspx?TermID=254a9f96-b883-476a-8ef8-e81f93a2b38d 1.2 Any Proposal submitted will be regarded as an offer by the Proposers and does not constitute or imply the acceptance of the Proposal by UNDP. UNDP is under no obligation to award a contract to any Bidder as a result of this RFP. 1.3 As part of the Proposal, it is desired that the Proposer registers at the United Nations Global Marketplace (UNGM) website (www.ungm.org). The Proposer may still submit a Proposal even if not registered with the UNGM. However, if the Proposer is selected for contract award, the Bidder must register on the UNGM prior to contract signature.
2. Fraud & Corruption, Gifts and Hospitality	2.1 UNDP strictly enforces a policy of zero tolerance on proscribed practices, including fraud, corruption, collusion, unethical or unprofessional practices, and obstruction of UNDP vendors and requires all proposers/vendors observe the highest standard of ethics during the procurement process and contract implementation. UNDP's Anti-Fraud Policy can be found at http://www.undp.org/content/undp/en/home/operations/accountability/audit/office_of_audit_andinvestigation.html#anti 2.2 Proposers/vendors shall not offer gifts or hospitality of any kind to UNDP staff members including recreational trips to sporting or cultural events, theme parks or offers of holidays, transportation, or invitations to extravagant lunches or dinners. 2.3 In pursuance of this policy, UNDP (a) Shall reject a proposal if it determines that the selected Proposer has engaged in any corrupt or fraudulent practices in competing for the contract in question; (b) Shall declare a vendor ineligible, either indefinitely or for a stated period of time, to be awarded a contract if at any time it determines that the vendor has engaged in any corrupt or fraudulent practices in competing for, or in executing a UNDP contract. 2.4 All Proposers must adhere to the UN Supplier Code of Conduct, which may be found at https://www.un.org/Depts/ptd/about-us/un-supplier-code-conduct
3. Eligibility	3.1 A vendor should not be suspended, debarred, or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization. Vendors are therefore required to disclose to UNDP whether they are subject to any sanction or temporary suspension imposed by these organizations. 3.2 It is the Proposer's responsibility to ensure that its employees, joint venture members, sub-contractors, service providers, suppliers and/or their employees meet the eligibility requirements as established by UNDP.

4. Conflict of Interests	4.1 Proposers must strictly avoid conflicts with other assignments or their own interests, and act without consideration for future work. Proposers found to have a conflict of interest shall be disqualified. Without limitation on the generality of the above, Proposers, and any of their affiliates, shall be considered to have a conflict of interest with one or more parties in this solicitation process, if they: a) Are or have been associated in the past, with a firm or any of its affiliates which have been engaged by UNDP to provide services for the preparation of the design, specifications, Terms of Reference, cost analysis/estimation, and other documents to be used for the procurement of the goods and services in this selection process; b) Were involved in the preparation and/or design of the programme/project related to the services requested under this RFP; or c) Are found to be in conflict for any other reason, as may be established by, or at the discretion of UNDP. 4.2 In the event of any uncertainty in the interpretation of a potential conflict of interest, Proposers must disclose to UNDP, and seek UNDP's confirmation on whether or not such a conflict exists. 4.3 Similarly, the Proposers must disclose in their proposal their knowledge of the following: a) If the owners, part-owners, officers, directors, controlling shareholders, of the Proposal entity or key personnel are family members of UNDP staff involved in the procurement functions and/or the Government of the country or any Implementing Partner receiving services under this RFP; and b) All other circumstances that could potentially lead to actual or perceived conflict of interest, collusion or unfair competition practices. Failure to disclose such an information may result in the rejection of the proposal or proposals affected by the non-disclosure. 4.4 The eligibility of Proposers that are wholly or partly owned by the Government shall be subject to UNDP's further evaluation and review of various factors such as being registered, operated and managed as an independent business entity, the extent of Government ownership/share, receipt of subsidies, mandate and access to information in relation to this RFP, among others. Conditions that may lead to undue advantage against other Bidders may result in the eventual rejection of the Proposal.
B. PREPARATION OF PROPOSALS	
5. General Considerations	5.1 In preparing the Proposal, the Proposer is expected to examine the RFP in detail. Material deficiencies in providing the information requested in the RFP may result in rejection of the Proposal. 5.2 The Proposer will not be permitted to take advantage of any errors or omissions in the RFP. Should such errors or omissions be discovered, the Proposer must notify the UNDP.
6. Cost of Preparation of Proposal	6.1 The Proposer shall bear any and all costs related to the preparation and/or submission of the Proposal, regardless of whether its Proposal was selected or not. UNDP shall not be responsible or liable for those costs, regardless of the conduct or outcome of the procurement process.

7. Language	7.1 The Proposal, as well as any and all related correspondence exchanged by the Proposer and UNDP, shall be written in the language (s) specified in the BDS.
8. Documents Comprising the Proposal	8.1 The Proposal shall comprise of the following documents: a) Documents Establishing the Eligibility and Qualifications of the Proposer; b) Technical Proposal; c) Financial Proposal; d) Proposal Security, if required by BDS; e) Any attachments and/or appendices to the Proposal.
9. Documents Establishing the Eligibility and Qualifications of the Bidder	9.1 The Proposer shall furnish documentary evidence of its status as an eligible and qualified vendor, using the Forms provided under Section 6 and providing documents required in those forms. In order to award a contract to a Proposer its qualifications must be documented to UNDP's satisfaction.
10. Technical Proposal Format and Content	10.1 The Proposer is required to submit a Technical Proposal using the Standard Forms and templates provided in Section 6 of the RFP. 10.2 The Technical Proposal shall not include any price or financial information. A Technical Proposal containing material financial information may be declared non-responsive. 10.3 Samples of items, when required as per Section 5, shall be provided within the time specified and unless otherwise specified by UNDP, and at no expense to UNDP. 10.4 When applicable and required as per Section 5, the Proposer shall describe the necessary training programme available for the maintenance and operation of the services and/or equipment offered as well as the cost to the UNDP. Unless otherwise specified, such training as well as training materials shall be provided in the language of the Bid as specified in the BDS.
11. Financial Proposal	11.1 The Financial Proposal shall be prepared using the Standard Form provided in Section 6 of the RFP. It shall list all major cost components associated with the services, and the detailed breakdown of such costs. 11.2 Any output and activities described in the Technical Proposal but not priced in the Financial Proposal, shall be assumed to be included in the prices of other activities or items, as well as in the final total price. 11.3 Prices and other financial information must not be disclosed in any other place except in the financial proposal.
12. Proposal Security	12.1 A Proposal Security, if required by BDS, shall be provided in the amount and form indicated in the BDS. The Proposal Security shall be valid up to thirty (30) days after the final date of validity of the Proposal. 12.2 The Proposal Security shall be included along with the Technical Proposal. If Proposal Security is required by the RFP but is not found along with the Technical Proposal, the Proposal shall be rejected. 12.3 If the Proposal Security amount or its validity period is found to be less than what is required by UNDP, UNDP shall reject the Proposal.

	12.4 In the event an electronic submission is allowed in the BDS, Bidders shall include a copy of the Bid Security in their proposal and the original of the Proposal Security must be sent via courier or hand delivery as per the instructions in BDS. 12.5 The Proposal Security may be forfeited by UNDP, and the Proposal rejected, in the event of any one or combination, of the following conditions: a) If the Proposer withdraws its offer during the period of the Proposal Validity specified in the BDS, or; b) In the event that the successful Proposers fails: • to sign the Contract after UNDP has issued an award; or 12.6 to furnish the Performance Security, insurances, or other documents that UNDP may require as a condition precedent to the effectivity of the contract that may be awarded to the Proposer.
13. Currencies	13.1 All prices shall be quoted in the currency or currencies indicated in the BDS. Where Proposals are quoted in different currencies, for the purposes of comparison of all Proposals: 1. UNDP will convert the currency quoted in the Proposal into the UNDP preferred currency, in accordance with the prevailing UN operational rate of exchange on the last day of submission of Proposals; and 2. In the event that UNDP selects a proposal for award that is quoted in a currency different from the preferred currency in the BDS, UNDP shall reserve the right to award the contract in the currency of UNDP's preference, using the conversion method specified above.
14. Joint Venture, Consortium or Association	14.1 If the Proposer is a group of legal entities that will form or have formed a Joint Venture (JV), Consortium or Association for the Proposal, they shall confirm in their Proposal that : (i) they have designated one party to act as a lead entity, duly vested with authority to legally bind the members of the JV, Consortium or Association jointly and severally, which shall be evidenced by a duly notarized Agreement among the legal entities, and submitted with the Proposal; and (ii) if they are awarded the contract, the contract shall be entered into, by and between UNDP and the designated lead entity, who shall be acting for and on behalf of all the member entities comprising the joint venture. 14.2 After the Deadline for Submission of Proposal, the lead entity identified to represent the JV, Consortium or Association shall not be altered without the prior written consent of UNDP. 14.3 The lead entity and the member entities of the JV, Consortium or Association shall abide by the provisions of Clause 9 herein in respect of submitting only one proposal. 14.4 The description of the organization of the JV, Consortium or Association must clearly define the expected role of each of the entity in the joint venture in delivering the requirements of the RFP, both in the Proposal and the JV, Consortium or Association Agreement. All entities that comprise the JV, Consortium or Association shall be subject to the eligibility and qualification assessment by UNDP. 14.5 A JV, Consortium or Association in presenting its track record and experience should clearly differentiate between:

	1. Those that were undertaken together by the JV, Consortium or Association; and 2. Those that were undertaken by the individual entities of the JV, Consortium or Association. 14.6 Previous contracts completed by individual experts working privately but who are permanently or were temporarily associated with any of the member firms cannot be claimed as the experience of the JV, Consortium or Association or those of its members, but should only be claimed by the individual experts themselves in their presentation of their individual credentials. 14.7 JV, Consortium or Associations are encouraged for high value, multi-sectoral requirements when the spectrum of expertise and resources required may not be available within one firm.
15. Only One Proposal	15.1 The Proposer (including the individual members of any Joint Venture) shall submit only one Proposal, either in its own name or as part of a Joint Venture. 15.2 Proposals submitted by two (2) or more Proposers shall all be rejected if they are found to have any of the following: f) they have at least one controlling partner, director or shareholder in common; or g) any one of them receive or have received any direct or indirect subsidy from the other/s; or h) they have the same legal representative for purposes of this RFP; or i) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about, or influence on the Proposal of, another Bidder regarding this RFP process; j) they are subcontractors to each other's Proposal, or a subcontractor to one Proposal also submits another Proposal under its name as lead Proposer; or k) some key personnel proposed to be in the team of one Proposer participates in more than one Proposal received for this RFP process. This condition relating to the personnel, does not apply to subcontractors being included in more than one Proposal.
16. Proposal Validity Period	16.1 Proposals shall remain valid for the period specified in the BDS, commencing on the Deadline for Submission of Proposals. A Proposal valid for a shorter period may be rejected by UNDP and rendered non-responsive. 16.2 During the Proposal validity period, the Bidder shall maintain its original Proposal without any change, including the availability of the Key Personnel, the proposed rates and the total price.
17. Extension of Proposal Validity Period	17.1 In exceptional circumstances, prior to the expiration of the proposal validity period, UNDP may request Proposal to extend the period of validity of their Proposals. The request and the responses shall be made in writing, and shall be considered integral to the Proposal. 17.2 If the Proposer agrees to extend the validity of its Proposal, it shall be done without any change in the original Proposal. 17.3 The Proposer has the right to refuse to extend the validity of its Proposal,

		and in which case, such Proposal will not be further evaluated.
18. Clarification of Proposal	18.1	Proposers may request clarifications on any of the RFP documents no later than the date indicated in the BDS. Any request for clarification must be sent in writing in the manner indicated in the BDS. If inquiries are sent other than specified channel, even if they are sent to a UNDP staff member, UNDP shall have no obligation to respond or confirm that the query was officially received.
	18.2	UNDP will provide the responses to clarifications through the method specified in the BDS.
	18.3	UNDP shall endeavor to provide responses to clarifications in an expeditious manner, but any delay in such response shall not cause an obligation on the part of UNDP to extend the submission date of the Proposals, unless UNDP deems that such an extension is justified and necessary.
19. Amendment of Proposals	19.1	At any time prior to the deadline of Proposal submission, UNDP may for any reason, such as in response to a clarification requested by a Proposer, modify the RFP in the form of an amendment to the RFP. Amendments will be made available to all prospective Proposers.
	19.2	If the amendment is substantial, UNDP may extend the Deadline for submission of proposal to give the Proposers reasonable time to incorporate the amendment into their Proposals.
20. Alternative Proposals	20.1	Unless otherwise specified in the BDS, alternative proposals shall not be considered. If submission of alternative proposal is allowed by BDS, a Proposer may submit an alternative proposal, but only if it also submits a proposal conforming to the RFP requirements. UNDP shall only consider the alternative proposal offered by the Proposer whose conforming proposal ranked the highest as per the specified evaluation method. Where the conditions for its acceptance are met, or justifications are clearly established, UNDP reserves the right to award a contract based on an alternative proposal.
	20.2	If multiple/alternative proposals are being submitted, they must be clearly marked as "Main Proposal" and "Alternative Proposal"
21. Pre-Bid Conference	21.1	When appropriate, a Proposer's conference will be conducted at the date, time and location specified in the BDS. All Bidders are encouraged to attend. Non-attendance, however, shall not result in disqualification of an interested Proposer. Minutes of the Proposer's conference will be disseminated on the procurement website and shared by email or on the e-Tendering platform as specified in the BDS. No verbal statement made during the conference shall modify the terms and conditions of the RFP, unless specifically incorporated in the Minutes of the Proposer's Conference or issued/posted as an amendment to RFP.
C. SUBMISSION AND OPENING OF PROPOSALS		

22. Submission	22.1 The Proposer shall submit a duly signed and complete Proposal comprising the documents and forms in accordance with the requirements in the BDS. The submission shall be in the manner specified in the BDS. 22.2 The Proposal shall be signed by the Proposer or person(s) duly authorized to commit the Proposer. The authorization shall be communicated through a document evidencing such authorization issued by the legal representative of the proposing entity, or a Power of Attorney, accompanying the Proposal. 22.3 Proposers must be aware that the mere act of submission of a Proposal, in and of itself, implies that the Bidder fully accepts the UNDP General Contract Terms and Conditions.
Hard copy (manual) submission **Email Submission** **eTendering submission**	22.4 Hard copy (manual) submission by courier or hand delivery allowed or specified in the BDS shall be governed as follows: a) The signed Proposal shall be marked "Original", and its copies marked "Copy" as appropriate. The number of copies is indicated in the BDS. All copies shall be made from the signed original only. If there are discrepancies between the original and the copies, the original shall prevail. b) The Technical Proposal and the Financial Proposal envelopes MUST BE COMPLETELY SEPARATE and each of them must be submitted sealed individually and clearly marked on the outside as either "TECHNICAL PROPOSAL" or "FINANCIAL PROPOSAL", as appropriate. Each envelope SHALL clearly indicate the name of the Bidder. The outer envelopes shall: i. Bear the name and address of the proposer; ii. Be addressed to UNDP as specified in the BDS iii. Bear a warning that states "*Not to be opened before the time and date for proposal opening*" as specified in the BDS. If the envelopes and packages with the Proposal are not sealed and marked as required, UNDP shall assume no responsibility for the misplacement, loss, or premature opening of the Proposal. 22.5 Email submission, if allowed or specified in the BDS, shall be governed as follows: a) Electronic files that form part of the proposal must be in accordance with the format and requirements indicated in BDS; b) The Technical Proposal and the Financial Proposal files MUST BE COMPLETELY SEPARATE. The financial proposal shall be encrypted with different passwords and clearly labelled. The files must be sent to the dedicated email address specified in the BDS. c) The password for opening the Financial Proposal should be provided only upon request of UNDP. UNDP will request password only from proposers whose Technical Proposal has been found to be technically responsive. Failure to provide correct password may result in the proposal being rejected. 22.6 Electronic submission through eTendering, if allowed or specified in the BDS, shall be governed as follows: a) Electronic files that form part of the proposal must be in accordance with

	the format and requirements indicated in BDS; b) The Technical Proposal and the Financial Proposal files MUST BE COMPLETELY SEPARATE and each of them must be uploaded individually and clearly labelled. d) The Financial Proposal file must be encrypted with a password so that it cannot be opened nor viewed until the password is provided. The password for opening the Financial Proposal should be provided only upon request of UNDP. UNDP will request password only from proposers whose technical proposal has been found to be technically responsive. Failure to provide the correct password may result in the proposal being rejected. c) Documents which are required to be in original form (e.g. Bid Security, etc.) must be sent via courier or hand delivery as per the instructions in BDS. d) Detailed instructions on how to submit, modify or cancel a bid in the eTendering system are provided in the eTendering system Bidder User Guide and Instructional videos available on this link: http://www.undp.org/content/undp/en/home/operations/procurement/business/procurement-notices/resources/
23. Deadline for Submission of Proposals and Late Proposals	23.1 Complete Proposals must be received by UNDP in the manner, and no later than the date and time, specified in the BDS. UNDP shall only recognize the date and time that the bid was received by UNDP 23.2 UNDP shall not consider any Proposal that is submitted after the deadline for the submission of Proposals.
24. Withdrawal, Substitution, and Modification of Proposals	24.1 A Proposer may withdraw, substitute or modify its Proposal after it has been submitted at any time prior to the deadline for submission. 24.2 Manual and Email submissions: A proposer may withdraw, substitute or modify its Proposal by sending a written notice to UNDP, duly signed by an authorized representative, and shall include a copy of the authorization (or a Power of Attorney). The corresponding substitution or modification of the Proposal, if any, must accompany the respective written notice. All notices must be submitted in the same manner as specified for submission of proposals, by clearly marking them as "WITHDRAWAL" "SUBSTITUTION," or "MODIFICATION" 24.3 eTendering: A Proposer may withdraw, substitute or modify its Proposal by Canceling, Editing, and re-submitting the proposal directly in the system. It is the responsibility of the Bidder to properly follow the system instructions, duly edit and submit a substitution or modification of the Proposal as needed. Detailed instructions on how to cancel or modify a Proposal directly in the system are provided in Proposer User Guide and Instructional videos. 24.4 Proposals requested to be withdrawn shall be returned unopened to the Proposers (only for manual submissions), except if the bid is withdrawn after the bid has been opened
25. Proposal Opening	25.1 There is no public bid opening for RFPs. UNDP shall open the Proposals in the presence of an ad-hoc committee formed by UNDP, consisting of at least two (2) members. In the case of e-Tendering submission, proposers will

	receive an automatic notification once their proposal is opened.
D. EVALUATION OF PROPOSALS	
26. Confidentiality	26.1 Information relating to the examination, evaluation, and comparison of Proposals, and the recommendation of contract award, shall not be disclosed to Bidders or any other persons not officially concerned with such process, even after publication of the contract award. 26.2 Any effort by a Bidder or anyone on behalf of the Bidder to influence UNDP in the examination, evaluation and comparison of the Proposals or contract award decisions may, at UNDP's decision, result in the rejection of its Proposal and may be subject to the application of prevailing UNDP's vendor sanctions procedures.
27. Evaluation of Proposals	27.1 The Bidder is not permitted to alter or modify its Proposal in any way after the proposal submission deadline except as permitted under Clause 24 of this RFP. UNDP will conduct the evaluation solely on the basis of the submitted Technical and Financial Proposals. 27.2 Evaluation of proposals is made of the following steps: a) Preliminary Examination b) Minimum Eligibility and Qualification (if pre-qualification is not done) c) Evaluation of Technical Proposals d) Evaluation of Financial Proposals
28. Preliminary Examination	28.1 UNDP shall examine the Proposals to determine whether they are complete with respect to minimum documentary requirements, whether the documents have been properly signed, and whether the Proposals are generally in order, among other indicators that may be used at this stage. UNDP reserves the right to reject any Proposal at this stage.
29. Evaluation of Eligibility and Qualification	29.1 Eligibility and Qualification of the Proposer will be evaluated against the Minimum Eligibility/Qualification requirements specified in the Section 4 (Evaluation Criteria). 29.2 In general terms, vendors that meet the following criteria may be considered qualified: e) They are not included in the UN Security Council 1267/1989 Committee's list of terrorists and terrorist financiers, and in UNDP's ineligible vendors' list; f) They have a good financial standing and have access to adequate financial resources to perform the contract and all existing commercial commitments, g) They have the necessary similar experience, technical expertise, production capacity where applicable, quality certifications, quality assurance procedures and other resources applicable to the provision of the services required; h) They are able to comply fully with UNDP General Terms and Conditions of Contract; i) They do not have a consistent history of court/arbitral award decisions against the Proposer; and j) They have a record of timely and satisfactory performance with their clients.
30. Evaluation of	30.1 The evaluation team shall review and evaluate the Technical Proposals on

Technical and Financial Proposals	the basis of their responsiveness to the Terms of Reference and other RFP documents, applying the evaluation criteria, sub-criteria, and point system specified in the Section 4 (Evaluation Criteria). A Proposal shall be rendered non-responsive at the technical evaluation stage if it fails to achieve the minimum technical score indicated in the BDS. When necessary and if stated in the BDS, UNDP may invite technically responsive bidders for a presentation related to their technical proposals. The conditions for the presentation shall be provided in the bid document where required. 30.2 In the second stage, only the Financial Proposals of those Proposers who achieve the minimum technical score will be opened for evaluation. The Financial Proposals corresponding to Technical Proposals that were rendered non-responsive shall remain unopened, and, in the case of manual submission, be returned to the Bidder unopened. For emailed Proposals and e-tendering submissions, UNDP will not request for the password of the Financial Proposals of bidders whose Technical Proposal were found not responsive. 30.3 The evaluation method that applies for this RFP shall be as indicated in the BDS, which may be either of two (2) possible methods, as follows: (a) the lowest priced method which selects the lowest evaluated financial proposal of the technically responsive Proposers; or (b) the combined scoring method which will be based on a combination of the technical and financial score. 30.4 When the BDS specifies a combined scoring method, the formula for the rating of the Proposals will be as follows: Rating the Technical Proposal (TP): **TP Rating** = (Total Score Obtained by the Offer / Max. Obtainable Score for TP) x 100 Rating the Financial Proposal (FP): **FP Rating** = (Lowest Priced Offer / Price of the Offer Being Reviewed) x 100 Total Combined Score: **Combined Score =** (TP Rating) x (Weight of TP, e.g. 70%) + (FP Rating) x (Weight of FP, e.g., 30%)
31. Due Diligence	31.1 UNDP reserves the right to undertake a due diligence exercise, also called post qualification, aimed at determining to its satisfaction, the validity of the information provided by the Proposer. Such exercise shall be fully documented and may include, but need not be limited to, all or any combination of the following: a) Verification of accuracy, correctness and authenticity of information provided by the Proposer; b) Validation of extent of compliance to the RFP requirements and evaluation criteria based on what has so far been found by the evaluation team;

	c) Inquiry and reference checking with Government entities with jurisdiction on the Proposer, or with previous clients, or any other entity that may have done business with the Proposer; d) Inquiry and reference checking with previous clients on the performance on on-going or contracts completed, including physical inspections of previous works, as necessary; e) Physical inspection of the Proposer's offices, branches or other places where business transpires, with or without notice to the Bidder; f) Other means that UNDP may deem appropriate, at any stage within the selection process, prior to awarding the contract.
32. Clarification of Proposals	32.1 To assist in the examination, evaluation and comparison of Proposals, UNDP may, at its discretion, ask any Proposer for a clarification of its Proposal. 32.2 UNDP's request for clarification and the response shall be in writing and no change in the prices or substance of the Proposal shall be sought, offered, or permitted, except to provide clarification, and confirm the correction of any arithmetic errors discovered by UNDP in the evaluation of the Proposals, in accordance with RFP. 32.3 Any unsolicited clarification submitted by a Proposer in respect to its Proposal, which is not a response to a request by UNDP, shall not be considered during the review and evaluation of the Proposals.
33. Responsiveness of Proposal	33.1 UNDP's determination of a Proposal's responsiveness will be based on the contents of the Proposal itself. A substantially responsive Proposal is one that conforms to all the terms, conditions, TOR and other requirements of the RFP without material deviation, reservation, or omission. 33.2 If a Proposal is not substantially responsive, it shall be rejected by UNDP and may not subsequently be made responsive by the Proposer by correction of the material deviation, reservation, or omission.
34. Nonconformities, Reparable Errors and Omissions	34.1 Provided that a Proposal is substantially responsive, UNDP may waive any non-conformities or omissions in the Proposal that, in the opinion of UNDP, do not constitute a material deviation. 34.2 UNDP may request the Proposer to submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Proposal related to documentation requirements. Such omission shall not be related to any aspect of the price of the Proposal. Failure of the Proposer to comply with the request may result in the rejection of its Proposal. 34.3 For Financial Proposal that has been opened, UNDP shall check and correct arithmetical errors as follows: a) if there is a discrepancy between the unit price and the line item total that is obtained by multiplying the unit price by the quantity, the unit price shall prevail and the line item total shall be corrected, unless in the opinion of UNDP there is an obvious misplacement of the decimal point in the unit price; in which case the line item total as quoted shall govern and the unit price shall be corrected; b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

	c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail. 34.4 If the Proposer does not accept the correction of errors made by UNDP, its Proposal shall be rejected.
E. AWARD OF CONTRACT	
35. Right to Accept, Reject, Any or All Proposals	35.1 UNDP reserves the right to accept or reject any Proposal, to render any or all of the Proposals as non-responsive, and to reject all Proposals at any time prior to award of contract, without incurring any liability, or obligation to inform the affected Bidder(s) of the grounds for UNDP's action. UNDP shall not be obliged to award the contract to the lowest priced offer.
36. Award Criteria	36.1 Prior to expiration of the proposal validity, UNDP shall award the contract to the qualified Proposer based on the award criteria indicated in the BDS.
37. Debriefing	37.1 In the event that a Proposer is unsuccessful, the Proposer may request a debriefing from UNDP. The purpose of the debriefing is to discuss the strengths and weaknesses of the Proposer's submission, in order to assist the Proposer in improving its future proposals for UNDP procurement opportunities. The content of other proposals and how they compare to the Proposer's submission shall not be discussed.
38. Right to Vary Requirements at the Time of Award	38.1 At the time of award of Contract, UNDP reserves the right to vary the quantity of services and/or goods, by up to a maximum twenty-five per cent (25%) of the total offer, without any change in the unit price or other terms and conditions.
39. Contract Signature	39.1 Within fifteen (15) days from the date of receipt of the Contract, the successful Proposer shall sign and date the Contract and return it to UNDP. Failure to do so may constitute sufficient grounds for the annulment of the award, and forfeiture of the Proposal Security, if any, and on which event, UNDP may award the Contract to the Second Ranked Bidder or call for new Proposals.
40. Contract Type and General Terms and Conditions	40.1 The types of Contract to be signed and the applicable UNDP Contract General Terms and Conditions, as specified in BDS, can be accessed at http://www.undp.org/content/undp/en/home/procurement/business/how-we-buy.html
41. Performance Security	41.1 40.1 A performance security, if required in BDS, shall be provided in the amount specified in BDS and form available at https://popp.undp.org/_layouts/15/WopiFrame.aspx?sourcedoc=/UNDP_POPP_DOCUMENT_LIBRARY/Public/PSU_Solicitation_Performance%20Guarantee%20Form.docx&action=default within fifteen (15) days of the contract signature by both parties. Where a performance security is required, the receipt of the performance security by UNDP shall be a condition for rendering the contract effective.
42. Bank Guarantee for Advanced Payment	42.1 Except when the interests of UNDP so require, it is UNDP's preference to make no advance payment(s) (i.e., payments without having received any outputs). If an advance payment is allowed as per BDS, and exceeds 20% of the total contract price, or USD 30,000, whichever is less, the Proposer shall

		submit a Bank Guarantee in the full amount of the advance payment in the form available at https://popp.undp.org/_layouts/15/WopiFrame.aspx?sourcedoc=/UNDP_POPP_DOCUMENT_LIBRARY/Public/PSU_Contract%20Management%20Payment%20and%20Taxes_Advanced%20Payment%20Guarantee%20Form.docx&action=default
43. Liquidated Damages	43.1	If specified in BDS, UNDP shall apply Liquidated Damages resulting from the Contractor's delays or breach of its obligations as per the Contract.
44. Payment Provisions	44.1	Payment will be made only upon UNDP's acceptance of the work performed. The terms of payment shall be within thirty (30) days, after receipt of invoice and certification of acceptance of work issued by the proper authority in UNDP with direct supervision of the Contractor. Payment will be effected by bank transfer in the currency of contract.
45. Vendor Protest	45.1	UNDP's vendor protest procedure provides an opportunity for appeal to those persons or firms not awarded a contract through a competitive procurement process. In the event that a Bidder believes that it was not treated fairly, the following link provides further details regarding UNDP vendor protest procedures: http://www.undp.org/content/undp/en/home/operations/procurement/business/protest-and-sanctions.html
46. Other Provisions	46.1	In the event that the Bidder offers a lower price to the host Government (e.g. General Services Administration (GSA) of the federal government of the United States of America) for similar services, UNDP shall be entitled to same lower price. The UNDP General Terms and Conditions shall have precedence.
	46.2	UNDP is entitled to receive the same pricing offered by the same Contractor in contracts with the United Nations and/or its Agencies. The UNDP General Terms and Conditions shall have precedence.
	46.3	The United Nations has established restrictions on employment of (former) UN staff who have been involved in the procurement process as per bulletin ST/SGB/2006/15 http://www.un.org/en/ga/search/view_doc.asp?symbol=ST/SGB/2006/15&referer

SECTION 3. BID DATA SHEET

The following data for the services to be procured shall complement, supplement, or amend the provisions in the Request for Proposals. In the case of a conflict between the Instructions to Bidders, the Data Sheet, and other annexes or references attached to the Data Sheet, the provisions in the Data Sheet shall prevail.

BDS No.	Ref. to Section.2	Data	Specific Instructions / Requirements
1	7	Language of the Proposal	English
2		Submitting Proposals for Parts or sub-parts of the TOR (partial bids)	Not Allowed
3		Joint Venture	Submission as Joint Venture is allowed. Note: Proposals submitted by Consortium or Association shall not be accepted.
4	20	Alternative Proposals	Shall not be considered
5	21	Pre-proposal conference	Will be Conducted Time: 14:00pm - 15:30pm (Turkey Local Time) Date: 14 June 2021 Venue: Virtual Zoom Meeting Prospective Proposers shall express their interest to be invited to the scheduled zoom meeting by sending an e-mail to tr.procurement@undp.org latest by 13 June 2021 17:00 pm (Turkey Local Time). Thereafter, UNDP will reply by sending Zoom Invitation Link.
6		Site Visit	Will be conducted Date: 07-10 (both inclusive) June 2021 Time: Site visit agenda will be announced latest by 01 June 2021. Venue: Model Factories in Bursa, Ankara, Konya and Kayseri Provinces Important Notes: - Site Visit might be rescheduled/cancelled in case of any restriction on the planned days due to COVID19 Pandemic. In this regard, proposers are advised not to make any travel arrangements until final agenda is announced by UNDP latest by 01 June 2021. - All costs to arise due to change in the site visit date will be borne by the Proposers, and UNDP shall not be held responsible for such costs. - All costs to arise for participation in site visit will be borne by the

			Proposers, including but not limited to international/local flights, ground transportation, accommodation, food, etc.
7	10	Proposal Validity Period	120 days
8	14	Proposal Security	Required in the amount of USD 30.000. Acceptable Forms of Proposal Security is the Bank Guarantee (See Section 6, Form H for template). - This guarantee shall be valid up to 30 days after the final date of validity of proposals (i.e. 150 days starting from the proposal submission deadline) - **This guarantee shall be in English and in USD**. **No change can be made to the template given in Form H except for the indicated fields.** - PDF copy of the Proposal Security shall be submitted as part of e-tendering submission. Additionally, original Proposal Security shall be delivered to the below address latest within 10 calendar days after Bid Submission Deadline. Focal Point: Murat OZERDEN UNDP Yıldız Kule, 21st Floor, Dikmen Mahallesi, Turan Güneş Bulvarı, No:106, 06550, Çankaya, Ankara, Turkey
9	41	Advanced Payment upon signing of contract	Not Allowed
10	42	Liquidated Damages	Will be imposed as follows: If the contractor fails to complete deliverables given in "Section G. Deliverables and Schedules/Expected Outputs" within 135 days following Contract signature, 2% of total contract amount will be imposed per week of delay beyond 190 calendar days after contract signature. Maximum number of weeks of delay is 4, after which UNDP may terminate the contract. Once the total amount of liquidated damages exceeds 10% of the total contract amount, UNDP may terminate the contract.
11	40	Performance Security	Required in the amount of 10% of the total contract amount in the Form of Bank Guarantee Format which will be provided to the successful Proposer along with the award letter. Contract will be signed upon submission of the Performance Security. This guarantee shall be valid until a date 30 days from the date of issuance by UNDP of a certificate of satisfactory performance and full completion of services by the Contractor as per the contract requirements.
12	18	Currency of Proposal	United States Dollar

13	31	Deadline for submitting requests for clarifications/ questions	10 Calendar days before the proposal submission deadline
14	31	Contact Details for submitting clarifications/questions	Focal Person in UNDP: Murat OZERDEN Address: Yildiz Kule, Yukari Dikmen Mah, Turan Gunes Bulvari, No: 106, Cankaya, Ankara, 06550 Turkey E-mail address: tr.procurement@undp.org
15	18, 19 and 21	Manner of Disseminating Supplemental Information to the RFP and responses/clarifications to queries	Posted directly to eTendering and following websites: www.undp.org www.ungm.org www.devbusiness.com www.un.org.tr
16	23	Deadline for Proposal Submission	19 July 2021, 07:00 am (New York Time) as indicated in eTendering system. Note that system time zone is in EST/EDT (New York) time zone.
17	22	Allowable Manner of Submitting Proposals	e-Tendering Only
18	22	Proposal Submission Address	Proposals shall be submitted through UNDP ATLAS e-tendering system which can be accessed through https://etendering.partneragencies.org EVENT ID: TUR10-RFP-21-02 This procurement process is being conducted through the online tendering system of UNDP. Bidders who wish to submit an offer must be registered in the system. Visit this page for system user guides and videos in different languages: https://www.undp.org/content/undp/en/home/procurement/business/resources-for-bidders.html If already registered, go to https://etendering.partneragencies.org and sign in using your username and password. Use "Forgotten password" link if you do not remember your password. Do not create a new profile. If you have never registered in the system before, you can register by visiting the link below and follow the instructions in the user guide (attached): https://etendering.partneragencies.org •Username: event.guest •Password: why2change

			It is strongly recommended to create a username with two parts: your first name and last name separated by a ".", (similar to the one shown above). Once registered you will receive a valid password to the registered email address which you can use for signing in and changing your password. Please note that your new password should meet the following criteria: • Minimum 8 characters • At least one UPPERCASE LETTER • At least one lowercase letter • At least one number You can view and download tender documents with the guest account as per the above username and password, However, if you are interested to participate in the tender, you must register in the system and subscribe to this tender to be notified when amendments are made. **Note:** Although proposals shall be submitted through e-tendering, UNDP reserves the right to request original copies of the documents submitted as part of the proposals during evaluation process, if deemed necessary.
19	22	Electronic submission (eTendering) requirements	▪ File names must be maximum 60 characters long and must not contain any letter or special character other than from Latin alphabet/keyboard. ▪ All files must be free of viruses and not corrupted. ▪ Financial Proposal shall be password protected and Password for financial proposal must not be provided to UNDP unless and until requested by UNDP. ▪ Max. File Size per transmission: 50 MB
20	27 36	Evaluation Method for the Award of Contract	Combined Scoring Method, using the 70%-30% distribution for technical and financial proposals respectively The minimum technical score required to pass is 70% in order to be considered for Financial Evaluation.
21		Expected date for commencement of Contract	*September 2021*
22		Maximum expected duration of contract	190 calendar days after signature of the contract by UNDP and the Contractor
23	35	UNDP will award the contract to:	One Proposer Only

24	39	Type of Contract	Contract Face Sheet for Goods and/or Services http://www.undp.org/content/undp/en/home/procurement/business/how-we-buy.html
25	39	UNDP Contract Terms and Conditions that will apply	UNDP General Terms and Conditions for Mixed Goods and Services http://www.undp.org/content/undp/en/home/procurement/business/how-we-buy.html
26		Tax Exemption	UN and its subsidiary organs are exempt from all taxes. Therefore, Proposers shall prepare their financial proposals excluding Value Added Tax (VAT). It is the Proposer's responsibility to learn from relevant authorities (Ministry of Treasury and Finance) and/or to review /confirm published procedures and to consult with a certified financial consultant as needed to confirm the scope and procedures of VAT exemption application as per VAT Law, Ministry of Treasury and Finance. The contractor selected for the award shall not be entitled to receive any amount over its proposal price in relation to VAT. Overall contract amount to be paid to the contractor shall not exceed the total amount offered in the Financial Proposal.
27		Payment Conditions / Schedule of Payments	Please refer to "Section 5, item N. Price and Schedule of Payments" for details on the Milestones for payments.
28		Currency of Payment	If the Contractor is registered and operating in Turkey, the payment shall be realized in Turkish Liras (TRY). Payment amount will be converted from United States Dollar (USD) to Turkish Liras (TRY) by the UN operational rate of exchange valid on the date of money transfer. Otherwise, the payments shall be affected in United States Dollar. UN Operational Exchange rates can be accessed through https://treasury.un.org/operationalrates/OperationalRates.php
29		Covid-19 Specific Measures	The Proposers shall review all local regulations, as well as that of UN and UNDP concerning the measures they must take during performance of the contract in the context of COVID-19, before they submit their proposals and factor relevant costs, if any, to their proposals. The Contractor shall take all measures against COVID-19 imposed by local regulations as well as by UN and UNDP during performance of the contract to protect health and social rights of its own personnel, as well as UNDP personnel, Project Stakeholders and third parties. As per "Clause 12- Indemnification" of UNDP General Terms and Conditions for Contracts (given in Clause 23 of Section 3. Bid Data Sheet), the Contractor shall indemnify, defend, and hold and save harmless, UNDP, and its officials, agents and employees, from and against all suits, proceedings, claims, demands, losses and liability of any kind or nature brought by any third party against UNDP.

			With respect to above indemnification clause of UNDP General Terms and Conditions, UNDP shall not be held accountable for any Covid-19 related health risks or events that are caused by negligence of the Contractor and/or any other third party.
30		Publishing of award Notice at UNDP Website	Contract award will be posted on corporate UNDP Web site. Notice of award will include the following information: a. name of contractor b. country of contractor c. date of contract signature d. contract amount in US$ e. description of contract

SECTION 4. EVALUATION CRITERIA

Preliminary Examination Criteria

Proposals will be examined to determine whether they are complete and submitted in accordance with RFP requirements as per below criteria on a Yes/No basis:

- Appropriate signatures
- Power of Attorney
- Minimum documents provided.
- Password Protected Financial Proposal
- Proposal Security submitted as per RFP requirements with compliant validity period.

Minimum Eligibility and Qualification Criteria

Eligibility and Qualification will be evaluated on Pass/Fail basis.
If the Proposal is submitted as a Joint Venture, please refer to the table given below which elaborates on the conditions for meeting the minimum criteria

Subject	Criteria	Document Submission requirement
ELIGIBILITY		
Legal Status	Vendor is a legally registered entity	Form B: Bidder Information Form
Eligibility	Vendor is not suspended, nor debarred, nor otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization in accordance with ITB clause 3.	Form A: Technical Proposal Submission Form
Conflict of Interest	No conflicts of interest in accordance with ITB clause 4.	Form A: Technical Proposal Submission Form
Bankruptcy	Not declared bankruptcy, not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against the vendor that could impair its operations in the foreseeable future.	Form A: Technical Proposal Submission Form
QUALIFICATION		
History of Non-Performing Contracts[1]	Non-performance of a contract did not occur as a result of contractor default for the last 3 years.	Form D: Qualification Form
Litigation History	No consistent history of court/arbitral award decisions against the Bidder for the last 3 years.	Form D: Qualification Form
Previous Experience	Minimum 5 years of general experience in the Field as a legally registered entity.	Form D: Qualification Form
	Minimum 2 contracts of similar value, nature and complexity implemented over the last 5 years.	

[1] Non-performance, as decided by UNDP, shall include all contracts where (a) non-performance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Non-performance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

	- Subject contracts must have been implemented in support of the manufacturing industry. - Total cumulative amount of above-mentioned contracts shall not be less than USD 2,500.000. - Amount of each single Contract shall not be less than USD 1,000.000.	
Financial Standing	Minimum average annual turnover shall not be less than USD 3,000,000 for the last 3 years (i.e., 2018, 2019, 2020).	Form D: Qualification Form
	Proposer must demonstrate the current soundness of its financial standing and demonstrate its prospective long-term profitability through submission of its "audited financial statements".	Form D: Qualification Form

Conditions for meeting eligibility and qualification criteria in case of submission as a Joint Venture

Joint Ventures is limited with maximum 3 members including Lead Entity.

In case of Joint Venture, Minimum Eligibility and Qualification Criteria shall be met in line with the following conditions:

No	Subject	Requirement	If bidding as a Single Entity	If bidding as a Joint Venture		
				All Combined	Lead Entity	Other Partner(s)
1	Legal Status	Vendor is a legally registered entity	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
2	Eligibility	Vendor is not suspended, nor debarred, nor otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization in accordance with ITB clause 3.	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
3	Conflict of Interest	No conflicts of interest in accordance with ITB clause 4.	Must meet requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
4	Bankruptcy	Not declared bankruptcy, not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against the vendor that could impair its operations	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement

		in the foreseeable future.				
5	History of Non-Performing Contracts	Non-performance of a contract did not occur as a result of contractor default for the last 3 years.	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
6	Litigation History	No consistent history of court/arbitral award decisions against the Bidder for the last 3 years.	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
7	Previous Experience	Minimum 5 years of general experience in the Field as a legally registered entity.	Must meet Requirement	Must meet Requirement	Must meet Requirement	Must meet Requirement
		Minimum 2 contracts of similar value, nature and complexity implemented over the last 5 years. - Subject contracts must have been implemented in support of the manufacturing industry. - Total Cumulative Amount of above-mentioned contracts shall not be less than USD 2,500.000. - Amount of each single Contract shall not be less than USD 1,000.000.	Must meet 100% of the Requirement	Must meet 100% of the Requirement	The lead entity shall have implemented minimum 1 contract of similar value, nature and complexity over the last 5 years.	Other Member of JV shall have implemented the second contract of similar value, nature and complexity over the last 5 years.
8	Financial Standing	Minimum average annual turnover of USD 3,000,000 for the last 3 years (i.e., 2018, 2019, 2020).	Must meet 100% of the Requirement	Must meet 100% of the Requirement	The lead entity shall meet at least 51% of the requirement	Other member(s) of the JV shall jointly complete the requirements (but demonstrate each individually meet at least 10% of the requirement)

Technical Evaluation Criteria

Summary of Technical Proposal Evaluation Forms		Points Obtainable
1.	Proposer's qualification, capacity and experience	250
2.	Proposed Methodology, Approach and Implementation Plan	500
3.	Management Structure and Key Personnel	250
	Total	**1000**

Section 1. Proposer's qualification, capacity and experience			Points obtainable
1.1	General Organizational Capability which is likely to affect implementation: management structure, financial stability and project financing capacity, project management controls, extent to which any work would be subcontracted.		**50**
	1.1.1	**Management Structure and Organigram (Is it sound and relevant with the requirements?)**	15
		Provided evidence for a functional corporate structure with an effective organigram including departments relevant to services on digital transformation and/or digitalization in the manufacturing industry: 15 pts.	
		Provided evidence for a functional corporate structure with an effective organigram including departments relevant to consultancy services: 10 pts.	
		Provided evidence for a functional corporate structure with an effective organigram not relevant with the requirements: 7 pts.	
		Provided an organigram, without any evidence for a functional corporate structure nor relevancy with the requirements: 3 pts.	
	1.1.2	**General experience in the Field as a legally registered entity**	10
		Older than 15 years: 10 pts.	
		11-15 years: 8 pts.	
		5-10 years: 7 pts.	
	1.1.3	**Financial Stability and Project Financing Capacity in terms of average annual turnover**	10
		Average annual turnover for the last 3 years (i.e. 2018, 2019, 2020) is: *More than USD 10,000,00: 10 pts.* *Between USD 7,000,01 and 10,000,000: 8 pts.* *Between USD 4,000,000 and 7,000,000 7 pts.*	
	1.1.4	**Project management control mechanisms, strength of project management support:**	10
		Proposer has strong project management resources, control mechanisms as part of company standard procedures and related department: 10 pts	

		Proposer has good project management control mechanisms: 7 pts	
		Project management control mechanism has not been sufficiently addressed: 2 pts.	
	1.1.5	**Extent to which any work would be subcontracted, to whom, how much percentage of the work, the rationale for such, and the roles of the proposed sub-contractors and how everyone will function as a team.**	5
		No work would be subcontracted: 5 pts.	
		Less than 10% of the work would be subcontracted: 3 pts.	
		Less than 30% of the work would be subcontracted: 1 pts.	
1.2	***Relevance of specialized knowledge and experience on similar engagements done in the region/country.***		***160***
	1.2.1	***Documented experiences in installation and operationalization of IOT Network in manufacturing industry***	30
		Installation and operationalization of IOT Network more than 5 projects: 30 pts.	
		Installation and operationalization of IOT Network in 3-5 projects: 20 pts.	
		Installation and operationalization of IOT Network in 2 projects: 15 pts.	
	1.2.2	***Documented experiences in installation and operationalization of MES (Manufacturing Execution System) in manufacturing industry***	20
		Installation and operationalization of MES in more than 5 projects: 20 pts.	
		Installation and operationalization of MES in 3-5 projects: 15 pts.	
		Installation and operationalization of MES in 2 projects:10 pts.	
	1.2.3	***Documented experiences in installation and operationalization of ERP System in manufacturing industry***	15
		Installation and operationalization of ERP System in more than 5 projects: 15 pts.	
		Installation and operationalization of ERP System in 3-5 projects: 10 pts.	
		Installation and operationalization of ERP System in 2 projects: 7 pts.	
	1.2.4	***Documented experiences in installation and operationalization of VR/AR Applications in manufacturing industry.***	20
		Installation and operationalization of AR/VR applications in more than 5 projects: 20 pts.	
		Installation and operationalization of AR/VR applications in 3-5 projects: 15 pts.	
		Installation and operationalization of AR/VR applications in 2 projects: 10 pts.	
	1.2.5	***Documented experiences in installation and integration of technological infrastructure (hardware and software described in this document) in manufacturing industry.***	65
		Installation and integration of technological infrastructure (hardware and	

		software described in this document) in a manufacturing environment in more than 3 projects: 65pts.	
		Installation and integration of technological infrastructure (hardware and software described in this document) in a manufacturing environment in 3 projects: 50 pts.	
		Installation and integration of technological infrastructure (hardware and software described in this document) in a manufacturing environment in 2 projects: 30 pts.	
	1.2.6	**Tracked record of successful cooperation with universities/research institutes/chambers or education centers to develop curriculum and methodologies on digital transformation.**	10
		Successful cooperation was made in the past: 10 pts.	
1.3	**Quality assurance procedures and risk mitigation measures. Proposer provided the approach to be deployed for assuring quality of the assignment and mitigating risk.** (The proposers shall submit a risk management plan for all tasks outlined in Section 5. Proposed risk management plan should consist of risk identification and analysis (qualitative and quantitative) as well as risk response planning and monitoring. Risk mitigation matrix shall be produced and submitted in this section as part of Risk Management Plan)		20
	Proposer proposed sound approach for assuring quality and addressed all possible risks and mitigation measures comparable to the market: 20 pts		
	Proposer proposed moderate approach for assuring quality and has not sufficiently addressed all possible risks and mitigation measures comparable to the market: 10 pts.		
1.4	**Organizational Commitment to Sustainability (mandatory weight)**		10
	Organization is compliant with ISO 14001 or ISO 14064 or equivalent – 5 pts.		
	Organization is a member of the UN Global Compact -2 pts.		
	Organization demonstrates significant commitment to sustainability through some other means- 3 pts., for example internal company policy documents on renewable energies or membership of trade institutions promoting such issues		
1.5	**"Gender and Women's Empowerment Policy of the Proposer"** The Proposers shall explain their current gender and women's empowerment policies in place and the facilities especially provided to women employees.		10
Total Section 1			**250**

Section 2. Proposed Methodology, Approach and Implementation Plan		**Points obtainable**
2.1	**Understanding of the requirement: Have the important aspects of the task been addressed in sufficient detail? Are the different components of the project adequately weighted relative to one another?** Describe important aspects of each deliverable and their relevance to each other over the course of the project) – *Outstanding: All important aspects of the task have been addressed in sufficient detail, with comments on the ToR for the successful execution of activities regarding the objectives and expected results: 50 pts.* – *Very Strong: All important aspects of the task have been addressed in sufficient detail: 40 pts.*	50

	– *Strong: Most of the important aspects of the task have been addressed in sufficient detail: 35 pts.* – *Moderate: Only a few important aspects of the task have been addressed by the proposer: 20 pts.*	
2.2	**Description of the Offeror's approach and methodology for meeting or exceeding the requirements of the Terms of Reference** (Detail overall process and prescribe the list of activities to be performed for accomplishment of the contract in accordance with the Terms of Reference. The proposers shall describe all activities they will undertake in detail in order to implement the key tasks outlined in Section 5.F. The proposers are urged to use 5W1H methodology rather than giving responses like "Accepted" or "Will be done" in their explanations.) Proposers should give special importance to showing how previous experience can relate or be applied to this project. The proposers shall also provide information on the allocation of key personnel (total working days for each staff) to each deliverable. This allocation should be compatible with nature of each deliverable) – *Outstanding: Exceeds the requirements of the ToR, with a remarkable strategy to achieve the objective and purposes of the contract: 80 pts.* – *Very Strong: Meets the requirements of the ToR, with a strategy to achieve the objective and purposes of the contract: 70 pts.* – *Strong: Meets the requirements of the ToR: 55 pts.* – *Moderate: Several requirements have been neglected by the proposer: 30 pts.*	80
2.3	**Details on how the different service elements shall be organized, controlled and delivered** (The proposers shall provide the list of all hardware, software, and peripherals to be used for digital transformation of each Model Factory (Ankara, Bursa, Konya, Kayseri) including their specifications separately. The proposers shall describe in detail how they will meet the specifications for hardware, software, and services defined in Section 5.F including installation and integration of IOT System, MES, ERP System, Database Management System, Virtual Reality and Augmented Reality, Pick by Light System, Deployment of Hardware, Integration of all systems, Architecture in line with Automation Pyramid, Use Cases, Developing and Delivering Training Curriculum on Technological Infrastructure) – *Outstanding: The proposed methodology for organization and control mechanisms of each service is excellent. The content of each activity and responsibilities are well defined and exceed the requirements: 80 pts.* – *Very Strong: The proposed methodology for organization and control mechanisms of each service are well structured. The content of major activities and responsibilities are defined and meets the requirements.: 70 pts.* – *Strong: The proposed methodology for organization, control mechanisms of each service are sufficient to meet the requirements: 55 pts.* – *Moderate: Details on how the different service elements shall be organized, controlled and delivered is unsatisfactory. Several important points are missing: 30 pts.*	80
2.4	**Description of available performance monitoring and evaluation mechanisms and tools; how they shall be adopted and used for a specific requirement** (The proposers shall explain their processes for incorporating their quality policy regarding planning, managing, monitoring, and controlling project and product quality requirements in order to meet the stakeholders' expectations including the mechanisms, tools, techniques, and metrics. Proposer shall also submit a communications management plan that provides communications requirements (parties, medium, information type, schedule, escalation processes and timeframes for moving issues upwards in the organization, etc.) among stakeholders (contractor,	60

	subcontractors, Model Factories, UNDP, etc.) Describe involvement of Senior Management in performance monitoring and evaluation process. Please indicate if your company has a performance monitoring and evaluation plan. Prescribe the precautions/actions to be adapted in case of poor performance and undesirable outcome.) – *Outstanding: Performance monitoring and evaluation mechanisms and tools are appropriate with the nature and complexity of the requirements and described in detail for each specific requirement with responsibilities and schedules: 60 pts.* – *Very Strong: Performance monitoring and evaluation mechanisms and tools are appropriate with the nature of the requirements and described in detail for each specific requirement with responsibilities and schedules: 50 pts.* – *Strong: Performance monitoring and evaluation mechanisms and tools are sufficient for the requirement: 45 pts.* – *Moderate: Performance monitoring and evaluation mechanisms and tools are proposed however they are slightly relevant with this requirement: 25 pts.*	
2.5	**Assessment of the implementation plan proposed including whether the activities are properly sequenced and if these are logical and realistic** (The proposers shall estimate activity durations, sequence activities, and submit a project schedule taking tasks outlined in Section 5.F into account and assuming that activities in four Model Factories will be implemented simultaneously. Provide a Gantt Chart or Project Schedule indicating the detailed sequence of activities that will be undertaken and their corresponding timing. Explain how each package contribute overall project) – *Outstanding: Proposed implementation plan is well-developed; all activities are properly sequenced in a logical and realistic way: 200 pts.* – *Very Strong: Proposed implementation plan is well-developed, most of the activities are properly sequenced in a logical and realistic way: 170 pts.* – *Strong: Proposed implementation plan is sufficient, and the activities are properly sequenced in a logical and realistic way: 140 pts.* – *Moderate: Proposed implementation plan is lacking some activities: 120 pts.*	200
2.6	**Demonstration of ability to plan, integrate and effectively implement sustainability measures in the execution of the contract.** (The contractor shall present a sustainability plan covering up to 5 years for the technological infrastructure established at Model Factories including after sales and technical support services (repair & maintenance, hardware and software updates, etc.) together with service quality metrics.) – *Outstanding: 30 pts.* – *Very Strong: 20 pts.* – *Strong: 15 pts.* – *Moderate: 10 pts.*	30
Total Section 2		**500**

Section 3. Management Structure and Key Personnel			Points obtainable
3.2	**Qualifications of key personnel proposed.** (CVs for key personnel that will be provided to support the implementation of this project using the format given in Section 6. CVs should demonstrate qualifications in areas relevant to the Scope of Services.)		***250***
3.2.1	**1 (One) Team Leader**	***34***	**34**
	University Education in Engineering (e.g., industrial, mechanical, mechatronic, electromechanical, product, process, plant) – *PhD: 4 pts.* – *Master's Degree: 3 pts.* – *Bachelor's Degree: 2 pts.*	*4*	
	Years of General Professional Experience – *More than 20 Years: 5 pts.* – *16-20 Years: 4 pts.* – *12-15 Years: 3 pts.*	5	
	Specific Experience relevant to the assignment on the industry 4.0 technologies, and production management systems in the manufacturing industry – *More than 12 Years: 7 pts.* – *9-11 Years: 5 pts.* – *8 Years: 3 pts.*	7	
	Specific experience in managing digital transformation projects in the manufacturing industry. - *More than 8 years: 6 pts.* - *6-8 years: 5 pts.* - *5 years: 3 pts.*	6	
	Number of digital transformation projects managed in the manufacturing industry. *- More than 10 Projects: 7 pts.* *- 6-10 Projects: 5 pts.* *- 5 Projects: 3 pts.*	7	
	International experience relevant to the assignment – *Managed more than 3 relevant projects in a different country than Turkey: 3 pts.* – *Managed more than 1 relevant project in a different country than Turkey: 1 pt.*	3	
	- Language Qualifications: (Fluency in Turkish and English is required.) – *Advanced spoken and written English and Turkish: 2 pts.* – *Advanced spoken and written Turkish and good English: 1 pt.*	2	
3.2.2	**4 (Four) Province Coordinators, 1 (One) for each Province (Ankara, Bursa, Kayseri, Konya)**	**27*4**	**108**
	University Education in Engineering (e.g., industrial, mechanical, mechatronic, electromechanical, product, process, plant) or related field – *PhD: 3 pts.* – *Master's Degree: 2 pts.* – *Bachelor's Degree:1 pt.*	3	

	Years of General Professional Experience – *More than 15 Years: 4 pts.* – *13-15 Years: 3 pts.* – *10-12 Years: 2 pts.*	4	
	Specific Experience relevant to the assignment on the digital transformation, industry 4.0 technologies or production management systems in the manufacturing industry – *More than 12 Years: 6 pts.* – *8-12 Years: 5 pts.* – *7 Years: 3 pts.*	6	
	Specific Experience in managing digital transformation projects in the manufacturing industry. - *More than 7 Years: 6 pts.* - *4-7 Years: 5 pts.* - *3 Years: 3 pts.*	6	
	Number of digital transformation project managed in the manufacturing industry. *- More than 8 Projects: 4 pts.* *- 3 to 8 Projects: 3 pts.* *- 3 Projects: 2 pts.*	4	
	International experience relevant to the assignment – *Managed more than 3 relevant projects in a Country other than Turkey: 2 pts.* – *Managed more than 1 relevant project in a Country other than Turkey:1 pt.*	2	
	- Language Qualifications: (Fluency in Turkish is required and Fluency in English is an asset.) – *Advanced spoken and written English and Turkish: 2 pts.* – *Advanced spoken and written Turkish: 1 pt.*	2	
3.2.3	**4 (Four) Senior Experts, 1(One) for each Province (Ankara, Bursa, Kayseri, Konya)**	**27*4**	**108**
	Education in Engineering (e.g., industrial, mechanical, mechatronic, electromechanical, product, process, plant), business administration, economics or related field. – *PhD: 3 pts.* – *Master's Degree: 2 pts.* – *Bachelor's Degree: 1 pt.*	3	
	Years of General Professional Experience – *More than 13 Years: 4 pts.* – *11-13 Years: 3 pts.* – *8-10 Years: 2 pts.*	4	
	Specific Experience relevant to the assignment on deployment of digital transformation, industry 4.0 technologies, and production management systems in the manufacturing industry – *More than 10 years: 6 pts.* – *7-10 Years: 5 pts.* – *6 Years: 3 pts.*	6	

	Specific Experience in digital transformation projects in the manufacturing industry – *More than 7 years: 6 pts.* – *4-7 years: 5 pts.* – *3 years: 3 pts.*	6	
	Number of digital transformation projects participated in manufacturing sector. *- More than 8 Projects: 4 pts.* *- 3-8 Projects:3 pts.* *- 3 Projects: 2 pts.*	4	
	International experience relevant to the assignment International experience relevant to the assignment – *Managed more than 3 relevant projects in a different country than Turkey: 2 pts.* – *Managed more than 1 relevant project in a different country than Turkey: 1 pt.*	2	
	Language Skills (Turkish is required. English is an asset) – *Advanced spoken and written Turkish and good in English: 2 pts.* – *Advanced spoken and written Turkish: 1 pt.*	2	
Total Section 3			**250**

SECTION 5. TERMS OF REFERENCE

A. Background Information and Rationale, Project Description

UNDP Turkey aims to find practical solutions to Turkey's development challenges and manages projects together with the Turkish Government and other partners to address them. Since 1986 it has implemented over 80 programs across the country. In addition, the UNDP has played a major role in response to crises and disasters in Turkey and the surrounding region. UNDP Turkey has positioned to contribute through three core areas: 1) Inclusive and Democratic Governance (IDG); 2) Inclusive and Sustainable Growth (ISG); and 3) Climate Change and Environment (CCE); and in addition to these core areas, UNDP Turkey is emphasizing the role of Strategic Partnerships that cut across the entire country program as well as regionally and globally.

The ISG Portfolio is geared towards addressing structural economic problems, such as productivity, innovation, the middle-income trap, multi-dimensional poverty, energy security and regional disparities, as well as challenges with social, environmental and economic repercussions, such as urbanization.

"Competitive Production and Productivity", one of the main objectives stated in the 11th National Development Plan is an important topic on the agenda of Turkish Government. Besides, improving productivity levels, particularly in SMEs, is also one of the strategic objectives of Turkey's SME Strategy and Action Plan (2015-2018). In the same vein, Turkey's Productivity Strategy and Action Plan (2015-2018) pays a special attention to productivity levels of the SMEs in the manufacturing industry. Additionally, 2023 Industry and Technology Strategy approaches digital transformation as one of the main drivers of productivity policy. Therefore, the enterprises should strengthen their infrastructure and core capabilities on lean manufacturing, digitalization (within the context of Industry 4.0), quality management, innovative product development, energy efficiency etc. through some well-developed transformation programs and practice-based trainings in order to improve capabilities of technical staff, engineers and mid-level managers.

B. Context

One of the effective solutions applied in many developed countries in the last two decades is to build well-designed training centres including a real didactic manufacturing environment (a real product, a real assembly line, real machines, real processes and real operators) and specialized training programs based on a series of hands-on and step-by-step exercises to improve the manufacturing processes within a "transformation" context. A feasibility study was completed for the appropriate model for Turkey in collaboration with Ministry of Industry and Technology in 2016 within the scope of Applied SME Capability Centre (a.k.a Model Factory) Project. Following the completion of the feasibility study, the Model Factories have been adopted as a policy tool and incorporated into Government Investment Plan in 2017.

In 2017 Ankara Chamber of Industry and Ankara I. Organized Industry Zone joined the Applied SME Capability Centre (a.k.a Model Factory) Project both as funding agencies and implementing partners so that first implementation has been carried out in Ankara. In the meantime, Government adopted these centres as a policy tool and planned several replication actions and funded replication in Bursa. UNDP supported Government endeavors for reaching out additional funding streams along with the national budget to serve this target. UNDP CO mobilized additional funding for the Ministry to replicate this model in Konya and Kayseri through German Development Bank (KfW) funding in 2018. Second component of this Financing Agreement between KfW and UNDP covers activities to support/enlarge activities in Ankara Model Factory, replicate model factories in Kayseri and Konya and support job creation in Ankara, Konya and Kayseri. Finally, with the additional funding allocated from the Public Investment Program to the project budget for the digitalization component of Ankara, Bursa, Kayseri and Konya Model Factories, third extension submitted and was approved by Ministry of Foreign Affairs on 29 April 2020 and the project has been extended until 31 December 2021.

Establishment and improvement of production lines (for training purpose) of Ankara, Bursa, Kayseri and Konya Model Factories and the project activities focusing on lean production is completed. As mentioned above, with the additional funding from the Government, digitalization of production lines in Ankara, Bursa, Kayseri, Konya

is prioritized by UNDP. Ankara Model Factory was established in 2018 after the installation of all machines and equipment, deployment of the core team and completion of Training of Trainers regarding the lean production. After its operationalization in 2018, Ankara Model Factory provided training and consultancy services in lean production for more than 200 companies until now. Through completion of the similar processes, the establishment of Bursa Model Factory was completed in 2019 and Konya and Kayseri Model Factories in 2020. All the model factories have been operational for the time being, offering experiential lean trainings and Learn & Transform Programs. The model factories in these four provinces shall extend their service lines for SMEs with the additional digitalization scenarios after the completion of the goods and services subject to this document.

Within this context, operationalization of the digital transformation component of Ankara, Bursa, Kayseri and Konya Model Factories are crucial for the both the success of the project and the development agenda of Turkey.

C. Specific Objectives

The overall objective of this RFP is to operationalize the Digital Transformation components of 4 Model Factories in 4 provinces, namely, Ankara, Bursa, Kayseri, and Konya. To achieve this objective, UNDP invites capable service providers to submit a proposal in response to this RFP based on the main activities listed below:

1. Provide integrated and standardized solutions for provision and installation of technological infrastructure (hardware and software) in Ankara, Bursa, Kayseri and Konya Model Factories to enable them to deliver theoretical and experiential trainings to SMEs on digital transformation alongside the lean production services and showcase state-of-art technology to SMEs over the course of Contract Implementation.
2. Prepare technological infrastructure training package which will cover curriculum, training materials; and deliver training of trainers (ToTs) for Model Factory Staff in Ankara, Bursa, Kayseri and Konya over the course of Contract Implementation.

D. Current Structure of 4 Model Factories (Ankara, Bursa, Kayseri and Konya)

Detailed information about status and layout of each Model Factory (Ankara, Bursa, Kayseri, Konya) is given as **"Annex I- Current Structure of Model Factories"** uploaded as a separate document among solicitation documents. While preparing their proposals, proposers shall consider the current structure and layout of each Model Factory and their specific products that are used in trainings.

E. Scope

Within the scope of the contract, the Contractor will undertake key activities outlined below for 4 Model Factories located in Ankara, Bursa, Kayseri and Konya Provinces in Turkey. Details of these activities including minimum technical standards to be proposed and applied are elaborated in Section F. Approach and Methodology below.

1. Preparation of a Roadmap for demonstrating how to achieve Contract activities i.e. Installation and Integration of Technological Infrastructure, and provision of Trainings.

Within the scope of Activity 1, Contractor shall develop a roadmap which will detail every step of the approach and methodology to be adopted for performing of the services stipulated in this Terms of Reference starting from the mobilization and up to contract closure.

2. Provision, Installation and Integration of Technological Infrastructure

2.1 Provision, Installation and integration of the Internet of Things infrastructure

Within the scope of Activity 2.1, Contractor shall complete provision and installation of IOT Devices including

additional sensors, RFID system, pick-by-light system, andon lamps and panels, installation of IoT Network, installation and integration of IoT Platform, development of test plans for this work package including use cases and conducting acceptance tests using the approved test plan.

2.2. Provision, Installation and integration of MES

Within the scope of Activity 2.2, Contractor shall complete provision and installation of the MES software, integration of the MES software with the IOT system, development of test plans for this work package and conducting acceptance tests using the approved test plan.

2.3 Provision, Installation and integration of ERP System

Within the scope of Activity 2.3, Contractor shall complete provision and installation of the ERP software, integration of the ERP software with the MES system**,** development of test plans for this work package including use cases and conducting acceptance tests using the approved test plan.

2.4 Development of the Virtual Reality (VR) and Augmented Reality (AR) applications

Within the scope of Activity 2.4, Contractor shall complete development of the VR application and AR applications, development of test plans for this work package including use cases and conducting acceptance tests using the approved test plan.

2.5 Conducting acceptance test of the entire technological infrastructure through application of the use cases defined in this document.

Within the scope of Activity 2.5, Contractor shall develop test plans and conduct acceptance test of the entire technological infrastructure including use cases defined in the following section to ensure that each model factory has a standardized and full functional digital system as defined in this Terms of Reference.

3. Development of Training materials and provision of trainings regarding the Technological Infrastructure installed and integrated.

The contractor shall complete development of the curriculum and the training program on the use of the installed technological infrastructure and delivery of approved training program for staff of Model Factories.

F. Approach and Methodology

This section elaborates on the activities to be conducted by the Contractor within the scope of the Contract. Proposers shall ensure compliance with the minimum requirements stipulated in this section for the required Software, Hardware and associated services including but not limited to preparation of the roadmap and system architecture; installation, integration, commissioning, testing of the systems and provision of related trainings. In their technical proposals, proposers shall ensure to demonstrate compliance with these requirements and elaborate on how to achieve the objective of the Contract.

1. PREPARATION OF ROADMAP FOR PROVISION, INSTALLATION AND INTEGRATION OF TECHNOLOGICAL INFRASTRUCTURE, AND PROVISION OF TRAININGS

Roadmap to be prepared shall consist of 3 components as follows. It shall be finalized within 30 days after contract signature and submitted for UNDP's approval before proceeding with other activities.

- Analysis of the existing state in 4 Model Factories after physical Inspections.
- Establishment of Technological Architecture for each Model Factory.
- Determination of the scope for Curriculum, Training Materials, and delivery of ToTs.

1.1. Analysis and elaboration of the existing state in 4 Model Factories after physical Inspections

The Contractor is expected to elaborate the existing state in Ankara, Bursa, Kayseri, and Konya Model Factories after physical inspection and prepare a requirement specification report for each Model Factory. The requirements specification report shall include the following sections for each subsystem (e.g., IOT infrastructure and platform, MES, ERP) of the technological infrastructure at a minimum:

1.1.1. User classes and characteristics: Identify the various user classes that you anticipate will use this system. User classes may be differentiated based on frequency of use, subset of product functions used, technical expertise, security or privilege levels, educational level, or experience. Describe the pertinent characteristics of each user class. Certain requirements may pertain only to certain user classes. Distinguish the most important user classes for this product from those who are less important to satisfy.

1.1.2. Design and implementation constraints: Describe any items or issues that may affect architecture design options. These might include corporate or regulatory policies; hardware limitations (timing requirements, memory requirements); interfaces within components in the system; specific technologies, tools, and databases to be used; parallel operations; language requirements; communications protocols; security considerations.

1.1.3. Interface Requirements: Describe the logical and physical characteristics of user interfaces, software interfaces (including databases, operating systems, tools, libraries, and integrated commercial components), hardware interfaces, and communication interfaces.

1.1.4. Functional requirements: Describe the capabilities that must be present in order for the users to utilize the services provided by the subsystem of the technological infrastructure.

1.1.5. Performance requirements: State the performance requirements here and explain their rationale, to lead suitable design choices. Specify the timing relationships for real time systems. Make such requirements as specific as possible. You may need to state performance requirements for individual functional requirements or features.

1.1.6. Safety requirements: Specify those requirements that are concerned with possible loss, damage, or harm that could result from the use of the subsystem of the technological infrastructure. Define any safeguards or actions that must be taken, as well as actions that must be prevented. Refer to any external policies or regulations that state safety issues that affect the subsystem of the technological infrastructure's design or use. Define any safety certifications that must be satisfied.

1.1.7. Security requirements: Specify any requirements regarding security or privacy issues surrounding use of the subsystem of the technological infrastructure or protection of the data used or created by the subsystem. Define any user identity authentication requirements. Refer to any external policies or regulations containing security issues that affect the subsystem.

Define any security or privacy certifications that must be satisfied.

1.1.8. Quality requirements: Specify any additional quality characteristics for the subsystem that will be important. Some to consider are adaptability, availability, correctness, flexibility, interoperability, maintainability, portability, reliability, reusability, robustness, testability, and usability. Write these to be specific, quantitative, and verifiable when possible. At the least, clarify the relative preferences for various attributes, such as ease of use over ease of learning.

1.1.9. Other requirements: Define any other requirements not covered elsewhere in the report. This might include internationalization requirements, legal requirements, and so on. Add any new sections that are pertinent to the project.

1.1.10. Glossary: Define all the terms necessary to properly interpret the report, including acronyms and abbreviations.

1.2. ESTABLISHMENT OF TECHNOLOGICAL ARCHITECTURE

The submitted architectural designs (automation and physical) shall address and make references to all the requirements identified and reported within the scope of activity 1.1 to clearly identify the design choices:

1.2.1. Design of the automation architecture

1.2.1.1. Necessary hardware (sensors, field and control busses, gateways, access points, servers, etc.) and their connections

1.2.1.2. Data flow architecture (e.g., which hardware and software component receives/sends which data from/to which hardware and software component for control and information sharing purposes

1.2.2. Design of the physical architecture (location of the components in the Model Factory)

1.2.3. Minimum Technical Requirements for The Technological Architecture

1.2.3.1. The proposed architecture shall be based on the system compliant with the ANSI/ISA-95 standards and the automation pyramid (See Figure 1)

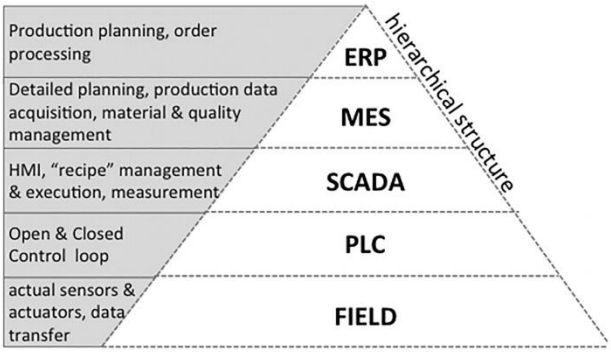

Figure 1. The Automation Pyramid

1.2.3.2. The software in each layer of the automation pyramid shall communicate with the software in both the upper layer and the lower layer. In other words, ERP and MES, MES and IOT/SCADA, IOT/SCADA and PLC, and PLC and Field devices shall be integrated such that bidirectional communication between the layers is achieved. Information on how they are integrated and what data will be communicated for what purpose shall be provided in detail in the proposal.

1.2.3.3. The Proposers shall submit a draft physical architecture and information flow architecture in their proposal considering the requirements and information provided in Section 5 F . The Proposers will be given the opportunity to visit the Model Factories on the specific date that will be announced by UNDP before the submission deadline of proposals.

1.2.3.4. The proposers shall provide all details (the employed hardware, software,

communication protocols, etc, and their technical details) together with explanations and definitions about their proposed architecture. The proposers may take the architecture presented in Figure 2 (below) as a simplified example.

1.2.3.5. The Contractor will be required to submit the finalized architectures upon completion of the "as-is" analysis of the shop floors in the Model Factories. The Contractor will get the approval of the UNDP before the start of the implementation of the architecture.

1.2.3.6. All software (IOT/SCADA, MES, ERP, PLC programming, any necessary software) and hardware (e.g., PLCs, fieldbus, controlbus, sensors, any necessary peripherals and accessories) in the finalized architecture shall be provided and seamlessly integrated to equip the Model Factories with the capabilities described in this document.

1.2.3.7. In order to obtain the required digital data from the machines and devices without numerical control and external data transfer features, necessary infrastructure shall be established, i.e., PLC or a similar additional component, sensors, etc. must be established. It must be guaranteed that all the work to be done for this purpose (adding sensors or similar components, connecting cables, connecting terminals, etc.) shall not affect the warranty coverage of the relevant machines.

1.2.3.8. The capabilities defined for ERP, MES, and IOT shall be considered in total as a turnkey system. In this regard, if a capability requirement can be met via different software, the Proposer has the liberty to provide the capability with the software of its choice. For example, suppose that a capability is expected from the ERP software; however, the proposed MES software has the same capability. In this case, the Proposers may offer to meet the stated capability for ERP with the MES software. The Proposers shall point out such cases, explain the rationale behind their choice, and ensure that all capabilities are fully provided. Any additional requirements for the system to work seamlessly shall be provided by the Proposers.

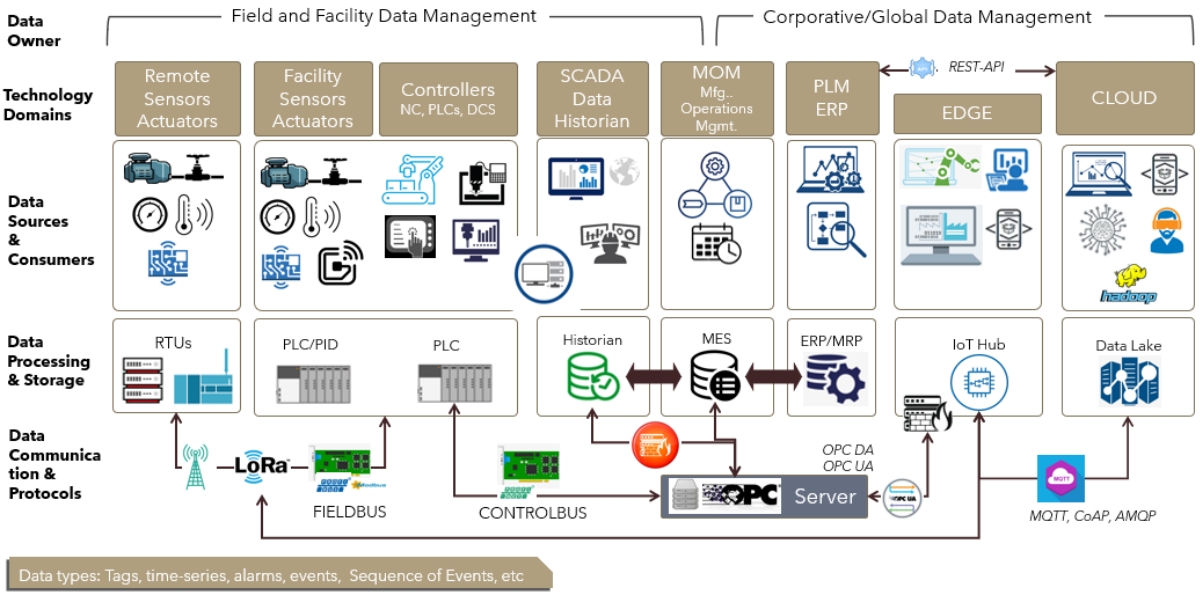

Figure 2. Example architecture of technological infrastructure (hardware and software).

1.3. DETERMINATION OF SCOPE FOR CURRICULUM, TRAINING MATERIALS, PROGRAMS AND DELIVERY OF ToTS.

The contractor is expected to determine the scope of the technological infrastructure trainings in the roadmap. Indicative timeline and schedule shall be submitted with the roadmap to UNDP for Approval prior to start the Activity 3.

2. PROVISION, INSTALLATION AND INTEGRATION OF TECHNOLOGICAL INFRASTRUCTURE

Following sections explain the minimum requirements to be met by Proposers regarding the proposed software and hardware as well as the services to be provided such as installation, integration and testing of the systems and provision of trainings. Estimated quantities of the hardware and software licenses to be supplied within the scope of Activity 2 are listed in Table given at the end of this section. (See Table 1: Estimated quantities for the hardware to be supplied at Page #63).

All the activities stated in this ToR will be implemented in common for each Model Factory (Ankara, Bursa, Kayseri and Konya). However, some minor differences among the Model Factories are also given in blue font in this section to be integrated into the system. The clauses given in blue font will be implemented only in the specified Model Factory not in the other ones. Proposers shall consider these variations when developing their proposals.

2.1. PROVISION, INSTALLATION AND INTEGRATION OF THE INTERNET OF THINGS INFRASTRUCTURE

2.1.1. Installation of new IOT devices

2.1.1.1. Installation of additional sensors as necessary

2.1.1.2. Installation of the RFID system

2.1.1.3. Installation of the pick-by-light system

2.1.1.4. Installation of Andon lamps and panels.

2.1.1.5. Integration of the cobot (Ankara MF) and industrial robot (Bursa MF) where applicable.

2.1.1.6. Integration of AGV (Bursa MF)

2.1.1.7. Integration of AGV and robot for machine-machine collaboration (Bursa MF)

2.1.2. Installation and integration of the IOT network (fieldbuses, controlbuses, gateways, access points, etc.) to connect all machines, devices and equipment.

2.1.3. Installation and integration of the IOT Platform (historians, servers, database system, etc.)

2.1.4. Development of test plans for this work package including use cases to ensure that data are collected as intended, individual applications can be run on individual devices, entire network can be managed via applications from the IOT Platform, collected data are correctly archived, the installed IOT system is fast enough and reliable under load tests (The contractor shall submit test plan including use cases and get approval from UNDP)

2.1.5. Conduct of acceptance tests using the approved test plan.

2.1.6. Minimum number of licenses that will allow the system to function as described in this document shall be provided for each Model Factory.

2.1.7. ASSOCIATED SOFTWARE AND HARDWARE

2.1.7.1. IOT SYSTEM/SCADA

2.1.7.1.1. IOT Network, Gateway and Local/Wide Area Network Connections

2.1.7.1.1.1. The infrastructure (hardware) and the platform (software) shall provide an easy access to sensors and actuators of different nature and diverse specifications (Bluetooth, Bluetooth Low Energy, Modbus, NFC, RFID, LORA, NB-IoT, SigFox, Zigbee, Zwave, SPI, I2C, etc.) in a homogenous and secure way over a TCP/IP network.

2.1.7.1.1.2. The infrastructure and the platform shall be scalable and allow for easy expansion of the network if new devices are added later.

2.1.7.1.1.3. When a sensor or actuator is activated, necessary security checks shall be made, and only authorized devices and users shall have connection permissions. The method by which the platform provides this secure connection shall be explained.

2.1.7.1.1.4. Supported communication protocols by the platform to connect field devices (e.g., machines, robots, sensors) to the infrastructure shall have the state-of-the-art, industrial-grade flexibility and security. All supported protocols shall be explained in detail. Information on and justification of the suitability of these protocols for industrial use shall be provided.

2.1.7.1.1.5. Information on the operating systems that the platform can run on and support shall be provided.

2.1.7.1.1.6. Information on the gateway hardware that the platform supports shall be provided.

2.1.7.1.1.7. Smart gateways are preferred to conventional gateways. All information about the capabilities of gateways shall be provided.

2.1.7.1.1.8. The infrastructure for transferring data from the relevant output unit of the machines and devices with a built-in external data transfer capability to the system shall be established. Any additional components (hardware and software) needed to achieve this shall be provided and installed.

2.1.7.1.1.9. In order to obtain the required digital data from the machines and devices without numerical control and external data transfer features, necessary infrastructure shall be established, i.e., PLC or a similar additional component, sensors, etc. must be established. It must be guaranteed that all the work to be done for this purpose (adding sensors or similar components, connecting cables, connecting terminals, etc.) shall not affect the warranty coverage of the relevant machine.

2.1.7.1.1.10. The cobot (where applicable) shall be integrated with the IOT network and MES for bidirectional data transfer and control purposes**.**

2.1.7.1.2. Data Processing

2.1.7.1.2.1. The platform shall have no restrictions on IOT data model of devices. The infrastructure shall allow for the entry of the data model via both the platform and the devices themselves. The schema shall allow for user-defined data types.

2.1.7.1.2.2. The tenure (how long the data will be stored on the device), frequency of collection, and frequency of uploads to the historians shall be adjustable. It shall be possible to individually set these parameters for a device as well as for different groups of devices together.

2.1.7.1.2.3. The tenure of the IOT data on historians shall be adjustable.

2.1.7.1.2.4. IOT data shall be stored on a device-by-device basis. The platform shall allow data queries on a device as well as on an individual sensor within the device.

2.1.7.1.2.5. Other software (if authorized) shall be able to query and retrieve the most recent values as well as the historical values of any device data.

2.1.7.1.2.6. It shall be possible to display the collected IOT data both graphically and numerically (as a list of numbers).

2.1.7.1.2.7. It shall be possible to export collected IOT data in files. The supported file formats shall be explained.

2.1.7.1.2.8. The platform shall be capable of streaming the collected data to other software with low latency (nearly real-time). The methods used for data streaming shall be explained in detail.

2.1.7.1.2.9. IOT data model, schemas, and other database architecture elements shall be explained in detail. It shall be possible to store the data on open-source SQL and NoSQL systems if required.

2.1.7.1.2.10. It shall be possible to install analytics software on the gateways in order to process and analyze the collected data from the devices on these gateways. The software shall continue to function using historical data even if one or more devices go offline.

2.1.7.1.3. Complex Event Processing (CEP)

2.1.7.1.3.1. It shall be possible to define complex events on individual sensor or device.

2.1.7.1.3.2. It shall be possible to define complex events on a group of sensors or devices.

2.1.7.1.3.3. It shall be possible to define complex events on system wide IOT data.

2.1.7.1.3.4. It shall be possible to define complex events involving the connection status (online, offline) of a sensor, actuator or device.

2.1.7.1.3.5. It shall be possible to define complex events involving a change in a sensor value.

2.1.7.1.3.6. CEP engine shall have a user-friendly graphical interface to facilitate the entry of new event definitions.

2.1.7.1.3.7. The defined events shall be monitored with low latency, approximately in real-time.

2.1.7.1.3.8. Upon the occurrence of a complex event, the CEP engine shall be able to trigger a variety of reactions including:

a. Alerting the designated receivers via e-mail or SMS
b. Invoking a webservice from a designated source
c. Sending a command or a dynamic message to a designated device

2.1.7.1.4. Security and Management

2.1.7.1.4.1. Authorization at device, user, and application levels shall be possible. All security mechanisms implemented in the platform at the device, user, and application levels shall be explained.

2.1.7.1.4.2. It shall be possible to monitor the connection status of field devices on the platform.

2.1.7.1.4.3. If a field device stays offline for a time period that is longer than an adjustable threshold duration, the designated users shall be notified.

2.1.7.1.4.4. The platform shall be able to disconnect any field device and deny its access to the network immediately when required.

2.1.7.1.4.5. A dynamic, user-role-based security and authorization mechanism shall be provided by the platform.

2.1.7.1.4.6. It shall be possible to selectively authorize the connected devices, users, or applications to access the stored data.

2.1.7.1.4.7. The platform shall detect intrusions on the firmware of the devices (e.g., rooting) and inform designated persons upon detection.

2.1.7.1.4.8. Information on all user operations (who, when, what, from which terminal, etc.) shall be logged.

2.1.7.1.4.9. The hardware, software, firmware and other stock-keeping information on devices shall be available on the platform.

2.1.7.1.4.10. The devices shall be able to automatically register themselves in the platform.

2.1.7.1.4.11. The registered devices shall automatically receive configuration data from the platform when activated.

2.1.7.1.4.12. It shall be possible to monitor the hardware and software versions of the devices on the platform.

2.1.7.1.4.13. It shall be possible to monitor information on currently running applications (device by device) on the platform.

2.1.7.1.4.14. The platform shall allow for scheduling of applications to be run or commands to be sent to the devices at specified future dates.

2.1.7.1.4.15. It shall be possible to manage the devices (installation of an application, software update, firmware update, running an application, stopping an application, exporting/deleting logs, resetting, restarting, and reconfiguring devices etc.) remotely using a secure connection.

2.1.7.1.4.16. It shall be possible to manage devices individually or manage groups of devices together. It shall be possible to form and disband groups of devices dynamically (i.e., it shall be possible to define temporary groups).

2.1.7.1.4.17. It shall be possible to grant users access to individual as well as groups of devices.

2.1.7.1.4.18. It shall be possible to manage the platform remotely using a secure connection.

2.1.7.1.5. Application Development and Integration

2.1.7.1.5.1. Application (to be used on connected devices) development kits or methods together with all related documentation and sample codes shall be provided.

2.1.7.1.5.2. Big data and artificial intelligence platforms shall easily be integrable with the IOT platform. The provided IOT platform shall have mechanisms to facilitate the integration of third-party applications, e.g., business intelligence and analytics.

2.1.7.1.5.3. All the necessary information shall be provided for Model Factories to develop their own system-wide management or monitoring applications.

2.1.7.1.5.4. All operations that can be performed using the administration interface of the platform (i.e., all functionality of the interface) shall also be provided as application programming interfaces (APIs).

2.1.7.1.5.5. Documentation, sample codes, and software support for the APIs of the platform shall be provided.

2.1.7.1.5.6. APIs for querying historical IOT data shall be provided with all the necessary documentation.

2.1.7.1.5.7. The platform shall have industrial grade access methods with low latency (virtually real-time) read and writes. The collected IOT data shall be exportable to external systems with the same time efficiency if required. It shall be possible to automatically authorize (or deny) the applications requiring access to the exported data according to their security clearances.

2.1.7.1.5.8. The platform shall provide virtual environments (as test benches) isolated from the live system.

2.1.7.1.6. Miscellaneous

2.1.7.1.6.1. The platform shall support different types of terminals such as kiosks, tablets, touchscreen monitors, smart glasses, Andon panels, legacy text-based terminals.

2.1.7.1.6.2. The platform shall be scalable and easily expandable with respect to the number of connected terminals.

2.1.7.1.6.3. Service level, maximum load and other technical capabilities of the platform shall be clearly documented.

2.1.7.1.6.4. Technical support and periodic software updates shall be provided.

2.1.7.1.6.5. It shall be possible to upgrade the platform software (when an update is available) on-the-fly without requiring a system-wide shut-down.

2.1.7.1.6.6. The platform shall be reliable. The failure of a component shall not be cascaded through the entire system to result in a system-wide failure. Back-up structure and contingency plans for recovery in the case of a component failure shall clearly be documented.

2.1.7.2. PoE NETWORK SWITCH

2.1.7.2.1. The network switch shall have at least 48 (forty-eight) 10/100/1000Base-T ports and at least 4(four) mini-GBIC/SFP ports.

2.1.7.2.2. All 10/100/1000Base-T ports shall be IEEE 802.3at (PoE+) compliant, with a maximum power budget of at least 740 W.

2.1.7.2.3. The mean-time-between-failure (MTBF) shall be at least 300,000 hours.

2.1.7.2.4. The switch shall allow for power supply redundancy if a second power supply is installed. The switch shall have a backup power supply. Power supplies shall be replaceable while the switch is working.

2.1.7.2.5. The proposed switch shall be stackable (up to 8 switches) via dedicated stack ports. No Base-T or SFP ports shall be used for stacking. All Base-T and SFP ports shall remain operational when the switch is stacked. The stacking bandwidth shall be 80 Gbps.

2.1.7.2.6. The backplane bandwidth shall be 216 Gbps. Layer 2 packet forwarding shall be at least 108 Mpps.

2.1.7.2.7. All the UTP ports shall have the TDR feature to detect cable faults.

2.1.7.2.8. Auto MDI/MDI-X shall be supported in all UTP ports.

2.1.7.2.9. All ports shall have LED indicators to provide information about the port speed, Tx/Rx activity, link up/down status, etc.

2.1.7.2.10. The switch shall allow for at least 32,000 MAC addresses.

2.1.7.2.11. The switch shall provide context-based access control using information in packet headers: in L2 via origin/destination MAC addresses, in L3 via origin/destination IP addresses, and in L4 via TCP/UDP port number.

2.1.7.2.12. Each port shall allow for MAC filtering for security, i.e., for each port, it shall be possible to allow only the clients with their MAC addresses in a port-specific pre-defined list.

2.1.7.2.13. The switch shall support IEEE 802.1x – Port-based Network Access Control (PNAC).

2.1.7.2.14. When a new MAC address is recorded or deleted (i.e., when the MAC address table changes), the change shall be reported to the SNMP server.

2.1.7.2.15. IEEE 802.1d - Spanning Tree Protocol (STP), 802.1s - Multiple Spanning Tree Protocol (MSTP), and IEEE 802.1w – Rapid Reconfiguration of Spanning Tree shall be supported.

2.1.7.2.16. All ports shall support IEEE 802.1q VLAN trunking protocol. At least 4000 VLAN IDs and 1000 active VLANS shall be supported. It shall be possible to define port specific VLANs.

2.1.7.2.17. DHCP relay shall be supported, i.e., it shall be possible to direct "DHCP Request Broadcast" packets to a DHCP server on a different VLAN.

2.1.7.2.18. Dynamic VLAN assignment shall be supported.

2.1.7.2.19. The switch shall have QoS (Quality of Service) support. In Layer 2, IEEE 802.1p or in Layer 3, Differentiated Services Code Point (DSCP) priority classes shall be supported. In addition, it shall be possible to prioritize packets using information in packet headers: in L2 via origin/destination MAC addresses, in L3 via origin/destination IP addresses, and in L4 via TCP/UDP port number.

2.1.7.2.20. IEEE 802.3ad - Link Aggregation Groups shall be supported.

2.1.7.2.21. It shall be possible to limit bandwidth on each port on the device.

2.1.7.2.22. The device shall support multicasting. IGMP filtering and IGMP Snooping shall be supported.

2.1.7.2.23. Jumbo frames with at most 9000 bytes of payload shall be supported.

2.1.7.2.24. The administration and monitoring of the device shall be possible via SNMP, telnet, secure shell (SSH), HTTP, SSL, and console.

2.1.7.2.25. Automatic firmware and operating system updates via TFTP shall be possible.

2.1.7.2.26. All ports on the device shall support at least 4 (four) RMON groups.

2.1.7.2.27. Port mirroring shall be supported for detailed real-time traffic analysis.

2.1.7.2.28. Netflow-sFlow shall be supported.

2.1.7.2.29. Necessary accessories (power adapter, power cables, CAT5 UTP cable, etc.) shall be included in the offer.

2.1.7.3. ACCESS POINTS (APs)

2.1.7.3.1. The APs shall support 802.11ac technology in 5 GHz band and 802.11n technology in 2.4 GHz band with the following specifications defined in this section. The proposed APs shall accept both 802.11n and 802.11ac clients simultaneously via a single radio on the 5 GHz band.

2.1.7.3.2. The proposed wireless access devices shall support the 802.11ac standard Wave2 technology.

2.1.7.3.3. The 2.4 GHz radio of the proposed wireless access devices shall have all 802.11ac features in addition to the 802.11n standard.

2.1.7.3.4. There shall be at least 2 radios on the proposed wireless access device, so that the AP shall broadcast simultaneously in the 2.4 and 5GHz frequency bands.

2.1.7.3.5. The proposed wireless access devices shall have 4x4 MIMO support in 5 GHz 802.11ac standard and 2.4GHz 802.11n standard.

2.1.7.3.6. 3 stream MU-MIMO and 1300 Mbps wireless network bandwidth shall be supported for 3 simultaneously connected clients.

2.1.7.3.7. SU-MIMO and 800 Mbps wireless network bandwidth shall be supported for 40 MHz 802.11 ac clients.

2.1.7.3.8. 600 Mbps wireless network bandwidth shall be supported for clients using the 2.4 GHz frequency band in the 802.11n standard.

2.1.7.3.9. In the 2.4 GHz band, 40 MHz HT and VHT modes shall be supported.

2.1.7.3.10. In the 5 GHz band, 80 MHz VHT mode shall be supported.

2.1.7.3.11. The proposed wireless access device shall support at least 800 Mbps in the 2.4 GHz frequency band and at least 1.733 Mbps in the 5 GHz frequency band.

2.1.7.3.12. Each radio shall have Short Guard Interval (400 ns) support. Short Guard interval shall be supported on channels with 20, 40, and 80 Mhz.

2.1.7.3.13. The proposed APs shall support packet aggregation.

2.1.7.3.14. The proposed APs shall support data rates from 6.5 to 600 Mbps and modulation types MCS0 - MCS31 in 802.11n.

2.1.7.3.15. The proposed APs shall support data rates from 6.5 to 1733 Mbps and modulation types MCS0 to MCS9 in 802.11ac.

2.1.7.3.16. The proposed wireless access devices shall support HT in the 20 and 40 MHz frequency bands for the 802.11n standard.

2.1.7.3.17. The proposed wireless access devices shall support VHT in the 20, 40, and 80 MHz frequency bands for the 802.11ac standard.

2.1.7.3.18. The proposed wireless access devices shall have A-MPDU and A-MSDU packet aggregation support for the 802.11n and 802.11ac standards.

2.1.7.3.19. The proposed wireless access devices shall support BPSK, QPSK, CCK modulation types for the 802.11b standard.

2.1.7.3.20. The proposed wireless access devices shall support BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM modulation types for the 802.11a, 802.11g, 802.11n and 802.11ac standards.

2.1.7.3.21. The proposed wireless access devices shall have a transmission power of 24 dBm for the 2.4 and 5 GHz frequency bands.

2.1.7.3.22. The proposed wireless access devices shall automatically detect the devices that support MU-MIMO, so that they can automatically be directed to the closest AP with MU-MIMO support.

2.1.7.3.23. The proposed wireless access devices shall have Client Match support, so that which client connects to which wireless access device shall be automatically determined.

2.1.7.3.24. The proposed wireless access devices shall support Enhanced Client Match technology.

2.1.7.3.25. The proposed wireless access device shall have Advanced Cellular Coexistence support, so that environments with 3G / 4G causes less interference.

2.1.7.3.26. There shall be 3 integrated, downtilt omni-directional antennas on the proposed wireless access device. The antennas shall have spatial diversity, at least 4 dBi for the 2.4 GHz frequency band and 6 dBi for the 5 GHz frequency band.

2.1.7.3.27. The proposed wireless access devices shall have two Ethernet interfaces that support Auto-Sensing Link Speed and MDI/MDX.

2.1.7.3.28. At least 1 UDB 2.0 interface shall be available on the proposed wireless access device.

2.1.7.3.29. The proposed wireless access device shall have a Bluetooth Low Energy (BLE) radio with 4dBm transmission power.

2.1.7.3.30. There shall be LEDs showing the system and radio status on the proposed wireless access devices.

2.1.7.3.31. There shall be a "reset" button on the proposed wireless access device to restore the factory settings.

2.1.7.3.32. There shall be at least 1 (one) RJ-45 console port on the proposed wireless access device.

2.1.7.3.33. The proposed wireless access device shall have a Kensington security slot.

2.1.7.3.34. The proposed wireless access devices shall operate between 0° C and 50° C without any performance degradation or problems.

2.1.7.3.35. The proposed wireless access devices shall operate at 5% to 95% humidity without any performance degradation or problems.

2.1.7.3.36. The proposed wireless access device shall comply with the FCC/Industry of Canada, CE Marked, R & TTE Directive 1999/5/EC, EN 300 328, EN 301 489, EN 301 893, UL/IEC/EN 60950, EN 60601-1-1 and EN 60601-1-2 regulatory domain standards.

2.1.7.3.37. The proposed wireless access devices shall operate with power transmitted over the Ethernet interface (PoE). It shall operate all its radios and support the features specified in this document with 802.3at PoE+, without any additional power source.

2.1.7.3.38. When the APs are turned off and on manually or after sudden power cycles, they shall become operational automatically, without any manual intervention, or an intervention via a central management equipment, or the like.

2.1.7.3.39. All wireless network devices shall broadcast at least 16 (sixteen) visible and serving SSIDs (each operating under independent authorization mechanisms, each receiving service from a different VLAN) at the same time. The encryption and modulation properties of SSID broadcasts shall be adjustable independently.

2.1.7.3.40. At least 255 clients shall be able to connect to each radio on the proposed wireless access device.

2.1.7.3.41. The proposed access points shall detect interferences caused by Wi-Fi or non-Wi-Fi factors in the frequency band they operate, and shall change the operating channel automatically when an adjustable interference threshold is exceeded.

2.1.7.3.42. The proposed wireless access devices shall support Mesh networks.

2.1.7.3.43. While an AP transmits data to other APs in its Mesh network using a radio, it shall also be able to provide service to clients over the same radio at the same time.

2.1.7.3.44. APs shall be able to communicate with the central control unit independently of the VLAN features, IP blocks and subnet addresses of the Ethernet switches between them. An AP in any VLAN shall do all the work described in this document according to the definitions on the central control unit, and shall provide wireless network connection to clients by routing all the traffic through the central control unit.

2.1.7.3.45. The proposed APs shall be able to send all spectrum information of the environment to the central control unit. They shall be configurable using a spectrum analyzer. They shall send the spectrum information of the channel they broadcast on to the central control unit.

2.1.7.3.46. The proposed wireless access devices shall be offered with all installation apparatus and power injectors.

2.1.7.3.47. The proposed wireless access devices shall be offered with the flat surface mounting kits.

2.1.7.3.48. The proposed wireless access devices shall be offered with the wireless network controller unit.

2.1.7.3.49. The proposer shall ensure a uniform connectivity over the entirety of the Model Factory premises. The required number of access points and the details of the architecture shall be explained in the proposed design.

2.1.7.3.50. A "Guest" SSID shall be broadcast for guests in each Model Factory. All activity shall be logged on this "Guest" SSID according to Turkish Republic Law No. 5651.

2.1.7.4. TOUCHSCREEN DISPLAY MONITOR

2.1.7.4.1. The proposed touchscreen display monitors shall have a screen size of at least 65".

2.1.7.4.2. The screens shall have at least 3,840 x 2,160 UHD native resolution (4K).

2.1.7.4.3. The screens shall have a contrast ratio of at least 1100:1.

2.1.7.4.4. The G-to-G (gray-to-gray) response time shall be at most 8 ms.

2.1.7.4.5. The proposed screens shall have anti-glare protection glasses.

2.1.7.4.6. The screen brightness shall be at least 300 nits (cd/m^2) with the protection glass.

2.1.7.4.7. The viewing angles shall be at least 178 degrees (both horizontal and vertical).

2.1.7.4.8. The proposed screens shall have IPS panel technology.

2.1.7.4.9. The proposed monitors shall have multi-touch property (at least 10 points, 5 writing).

2.1.7.4.10. The proposed monitors shall have built-in speakers.

2.1.7.4.11. The proposed monitors shall have embedded writing software. The writing function interface shall realize the functions of writing, magnifying, shrinking, erasing, dragging, and the like. It shall be possible to save annotations to a file. It shall be possible to store these files in the database system explained in this document.

2.1.7.4.12. The proposed monitors shall have at least 2 (two) RS232C, at least 2 (two) HDMI, at least 1(one) RJ45(LAN), at least 3 (three) USB2.0, and at least 3 (three) USB3.0 ports.

2.1.7.4.13. The proposed monitors shall be FCC Class "A" and CE certified.

2.1.7.4.14. The proposed monitors shall have Wi-Fi connectivity.

2.1.7.4.15. The operating system shall be compatible with the system explained in this document. If there are alternatives, the operating system that provides the lowest response time (touch) is preferred.

2.1.7.4.16. The touch response time shall be at most 80 ms.

2.1.7.4.17. The proposed touchscreen display monitors shall be portable, mounted on a floor stand with lockable wheels.

2.1.7.4.18. All the necessary accessories (the stand, power cable, USB cables, RS232C cable, HDMI cable, remote controller, and the like) shall be included in the offer.

2.1.7.5. LED ANDON BOARD DISPLAYS

2.1.7.5.1. The proposed Andon boards shall have full matrix high resolution displays.

2.1.7.5.2. The proposed Andon boards shall have .3" or better resolution for graphic and text applications.

2.1.7.5.3. The proposed Andon boards shall display characters of various sizes from 1" to 10" (The exact values shall be provided)

2.1.7.5.4. The proposed Andon boards shall have displays with dimensions 144 cm x 81 cm. Small variations are tolerable.

2.1.7.5.5. The proposed Andon boards shall display characters in at least red, green, blue, white, and amber.

2.1.7.5.6. The proposed Andon boards shall have aluminum cases.

2.1.7.5.7. The proposed Andon boards shall have at least 1 (one) RS232C, at least 1 (one) RS485, at least 1(one) RJ45(LAN) ports, and Wi-Fi connectivity.

2.1.7.5.8. The control software shall be compatible with the proposed operating system and with the proposed server.

2.1.7.5.9. The control software shall support text, graphics, counters, and international (Turkish) characters.

2.1.7.5.10. The control software shall allow for message scheduling.

2.1.7.5.11. The protection level of the proposed Andon boards shall be at least IP65.

2.1.7.5.12. The proposed Andon boards shall be suspended from the ceiling, or wall-mounted, or mounted on a stand. The administration of each Model Factory shall decide on the mounting option. The necessary accessories for each option shall be included in the offer.

2.1.7.6. INDUSTRIAL TABLETS

2.1.7.6.1. The proposed tablets shall have at least 10", at least Full HD (1080p) TFT LED touchscreens.

2.1.7.6.2. The proposed tablets shall have Intel Core i5 6300U, 2.3 GHz or better CPUs.

2.1.7.6.3. The proposed tablets shall have at least 8 GB DDR4 RAM.

2.1.7.6.4. The proposed tablets shall have at least 256GB solid state disk.

2.1.7.6.5. The protection level of the proposed tablets shall be at least IP65.

2.1.7.6.6. The proposed tablets shall have at least 1 (one) USB 2.0, 1 (one) USB 3.0, and 1(one) micro-HDMI port.

2.1.7.6.7. The proposed tablets shall have built-in microphones and stereo speakers

2.1.7.6.8. The proposed tablets shall have a docking port.

2.1.7.6.9. The proposed tablets shall have GPS, and Wi-Fi connectivity.

2.1.7.6.10. The operating system of the tablets shall be compatible with the proposed IOT/MES/ERP. It shall be possible to use tablets as terminals.

2.1.7.6.11. It shall be possible to login on the system with the correct user-role using tablets by scanning the employee smart cards. The user shall automatically see tasks waiting his/her attention (e.g., replenishment orders).

2.1.7.7. PANEL PC

2.1.7.7.1. The proposed panel PCs shall have at least 15.0", with at least 1024 x 768 px resolution touchscreens.

2.1.7.7.2. The proposed panel PCs shall have Intel Core i5 6500TE, or better CPUs.

2.1.7.7.3. The proposed panel PCs shall have at least 8 GB DDR4 RAM.

2.1.7.7.4. The proposed panel PCs shall have at least 128 GB disk.

2.1.7.7.5. The protection level of the proposed panel PCs shall be at least IP65.

2.1.7.7.6. The proposed panel PCs shall have at least 1 (one) USB 2.0, 1 (one) USB 3.0, and 1(one) micro-HDMI port.

2.1.7.7.7. The proposed panel PCs shall have Wi-Fi connectivity.

2.1.7.7.8. The operating system of the panel PCs shall be compatible with the proposed IOT/MES/ERP. It shall be possible to use panel Pcs as terminals.

2.1.7.7.9. It shall be possible to login on the system with the correct user-role using panel PCs by scanning the employee smart cards. The user shall automatically see tasks waiting his/her attention (e.g., replenishment orders).

2.1.7.7.10. The proposed panel PCs shall be fanless and noise free.

2.1.7.7.11. The panel PCs shall be mounted on machines and/or assembly racks designated by the Model Factories. The Contractor shall provide and install all the necessary peripherals (such as VESA mounts, kits, etc).

2.1.7.8. SMARTWATCHES

2.1.7.8.1. It shall be possible to use smartwatches as a terminal of the technological infrastructure.

2.1.7.8.2. The smartwatches shall be capable of reading and sending QR codes to the technological infrastructure.

2.1.7.8.3. The operating system of the smartwatches shall be compatible with the technological infrastructure.

2.1.7.8.4. The smartwatches shall have Wi-Fi connectivity.

2.1.7.8.5. The smartwatches shall have at least 1.7" IPS LCD displays.

2.1.7.8.6. The smartwatches shall have at least 300 mAh batteries.

2.1.7.8.7. The smartwatches shall have at least 512 MB of RAM and 4GB of storage.

2.1.7.8.8. The smartwatches shall have at least IP65 rating.

2.1.7.9. QR CODE PRINTER

2.1.7.9.1. The QR code printers shall be capable of thermal printing.

2.1.7.9.2. The printers shall have at least 200 DPI printing resolution

2.1.7.9.3. The printing speed shall be at least 100 mm/s.

2.1.7.9.4. The printing width shall be at least 80 mm.

2.1.7.9.5. The printers shall have at least 4 MB of RAM and 4 MB of flash ROM.

2.1.7.9.6. The printers shall have multi-language support, including Turkish.

2.1.7.9.7. The printers shall have at least USB and RS232C connectivity.

2.1.7.10. LED ANDON LIGHT

2.1.7.10.1. The Andon lights shall be tower stack lights with a diameter of at least 50 mm.

2.1.7.10.2. The Andon lights shall have adjustable (10 dB – 100 dB) buzzers.

2.1.7.10.3. The LED Andon lights shall the colors red, yellow, and green.

2.1.7.10.4. The Andon lights shall operate with 802.3at PoE+, without any additional power source.

2.1.7.10.5. It shall be possible to operate the lights over the IOT platform using software as well as manually (i.e., shall have buttons for operators to manually light red, green, or yellow).

2.1.7.10.6. The necessary accessories (e.g. mounting bracket) shall be included in the offer.

2.1.7.11. PICK-BY-LIGHT SYSTEM

2.1.7.11.1. Assembly Station

2.1.7.11.1.1. Parts to be used in the assembly operations at each bench are located inside the boxes on the shelves. Pick-by-light application shall guide the operator at each bench to pick up the correct part by turning on a green light that shows the correct box and thereby eliminate the possibility of the usage of incorrect parts. The green lights shall be turned on in accordance with the order of assembly operations (Figure 3).

2.1.7.11.1.2. When an operator picks up a part in a box, the system shall sense this and turn on the light of the next part to be used automatically without waiting for any action of the operator (e.g., pushing a button, pulling a lever, etc.). Moreover, the system shall update the inventory level.

2.1.7.11.1.3. Pick-by-light system shall be consistent with the process steps in the Standard Operating Procedures (SOPs) and the product tree.

2.1.7.11.1.4. In case the operator reaches out to the wrong box to pick up a part, the system shall warn the operator with a red light. If the operator continues and picks up the wrong part, the system shall warn the operator with a sound, allow the operator to put away the excess part(s), correct the number of remaining items in the box (the number of items in the system shall be updated to the correct value), resume and continue its usual operation via the guidance of lights in accordance with the process steps (See 2.2.5.2.4 Process Management). The sound alarm shall be on until the operator puts the wrong part(s) back into the box. Pick-by-light system will not track fasteners (e.g., nuts, washers, bolts).

2.1.7.11.1.5. If the operator reaches out to the correct box but picks up more than one piece, the system shall allow the operator to put the excess part(s) back into the box, correct the number of remaining items in the box (the number of items in the system shall be updated to the correct value), resume and continue its usual operation via the guidance of lights in accordance with the process steps.

2.1.7.11.1.6. The system shall collect the times between two correct pick-ups in order to track KPIs such as process time, cycle time, lost time (due to the pick-up of the wrong material).

2.1.7.11.1.7. The parts to be used for the assembly operations are placed in the boxes on the shelves at the assembly station. As soon as the last item in a box at the assembly station is used by the assembly operator, the system shall automatically detect this, create a replenishment order, and warn the logistics operator via an interface (e.g., smartwatch, tablet, andon boards). At the same time, an amber light shall be turned on in the backside of the rack to show the logistics operators the locations of the empty boxes. The lights shall not be turned off until the empty boxes are replaced with full boxes.

2.1.7.11.1.8. Upon replacing the empty boxes with the full boxes, the system shall close the replenishment order, turn the amber lights off, and update the inventory status of the parts automatically.

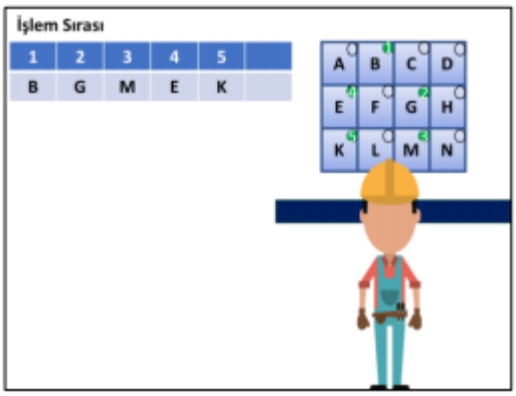

Figure 3. Pick-by-Light for Assembly Line

2.1.7.11.2. Supermarket

2.1.7.11.2.1. Pick-by-light application shall guide the logistics operators to find the correct box in the semi-finished supermarket needed by the assembly station in a short time by turning on the green light for the shelf where the correct box is located (see Figure 4).

2.1.7.11.2.2. Pick-by-light system for semi-finished product supermarket shall work similarly to the system described in Section 2.1.6.11.1.4 through Section 2.1.6.11.1.5 (e.g., when the incorrect box is picked up, the system shall behave as defined in the associated sections).

2.1.7.11.2.3. The logistics operator will collect the empty boxes on the shelves at the assembly station and move them to the semi-finished product supermarket.

2.1.7.11.2.4. When the logistics operator starts processing the replenishment order at the semi-finished product supermarket using an interface (e.g., the tablet), the location of the correct shelf shall be displayed with a green light.

2.1.7.11.2.5. The system shall turn on the green light for the shelves of the supermarket from where the logistics operator will pick up the full box(es).

2.1.7.11.2.6. Upon picking up the box on the shelf at the supermarket, the system will automatically detect this and turn the green light off. The system shall update the inventory status of the parts automatically.,

2.1.7.11.2.7. As soon as a full box at the semi-finished product supermarket is picked up by the logistic operator, the system shall automatically (1) detect this, (2) create a replenishment order, and (3) inform the logistics operator via an interface (e.g., smartwatch, tablet, andon boards). At the same time, an amber light shall be turned on in the backside of the rack to show the logistics operators the locations of the required replenishment. The lights shall not be turned off until shelf is replenished.

2.1.7.11.2.8. Pick-by-light system shall be integrated with the IOT network and MES for bidirectional data transfer and control purposes.

2.1.7.11.2.9. Pick-by-light system will be used to collect necessary data and track the performance of the (assembly and logistics) operators at all processes.

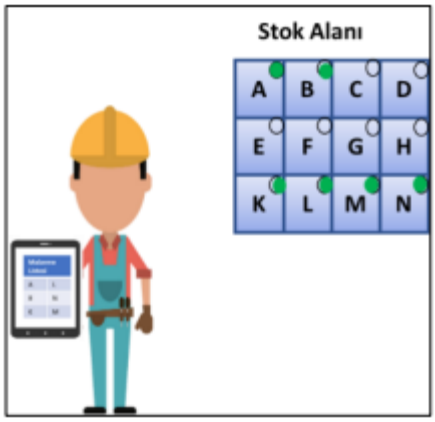

Figure 4. Pick-by-Light for Semi-Finished Product Supermarkets

2.1.7.12. 3D Printer

2.1.7.12.1. 3D Printer shall support the dual-extrusion mode to simultaneously print with separate support and base filaments. It shall also support the single extrusion mode.

2.1.7.12.2. 3D Printer shall have a blackout response system. When a power outage is detected, the printer automatically shall save the position of the printing head to resume from the same spot when the power is back on.

2.1.7.12.3. 3D Printer shall be compatible with several build platforms (e.g., perforated, glass, and other compatible build-platforms).

2.1.7.12.4. 3D Printer shall allow to use different types of base and support filaments (e.g., nylon, PETG, PLA, PVA) and support third-party alternatives in both dual and single extrusion modes.

2.1.7.12.5. 3D Printer shall have Wi-Fi, Ethernet, and USB connection capability.

2.1.7.12.6. 3D Printer shall support Windows operating system.

2.1.7.12.7. 3D Printer shall have a build volume of 265 x 265 x 300 mm.

2.1.7.12.8. 3D Printer shall support different file types (e.g., dxf, stl, 3mf).

2.1.7.12.9. 3D Printer shall be provided with any additional software and peripherals.

2.1.7.12.10. 3D Printer shall allow to track printing process remotely via built-in camera.

2.1.7.12.11. 3D Printer shall be integrated with the IOT network and MES for bidirectional data transfer and control purposes.

2.1.7.13. RFID

2.1.7.13.1. RFID system shall support to track production history (e.g., data on operators, manufacturing dates, inspection results with time stamp) and product genealogy as well as to perform work according to the work instructions (For example, while boxes with RFID tags move on a conveyor, the system shall ensure that the conveyor will work in such a way that each box only visits the machines where the parts are to be processed and bypasses the others by using the information from the RFID tag on the boxes.). Data collected through the RFID system shall be integrated into the MES system that will calculate KPIs such as process time, cycle time, operator OEE, and equipment OEE automatically. In this context, an infrastructure consisting of RFID readers, RFID tags, RFID printer, software, and any other necessary peripherals (cable, etc.) shall be installed and integrated with IOT and MES properly in order to meet the requirements defined in Section 5. F.

2.1.7.13.2. RFID readers shall be installed at appropriate locations throughout the machine and the assembly lines in order to attain the stated goals. The proposers are expected to determine the number and possible locations of RFID readers

during their visits to the Model Factories to be organized by the UNDP. The exact locations of the RFID readers in each Model Factory shall be determined by the Contractor following the analysis of the production layouts and processes in coordination with the Model Factories.

2.1.7.13.3. RFID readers shall (1) work with EPC Class 1 Gen 2 protocol, (2) support ISO 180000-6C standard, (3) work within 865-868 MHz frequency band, (4) have CE a certificate, (5) have a structure that will prevent them from being affected by radio frequency emitted from the devices such as cellular phones, (6) support low level reader protocol, and (7) support PoE (Power over Ethernet).

2.1.7.13.4. Passive RFID tags will be affixed to the material boxes used in the machine line and to the fixtures in the assembly line. However, the Contractor shall make the final proposal considering the needs of the Model Factories.

2.1.7.13.5. RFID tags shall (1) work with EPC Class 1 Gen 2 protocol, (2) support ISO 180000-6C standard, and (3) work within 865-868 MHz frequency band, and (4) have a CE certificate.

2.1.7.13.6. RFID printer shall be compatible with the properties of RFID tags.

2.1.7.13.7. The Contractor shall supply 500 UHF passive RFID tags for each Model Factory (a total of 2000). However, depending on the needs of the Model Factories that arise during the conduct of the project, the aforementioned supply quantity may change.

2.1.7.13.8. RFID system shall be integrated with the IOT network and MES for bidirectional data transfer and control purposes.

2.2. INSTALLATION AND INTEGRATION OF THE MES SOFTWARE

2.2.1. Installation of the MES software

2.2.2. Integration of the MES software with the IOT system

2.2.3. Development of test plans for this work package including use cases to ensure that MES satisfies the expected functionalities and works seamlessly with the IOT system (The contractor shall submit test plan including use cases and get approval from UNDP)

2.2.4. Conduct of acceptance tests using the approved test plan.

2.2.5. ASSOCIATED SOFTWARE

2.2.5.1. MES (Manufacturing Execution System)

MES is a Level 3 software according to ISA-95 standards. MES is expected to (1) collect all real-time data required to provide the production management services detailed below by communicating with the operational level network (sensor network, PLC, IOT, SCADA, etc.), which is in direct connection with the field devices in lower levels (Level 0, 1, and 2) bidirectionally, (2) to process, organize, and store data in a central database, (3) to communicate bidirectionally with the ERP system at a higher level (Level 4) in order to provide enterprise resource planning service detailed below. Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously shall be provided for each Model Factory.

2.2.5.2. Functions Expected from MES Software

The functions to be fulfilled by the MES software in accordance with the MESA-11 model are listed below.

2.2.5.2.1. Product Tracking and Genealogy: MES software shall be able to follow the progress of raw materials and semi-finished products in the manufacturing system in an integrated manner with the RFID system described in this document. MES software shall be able to receive data regarding a given order number, the relevant product tree, route, workbench, and process information from the ERP software and instantly collect and report the processes, the remaining processes, and their durations from raw material to the final product for an order. Both lot tracking and batch tracking shall be possible. Non-serialized components and their batch

information shall be traceable. Detailed genealogy of the finished product (e.g., batch information of the raw material used; machines used in manufacturing the product; processing times of the product at the machines; supervising or process operators; entrance time to the semi-finished product supermarket; withdrawal time from the supermarket for assembly; the assembly table(s) used; the assembly operator(s)) shall be traceable as well. It shall be able to provide inventory tracking support according to item number, storage location, serial number, lot number, and inventory status.

2.2.5.2.2. Resource Allocation and Status: MES software shall monitor and report in real time the status (e.g., defective, busy) of resources (e.g., the machines, raw materials, and operators) as well as what they must do and are doing at the current time. It shall monitor the proficiency level of the operators for using each machine depending on their training. Work order management shall be done in coordination with the ERP software. Work orders shall be traceable visually via terminals such as tablets, andon boards, smart boards, and touchscreen monitors. It shall be possible to send production work orders from an external system (e.g., ERP). The software shall allow to create production work orders manually. It shall be possible to monitor whether the machines allocated to a work order are set up in accordance with the requirements of the work order. If the setup is not proper, the operation shall not be initiated, and the operator shall be warned about the problem. The software shall support inventory allocations and allow automatic allocation of inventory.

2.2.5.2.3. Performance Analysis: It shall be possible to compare the metrics (e.g., cycle time, usage percentage, and semi-finished product stock level) calculated from the collected data with the predetermined target values. For example, machine-based and line-wide OEE calculations shall be made using collected data about machine downtimes and operations performances. It shall be possible to compute the on-time order fulfillment ratio by comparing the order completion times with the order times in the ERP system; to collect and report data regarding wastage; to collect historical maintenance data and calculate average repair time, average uptime, and other related metrics; to calculate production cost through collected data regarding energy consumption and operator time; to report the distribution of past downtime causes; to monitor instantaneously and display historical data about parameters such as machine downtimes, stoppage causes, total production quantity, active work order, active work order production quantity, active work order remaining quantity, wastage quantity, and scrap quantity. The MES software shall allow to add metrics, some examples of which are given above, that will be defined by the Model Factories without a need to change the source code and to purchase additional service.

2.2.5.2.4. Process Management: MES software shall work in integration with the pick-by-light system described in this document. It shall be able to show sequentially what the production workers will work on via terminals such as tablets and touchscreen monitor. If deviations from the SOPs (standard operating procedures) in process components such as machine setting and tool tip are detected, the operator shall be warned. The collected process data (see Section 1.2.5.2.5) shall be monitored in real time and if statistically significant deviations from the process parameters described within quality management framework (see section 1.2.5.2.6) are detected, the operator shall be warned. MES software shall allow the operators to mark the completion of operations and notify the system.

2.2.5.2.5. Data Collection: MES software shall retrieve data regarding operators,

machines and, devices (e.g., 3D printer, andon lights), process data (e.g., erroneous data must be removed, summary statistics must be prepared), and store data for further use (e.g., performance computations or digital transformation training applications). MES software shall allow to access data archive at any time and for any time window. It shall visually display summary information, e.g., OEE, preventive maintenance, predictive maintenance, calculated by processing data via terminals such as tablets, andon panels, and touchscreen monitors.

2.2.5.2.5.1. Data to be Retrieved from the System.

Sample data:

- Machines stop data: The time between machine stop and restart shall be kept. The operator shall be provided with a set of options to select the cause of a machine stop. The options for a machine stop may be as follows:
    - Machine failure
    - Machine setup
    - Material feeding
    - Loss of onset
    - Rework (even if the machine is running, the rework for repair needs to be considered as a time loss)
    - Tool change (When different tools are used on the same material)
    - Waiting for work order

  The software interface shall allow to define a new cause of machine stop other than those listed above without a need to change the source code or to purchase new services.
- Machining time data per material type
- Labor time data per material type
- Machine vibration data
- Consumed power (Watt)
- Tool (e.g., saw) life or tool tip data (specific to tool codes)
- Consumed energy data
- Rotation speed and forward speed
- Pressure, temperature, and PH data of the coolant liquid
- Quality data entry: At the end of the work order or at the end of the day, operator shall be able to enter quality data through terminals such as tablets. The operator shall be provided with a set of options to select the cause of a quality defect and be able to add new defect causes without a need to change the source code or to purchase new services.

2.2.5.2.5.2. Other Data

In addition to the machines/devices in the production line, data shall be collected from andon lights as well. For each machine/device and assembly table equipped with an andon light, data regarding how long, within which time intervals, and why red and yellow lights are on shall be collected and monitored. Data such as product genealogy, remaining inventory, and process times shall be automatically tracked in integration with the pick-by-light and RFID systems defined in this document.

All the aforementioned data shall be considered as a sample rather than being precise. The precise data sets to be collected will be determined by the Contractor in coordination with the Model Factories.

2.2.5.2.6. Quality Management: MES software shall allow the operators to enter quality data (e.g., number of defects, defect type, defect cause) related to product and process characteristics and automatically retrieve data such as process time, energy consumption, and machine vibration. Within the framework of Statistical Process Control (SPC), $\bar{X} - R$, $\bar{X} - S$, p, np, c, u), calculate control limits for control charts, and display control charts on terminals such as tablets,

touchscreen monitors, and andon boards. It shall be possible to add quality characteristics to be tracked (e.g., color, size, number and severity of defects) to the software without a need to change the source code or to purchase new services and to carry out all quality processes on tablets, computers, touchscreen monitors, and/or legacy text-based devices. Quality manuals and procedures shall be accessible online. It shall be possible to manage the resolution of quality problems (including workflow approvals) and rework activities (including tracking of quarantined parts)

2.2.5.2.7. Shipment of Production Units: MES software shall direct and control all ongoing workflows planned in cooperation with the ERP system and support material synchronization. Material flow must be matched with production demands in real time. The software shall recalculate Kanban material refill quantities based on production variables. It shall automatically create work orders for all processes such as production, maintenance, and material supply in the workshop and allow authorization as necessary. It shall be possible to implement all warehouse operations on tablets, computers, touchscreen monitors, and/or legacy text-based devices. The software shall support real-time stock visibility and allow operators to place material replenishment orders from their job sites.

2.2.5.2.8. Detailed Scheduling: The software shall be able to create detailed production schedule in cooperation with the ERP system within the framework of existing orders and production plan. This production schedule shall be displayed on terminals such as dashboard, andon board, and tablet. Production orders shall be created automatically according to the schedule.

2.2.5.2.9. Maintenance Management: MES software shall create a planned maintenance schedule. Moreover, it shall predict machine/device failures, give preventive maintenance alerts, and provide reports by continuously monitoring and analyzing instant data in a predictive manner. It shall be possible to implement all maintenance operations on tablets, computers, touchscreen monitors, and/or legacy text-based devices. Spare parts usage and maintenance work shall be tracked. MTTF (mean time to failure) and MTTR (mean time to repair) measurement and downtime Pareto analysis shall be supported.

2.2.5.2.10. Documentation Control: The software shall allow to carry out standard database operations (insert, delete, update, monitor) for SOPs and product trees (communicating with ERP). SOPs shall be displayed to the operators visually (videos, animations, pictures) and vocally with explanations in written form as necessary via terminals such as tablets and touchscreen monitors. Automatic transitions between the process steps shall be possible while data about the realization times of these operations are transmitted from the relevant sensors, equipment and/or machines to the central system. SOPs shall be displayed in learning mode in operator training: While the details of the operation steps are explained to the operator through visuals and audio, it shall be possible to transition between operation steps manually. Quality manuals and procedures shall be accessible online.

2.2.5.2.11. The system interface shall be multilingual (at least in Turkish and English languages).

2.3. INSTALLATION AND INTEGRATION OF THE ERP SOFTWARE

2.3.1. Installation of the ERP software
2.3.2. Integration of the ERP software with the MES system

2.3.3. Development of test plans for this work package including use cases to ensure that ERP satisfies the expected functionalities and works seamlessly with the MES system (The contractor shall submit test plan including use cases and get approval from UNDP)

2.3.4. Conduct of acceptance tests using the approved test plan.

2.3.5. Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously shall be provided for each Model Factory.

2.3.6. ASSOCIATED SOFTWARE

2.3.6.1. ERP SYSTEM

2.3.6.1.1. Reports

2.3.6.1.1.1. All modules (details of the relevant functionality given in Section 2.3.5.1.4 below) shall be capable of generating detailed reports (as lists) as well as summary reports.

2.3.6.1.1.2. It shall be possible to easily change the formats of all the generated reports without a need to change the source code or purchase additional services.

2.3.6.1.1.3. It shall be possible to query, preview, and track the history (generation date, print logs, etc.) of all the reports in the system.

2.3.6.1.1.4. The access to the report shall be authorized in a user-role-based manner.

2.3.6.1.2. Security and Management

2.3.6.1.2.1. It shall be possible to authorize users individually or by user groups for all operations.

2.3.6.1.2.2. The operations of all users (who, when, from which terminal, what, etc.) shall be logged.

2.3.6.1.2.3. The same window in the interface shall have multiple views based on the user-role. The user shall operate on his/her version of the interface, where the version is determined based on the user-role.

2.3.6.1.2.4. The access to the fields of the records in the database shall be authorized according to the user-role.

2.3.6.1.3. User Interface

2.3.6.1.3.1. The system interface shall be multilingual (at least in Turkish and English languages).

2.3.6.1.3.2. It shall be possible to print and export the contents of the windows. The supported file formats for exporting shall be explained.

2.3.6.1.3.3. The users shall be able to introduce macros and shortcut keys.

2.3.6.1.3.4. It shall be possible to work with multiple windows simultaneously.

2.3.6.1.3.5. It shall be possible to import, attach, and save relevant third-party files in each window.

2.3.6.1.4. Functionality

2.3.6.1.4.1. The ERP software shall be modular, and it shall provide only the functionality explained below with only the related modules, without requiring irrelevant modules to be present. Ideally, each function shall be associated with one module. The detailed information on the modules, and which module addresses which function shall be provided.

2.3.6.1.4.2. The inventory levels of raw material (including the inbound traffic) and finished products (including the outbound traffic) shall be tracked and reported in cooperation with MES. All the relevant data (e.g., from which supplier, when, to which customer, at what price, etc.) shall be tracked. The tracking shall be done in a lot-by-lot resolution (e.g., the same raw material

from the same supplier may have different prices at different times). Stock entry and exit transactions shall be automatically accounted by updating the relevant accounts in the relevant ledgers.

2.3.6.1.4.3. It shall be possible to track the semi-finished-product inventory levels in cooperation with the MES software.

2.3.6.1.4.4. The MES software will have the capability of tracking the genealogy of the manufactured products. Hence, all the necessary raw material information (serial number, lot number, supplier ID, when the raw material has been accepted to the warehouse, etc.) shall be shared with the MES software.

2.3.6.1.4.5. Incoming orders shall be tracked (date, order size, involved products, etc.)

2.3.6.1.4.6. Each order shall be tracked (which products are relevant, how many of them will be met from the finished goods inventory, how many of them will be manufactured, at what stage of production the manufactured parts are, etc.).

2.3.6.1.4.7. Sales shall be automatically accounted by updating the relevant accounts in relevant ledgers.

2.3.6.1.4.8. The accounting module shall be fully functional for other accounting activities (balancing the accounts; automatic preparation of statements such as balance sheets, income tables, statements of cash flows; end of financial year closing activities, preparing the ledgers for the new financial year, etc. in accordance with the Turkish laws and regulations).

2.3.6.1.4.9. The accounting module shall be capable of automatically generating up-to-date internal reports related with managerial (cost) accounting (e.g., allocated inventory costs, operational costs) in coordination with the MES software).

2.3.6.1.4.10. The currency of the accounts shall be TRY but the accounting module shall automatically obtain up-to-date exchange rates from the Central Bank of the Republic of Turkey and convert the currency of the accounts to USD or EUR if required.

2.3.6.1.4.11. The ERP software shall keep track of the human resources. In addition to conventional demographic information database, payroll management, benefits management, staff appraisal, organizational structure, workflow management, leave management, and recruiting management functionalities, high resolution details such as the training levels and performance measures of the operators shall be accessible in coordination with the MES software.

2.3.6.1.4.12. Customer orders shall be managed and tracked by the ERP software (e.g., products to manufacture and outsource is, the quantities of products to be met from the inventory). Necessary work orders shall be automatically formed.

2.3.6.1.4.13. Work orders shall be managed and tracked in cooperation with the MES software (which work orders are released to the shop floor, at what stage of production each released work order is, what the cumulative incurred cost in each released work order is, which orders are waiting for release, what the estimated completion times are, etc.).

2.3.6.1.4.14. When an order is accepted and relevant work orders are generated, related purchasing orders shall automatically be formed and released as well. The purchasing orders shall be tracked (when the purchasing order has been formed, which raw material, which supplier, what is the estimated time of arrival, etc.)

2.4. DEVELOPMENT OF THE VIRTUAL REALITY AND AUGMENTED REALITY APPLICATIONS

2.4.1. Development of the VR application

2.4.2. Development of the AR application

2.4.3. Development of test plans for this work package including use cases (The contractor shall

submit test plan including use cases and get approval from UNDP)

2.4.4. Conduct of acceptance tests using the approved test plan.

2.4.5. Necessary licenses for one user shall be provided for each Model Factory.

2.4.6. ASSOCIATED SOFTWARE

2.4.6.1. VIRTUAL REALITY SOFTWARE

2.4.6.1.1. The virtual reality software shall provide training on assembly operations for every bench in the assembly lines of Model Factories. The aim is to provide a learning-by-doing experience in a virtual environment for the operators after they study the assembly operations from SOPs.

2.4.6.1.2. When an operator wears the VR headset and starts the VR software, it shall be possible to select the assembly bench from the main menu. After the selection, the operator shall be at a virtual assembly bench, with all components (e.g., racks, boxes, parts, bench, fixtures, etc.) present.

2.4.6.1.3. The components shall have realistic textures and shall be to the scale, based on 3D CAD data, i.e., an exact virtual copy of the real counterparts.

2.4.6.1.4. It shall be possible for the operator to carry out the assembly operations in the virtual world. All real-life operations shall be possible (i.e., all rotation and relocation of 3D virtual objects shall be implemented).

2.4.6.1.5. Work instructions (text, visual, and sound) shall be supplied as the trainee operator tries to carry out the operations.

2.4.6.1.6. When the operator successfully carries out all the operations in his/her bench, the program shall terminate.

2.4.6.1.7. It shall be possible to watch what the operator sees/hears in his/her virtual environment from an outside terminal such as touchscreen monitors or tablets.

2.4.6.1.8. Any necessary additional hardware including VR headsets shall be included in the offer.

2.4.6.2. AUGMENTED REALITY SOFTWARE

2.4.6.2.1. The augmented reality software shall provide guidance to assembly operators on operations for every bench in the assembly lines of Model Factories.

2.4.6.2.2. The augmented reality application shall be able to identify the relevant assembly step by processing the video feedback from integrated camera of the smart glasses.

2.4.6.2.3. The application shall provide work instructions (text, visual, and sound) to assembly operator by highlighting the relevant parts of the workpiece while carrying out operations.

2.4.6.2.4. The application shall detect deviations from the SOP of the relevant assembly step (e.g., the part is held with the wrong hand or held upside-down) and warn the operator by displaying error messages on the smart glasses.

2.4.6.2.5. It shall be possible to watch what the operator sees/hears in his/her environment (camera feedback of smartglasses plus computer-generated perceptual information) from an outside terminal such as touchscreen monitors or tablets.

2.4.6.2.6. The software shall allow for development of new applications by the Model Factory staff.

2.4.7. ASSOCIATED HARDWARE

2.4.7.1. SMARTGLASSES

2.4.7.1.1. The smartglasses shall have an integrated full HD, autofocus camera (at least 8 MP).

2.4.7.1.2. The smarglasses shall have integrated stereo speakers.

2.4.7.1.3. The smarglasses shall have an integrated noise-cancelling microphone.

2.4.7.1.4. The smartglasses shall have a full HD (1080p) 24-bit full OLED display (whether it is on the left- or the right-hand side shall be set by the user

2.4.7.1.5. The smartglasses shall be adjustable to the user's head size.

2.4.7.1.6. The smartglasses shall have wireless connection capability (Wi-Fi and Bluetooth)

2.4.7.1.7. The smartglasses shall have at least 6 GB RAM and 64 GB internal memory (expandable by at least another 64 GB via a microSD card).

2.4.7.1.8. The field of view (FoV) shall be at least 50 degrees.

2.4.7.1.9. The smartglasses shall be controlled by eyes and hands with haptics.

2.4.7.1.10. The IP rating shall be at least IP 67, water resistant to 1 meter and no dust intrusion. The glasses shall be drop tested (2 meters).

2.4.7.1.11. The smartglasses shall be compatible with AR applications.

2.4.7.2. VR HEADSETS

2.4.7.2.1. The VR headsets shall have LCD panels with resolution at least 1832 x 1920 px per eye with at least 60 Hz refresh rate.

2.4.7.2.2. The VR headsets shall have at least one USB connector.

2.4.7.2.3. The VR headsets shall support both positional and orientation tracking (i.e., shall support tracking with at least 6 Degrees-of-Freedom (DOF).

2.4.7.2.4. The VR headsets shall have integrated audio (headphones).

2.4.7.2.5. The VR headsets shall have at least 6 GB of memory.

2.4.7.2.6. The VR headsets shall support lens distance adjusting.

2.4.7.2.7. The VR headsets shall have their own CPU, i.e., shall not require any external compute.

2.4.8. Additional Hardware and Software required to work with the whole system.

2.4.8.1. DATABASE MANAGEMENT SYSTEM

2.4.8.1.1. The database management system shall seamlessly work with the IOT Platform, MES, and the ERP software.

2.4.8.1.2. It shall be possible to back up the stored databases on an external data warehouse (e.g., on a server in the Model Factory premises outside the IOT/MES/ERP system or on a cloud server).

2.4.8.1.3. The database management system shall support the process of extracting, transforming, and loading data into a new host source (ETL) to optimize the data for analytics.

2.4.8.1.4. The database management system shall support Online Analytical Processing (OLAP) operations.

2.4.8.1.5. The queries, reads, and writes shall have industrial grade low latency.

2.4.8.1.6. The reporting services shall be web-enabled. It shall be possible to generate reports that pull content from various data sources.

2.4.8.1.7. It shall be possible to copy and distribute data and database objects from one database to another and then synchronize between databases to maintain consistency and integrity of the data via server replication.

2.4.8.1.8. The security, subscribers (of server replication) and users shall be centrally managed.

2.4.8.2. SERVERS

2.4.8.2.1. Servers shall be rack servers with the form factor of at least 2U.

2.4.8.2.2. The central processing unit(s) of the server shall be in 64-bit architecture.

2.4.8.2.3. There will be at least 2 physical CPU slots on the server.

2.4.8.2.4. There will be at least 1 CPU with at least 2.2GHz operating speed on the server.

2.4.8.2.5. Each of the CPUs on the server shall have at least 10 cores.

2.4.8.2.6. There shall be at least 13MB of L3 cache memory on each of the CPUs on the server.

2.4.8.2.7. There shall be at least 64GB DDR4 memory (RAM) with at least 2667 Mbps data transfer rate. The memory modules on the server shall be manufacturer certified.

2.4.8.2.8. The server must support ECC, SDDC, Memory Mirroring, Memory Rank Sparing, Patrol Scrubbing and Demand Scrubbing features. If any of these features are not supported, the amount of memory shall be at least 128 GB.

2.4.8.2.9. There shall be at least 24 memory slots on the server.

2.4.8.2.10. It shall be possible to install at least 8 2.5" disks.

2.4.8.2.11. On the server, there shall be at least 3 SAS hard disks, each with a capacity of at least 1 TB, which can be removed and installed during operation.

2.4.8.2.12. On the server, there shall be at least 1 SAS RAID controller with at least 2 GB cache memory, flash protection, and 12Gb/s data transfer rate. The RAID controller shall have support for RAID levels 0/1/10/5/50/6/60.

2.4.8.2.13. There shall be at least 4 (four) 1Gb RJ45 ethernet ports on the server. These ethernet interfaces can be onboard.

2.4.8.2.14. There shall be 1 (one) 1Gb RJ45 standard remote access and management interface on the server.

2.4.8.2.15. There shall be the highest number of PCIe Gen 4 expansion slots supported by the operating system.

2.4.8.2.16. On the server, there shall be at least n+1 redundancy in terms of power supplies, each of which has a capacity of at least 750W and can be removed and installed during operation. Power supplies shall have 80 PLUS Platinum certifications.

2.4.8.2.17. On the server, there shall be cooling units that can be disassembled and installed during operation, and that work with redundancy. The number of such cooling units shall be the highest number supported by the system.

2.4.8.2.18. There shall be a management module integrated on the server, which communicates wirelessly over bluetooth. With this module and the manufacturer's software, general BIOS settings, IP configuration and boot devices shall be accessible and configurable via mobile platforms.

2.4.8.2.19. The server's power control, power limitation, health status monitoring of the components, firmware updates, virtual media redirection shall be managed from a single screen. These features shall be provided by the embedded capabilities of the server's operating system and there shall be no need to install additional management softwares.

2.4.8.2.20. On the servers, there shall be a management module that provides remote access to the servers and that performs administrative activities. Server configuration management shall be done with this processor. If additional license is required for server configuration management, it shall be included in the offer.

2.4.8.2.21. The server management processor shall be at least 800MHz and dual-core, with at least 8GB of internal NAND-enabled memory.

2.4.8.2.22. There shall be a provisioning tool on the server. A chip that is integrated on the server shall determine the recommended or customized settings required before the installation of the operating system. After these processes are completed, the operating system installation media shall be accessible via DVD reader, USB memory or network.

2.4.8.2.23. There shall be automatic fault notification.

2.4.8.2.24. Via the server management module, the health status of the servers shall be

observed, and alarms shall be generated in case of any malfunction.

2.4.8.2.25. There shall be an LCD / TFT screen on the servers and in case of any component failure, the screen shall give color-coded information about the failure on this screen.

2.4.8.2.26. Servers shall be able to be turned on and off remotely with a virtual power feature. Even if the operating system is down or the server is turned off, the management processor of the server shall be accessible and the server shall be remotely bootable.

2.4.8.2.27. Servers shall support virtual media: a USB stick, CD, DVD, etc. connected to a remote computer shall be usable on the server as if they were connected to the server.

2.4.8.2.28. Power consumption reports of the servers, instantaneous power usage, temperature conditions shall be monitored. It shall be possible to limit the power consumption via the management module. This feature shall also be available for all VMs on the server.

2.4.8.2.29. The management module, regardless of operating system, shall keep the logs of power on/offs, resets, successful and unsuccessful login attempts, etc.

2.4.8.2.30. The server management software shall automatically update the drivers and firmware.

2.4.8.2.31. The server management module shall have HTML5 support and the system shall be managed without any additional agent or add-on.

2.4.8.2.32. The server management module shall be able to fully manage the RAID card on the server to make the RAID configuration of new disks and to increase capacity by adding these disks to existing RAID groups.

2.4.8.2.33. The management module shall check the security and authenticity of the files for BIOS and firmware updates via certificates. It shall have a permanent safe memory on the hardware that shall protect the security certificates against attacks.

2.4.8.2.34. The memory, CPU, and disks shall give pre-failure warnings. These pre-failure warning with related information shall be deemed sufficient evidence by the manufacturer or the service provider to replace the component before it actually fails.

2.4.8.2.35. Hardware and health information of the servers shall be accessible through a web page. From this web page, previous malfunction information of the servers, warranty status, malfunction tickets opened to the manufacturer, etc. shall be monitored.

2.4.8.2.36. There shall be a lockable guard that prevents unauthorized access on the front of the server.

2.4.8.2.37. Necessary rack cabinets (25U, portable on wheels, weight capacity of 1000 kg, and with grounding lugs, temperature-controlled cooling fans, leveling feet, removable side panels and a lockable glass door) for the servers shall be included in the proposal. The detailed information about the cabinets shall be provided.

2.4.8.2.38. The operating system shall be included in the offer. The detailed information on the proposed operating system and the justification thereof shall be provided. The Contractor shall ensure that the operating system works seamlessly with the technological infrastructure (hardware and software) described in this document.

2.4.8.3. SERVER VIRTUALIZATION

2.4.8.3.1. The proposed virtualization software shall be a bare metal (i.e., Type 1 or native) hypervisor.

2.4.8.3.2. The proposed virtualization software shall be scalable, supporting virtual servers with 128 virtual CPUs and 1 TB virtual RAM.

2.4.8.3.3. The proposed virtualization software shall support memory

overcommitment and memory compression.

2.4.8.3.4. The proposed virtualization software shall allow forming server clusters of virtual servers.

2.4.8.3.5. The proposed virtualization software shall allow dynamic expansion of the file system for each virtual machine (i.e., without turning the virtual machine off first).

2.4.8.3.6. The proposed virtualization software shall support thin provisioning, i.e., allocating more storage as needed.

2.4.8.3.7. The proposed virtualization software shall provide an administration center to monitor and control all the virtual machines using a single interface.

2.4.8.3.8. The proposed virtualization software shall monitor, log, and report parameters such as CPU, memory, disk and network usage by each virtual machine.

2.4.8.3.9. The proposed virtualization software shall allow for assigning different VLANS to different virtual servers.

2.4.8.3.10. The proposed virtualization software shall allow for taking mirrors of running virtual machines (i.e., without turning off the virtual machine first).

2.4.8.3.11. The proposed virtualization software shall support all the operating systems employed in the technological infrastructure.

2.4.8.3.12. The proposed detailed architecture of virtual servers and all their connections (including to the database management system, to NAS units, etc.) shall be explained in the proposed design.

2.4.8.3.13. The proposed virtualization software shall be used in conjunction with an SAN (storage area network). The SAN shall be a high-speed network that connects the two physical servers to high performance storage subsystems. The storage subsystems and the SAN shall be proposed, provided and installed by the Contractor.

Below table 1 demonstrates the quantities of Hardware and Software Licenses to be supplied within the scope of Activity 2.

In addition to below table, Proposers shall identify the quantities for hardware including but not limited to server, server cabinet, rack, switch, access point, UPS, peripherals, portable storage device, sensors, RFID readers, RFID cable, RFID tags, RFID tag mounting apparatus, light barriers, control panels, etc. and software including but not limited to operating systems on servers, database software, firewall, AR/VR software, etc. in line with the requirements of the Model Factories for achieving full-fledged digitally transformed systems as per the scope and objectives stipulated in this Terms of Reference. To that purpose, Proposers shall demonstrate their approach in their methodology to be proposed as part of their technical proposal. The proposers shall include the cost of identified additional software and hardware in their all-inclusive financial proposals.

Table 1: Estimated quantities for the hardware to be supplied

Requirements	Ankara	Bursa	Kayseri	Konya
Andon Lights	7 (seven) andon lights, 5 (five) for each assembly table, 1 (one) for the saw station, 1 (one) for the washing station.	2 (two) andon lights, 1 (one) for assembly table, 1 (one) for bending machine.	7 (seven) andon lights, 5 (five) for each assembly table, 1 (one) for the saw station, 1 (one) for the washing station.	N/A
Virtual Reality Headsets	2 (two)	2 (two)	2 (two)	2 (two)

Augmented Reality Smart Glasses	2 (two)	1 (one)	2 (two)	2 (two)
3D Printer	1 (one)	1 (one)	N/A	1 (one)
Smart Watches	2 (two)	2 (two)	2 (two)	2 (two)
Industrial Tablets	N/A	5 (five)	N/A	1 (one)
Panel PCs	11 (eleven)	4 (four)	2 (two)	7 (seven)
Touchscreen monitor	1 (one)	1 (one)	1 (one)	1 (one)
Andon Boards	2 (two)	2 (two)	2 (two)	2 (two)
Servers and any necessary peripherals	2 (two)	2 (two)	N/A	2 (two)

2.5. ACCEPTANCE TEST OF THE ENTIRE TECHNOLOGICAL INFRASTRUCTURE USING THE USE CASES DEFINED IN THIS SECTION

2.5.1. TECHNICAL REQUIREMENTS FOR USE CASES

The technological infrastructure to be installed in the Model Factories shall support at least the following use cases.

2.5.1.1. Human-Robot and Machine-Machine Collaboration

Cobots are robots intended for direct human-robot interaction within a shared space where humans and robots work in close proximity. One of the following alternative use cases shall be implemented for Ankara Model Factory that has a cobot.

- A cobot shall replace one of the operators in the assembly line and work with the remaining operators in the assembly of the product.
- A cobot shall replace one of the operators in the machine line.

Bursa Model Factory has an industrial robot and an AGV. A use case where the industrial robot place items on AGV for transportation shall be implemented for Bursa Model Factory.

Any necessary programming and integration requirements shall be satisfied by the Contractor.

2.5.1.2. Digital assistance system (SOP)

Work orders shall be sent to the operator who will work at the assembly line and at the machine line (e.g., saw, lathe, miller) through the system (e.g., ERP, MES, and IOT). The operators shall access the work orders using the interface (e.g., tablets). In order to assist the operators with the conduct of the work order, SOPs relevant to the work orders shall be provided to the operators on the interface visually (videos, animations, pictures) and vocally with explanations in written form as necessary. The operators shall enter any relevant data (e.g., the cause of machine stop or defective product, using safety quality stock, etc.) about the process steps through the interface. In order to ensure the traceability of the processes, relevant data from the sensors, machines, devices, and operators shall be collected and transferred to the relevant systems for further use (e.g., the computation of KPIs).

SOPs shall be displayed to the operators in two modes:

- Learning Mode: The operator shall move from one step to another manually at his/her own pace to learn or to remember the details of an operation.
- Production Mode: Transitions from one step to another shall be automatic and the data regarding the realization of steps of an operation shall be collected from relevant sensors, machines, devices, equipment, and operators to be transferred to the relevant systems for further use.

2.5.1.3. Condition monitoring

The values of key parameters (OEE, downtimes and their causes, total production quantity, active work order, active work order production quantity, active work order remaining quantity, the quantity of scrap, rpm,

vibration, power, energy consumption, PH, pressure, etc.) for all machines, devices, equipment, and operators shall be viewed live and historically (for appropriate parameters) for a given time period through interfaces (e.g., tablets, touchscreen monitors, andon panels) connected to the system. The user shall be able to select the parameters for machines, devices, equipment, and operators collected or calculated to display on the interfaces separately (e.g., per machine) or as a whole (e.g., machine line or assembly line). How the selected parameters will be displayed shall be determined in coordination with the Model Factories.

The system shall monitor whether the parameter values are within the predetermined ranges and shall alert the operators or the relevant personnel through interfaces (e.g., andon panels, monitors, smartwatch) when the parameter values are out of the range. The user shall be able to determine the ranges of the parameters for which an alert will be created. An alert shall also be created when there is a breakdown at any point in the factory or when the operator stops the process using an andon button.

The Contractor has the flexibility to determine which software (e.g., ERP, MES) will implement the tasks defined in the context of this use case.

2.5.1.4. Digital quality management

Within the framework of Statistical Process Control (SPC), qualitative and quantitative control charts (e.g., $\bar{X} - R, \bar{X} - S, p, np, c, u$) shall be created automatically for quality characteristics (e.g., color, size, number and severity of defects) to be tracked using data collected through the system. Control limits for control charts shall be calculated automatically and control charts shall be displayed on terminals such as tablets and monitors. The user shall be able to add new quality characteristics to be tracked without a need to change the source code. When the values go beyond the control limits, an alert shall be created by the system.

2.5.1.5. Pick-By-Light for Assembly and Logistics Operation

Pick-By-Light system installed at the assembly station and the digital SOP application shall be used in an integrated manner. The assembly operator shall pick up the parts in the boxes on the shelves in the correct order and from the correct box by following the green lights that become on in accordance with the order of assembly operations. All capabilities defined for Pick-By-Light system in Section 2.1.6.11 shall be incorporated into the use case (e.g., when the operator reaches out to the wrong box or picks up more than one-piece, necessary alerts shall be created by the system.).

When a box at the assembly line becomes empty, the system shall automatically detect this and warn the logistics operator via an interface (e.g., smartwatch, tablet, andon boards). The logistics operator will collect the empty boxes by following the amber lights and take them to the semi-finished product supermarket. The system shall create a replenishment order whenever a box becomes empty. When the logistics operator starts processing the replenishment order at the semi-finished product supermarket using an interface (e.g., the tablet), the location of the correct shelf shall be displayed with a green light. The operator will take the full boxes to the assembly line and will place them in the appropriate shelves by following amber lights on the back side of the assembly racks. Upon completion of the task, amber lights shall be turned off, replenishment order shall be closed, and the inventory level shall be updated.

2.5.1.6. Digital performance management

This use case is similar to the Condition Monitoring case except that this focuses on defining and tracking production performance. All KPIs relevant to the production (e.g., OEE, throughput, final quality, productivity, safety) shall be viewed live and historically for a given time period via interfaces (e.g., andon boards, tablets). Operators or related personnel shall be able use the digital dashboards to automate tracking of production metrics and conduct root cause problem solving using analytics. Alerts shall be created automatically for deviations from the standards. The production metrics to track and their standards will be determined in cooperation with the Model Factories.

2.5.1.7. Digital product shadow – product tracking and tracing

All manufacturing and quality information of a product (e.g., where each item is in the production process, along with the source, unique identification of parts and materials as well as the equipment and personnel involved in handling it, production time, energy consumption, product lead time, deviations from the production schedule) shall be collected and accessible by work order number. The system shall allow to assign target ranges for relevant information (e.g., planned production time). The dashboards shall indicate whether the targets are met or not by different colors. Information regarding the process shall be provided to the operators or related personnel to accelerate root cause analysis.

2.5.1.8. Real-time cycle analysis

Cycle time for each workstation (machines and assembly stations) shall be analyzed live using relevant data collected and calculated by the system automatically. Data comparisons and visualizations (e.g., charts, graphs) shall be displayed on operator, shift, product, and overall basis for machines and assembly stations. For each process step, standards (e.g., average duration of an operation, comparable speeds of machines) shall be set and deviations from the standards (e.g., speed losses for machines) shall be displayed.

The system shall create suggestions for line balancing considering several parameters (e.g., planned production quantity, takt time, cycle time, number of operators). This will help the production manager to balance the existing line and to achieve line balancing for new cases (e.g., there is an increase in the production quantity under time constraints).

2.5.1.9. Virtual reality and augmented reality

The assembly operator shall be able to learn how to assemble the parts of a product in a virtual reality environment.
The assembly operator shall be guided by the augmented reality system in assembling the parts. For example, if the operator holds a part in the wrong direction, the system shall display the mistake and guide the operator to correct the mistake.
Virtual reality and augmented reality models shall be developed for each product of the Model Factories.

3. TRAINING THE STAFF OF MODEL FACTORIES ON THE USE OF THE INSTALLED TECHNOLOGICAL INFRASTRUCTURE (SOFTWARE AND HARDWARE)

3.1. Development of the curriculum and training program with necessary adaptations for the training product of each Model Factory (Ankara, Bursa, Kayseri and Konya) (The contractor shall get approval from the UNDP for the curriculum and training program)

3.2. Delivery of approved training program for Staff of Model Factories

3.3. The training curriculum shall equip full and part-time Model Factory personnel with technical knowledge, experience, and skills that will enable them (i) to effectively use the technological infrastructure (hardware and software) described in this document, (ii) to make modifications in the system that do not require any changes in the source code (e.g., adding a new KPI), (iii) to manage the installed system at the operational level, and (iv) to demonstrate the capabilities of the infrastructure through use cases.

3.4. The proposers shall provide the outline of the training curriculum for the technological infrastructure in their proposals. The curriculum outline shall include theoretical and applied training regarding the technological infrastructure as well as the use cases described in this document.

3.5. The proposers shall explain in their proposals the duration of each item in the training curriculum. However, the total duration of training shall not be less than 40 (forty) hours for each Model Factory.

3.6. The proposers shall explain in their proposals how their proposed training curriculum will equip the trainers with the aforementioned technical knowledge, experience, and skills.

3.7. The proposers shall specify in their proposals all course materials (multimedia content, documents, lecture notes, slides, etc.) they will provide. Course materials shall be prepared such that Model Factory personnel can use them to learn the technological infrastructure by themselves.

3.8. The UNDP has the right to make changes it deems necessary in the curriculum in coordination with the Contractor, Ministry of Industry and Technology, and the Model Factories. The Contractor shall

get approval of the curriculum and training program (e.g., the duration, the theoretical and practical content).

3.9. For delivery of trainings, Contractor shall assign sufficient number of trainers who have the necessary knowledge, skills, and experience to teach the technological infrastructure to Model Factory personnel at the desired level.

3.10. Proposers shall provide CVs of trainers in their proposals. Contractor shall get approval of the trainers from the UNDP before the delivery of the training curriculum. The UNDP has the right to request changes regarding the trainers offered by Contractor.

3.11. The training shall be delivered to a total of 40 Model Factory personnel (10 for each Model Factory). The training for each Model Factory's personnel shall be executed separately. Contractor may plan to deliver training for each Model Factory at different times depending on the progress of the installation of the technological infrastructure.

3.12. At the end of each training, a training report, which will include at least the list of participants for each day, training curriculum and materials, lessons learned, approaches used to evaluate participants, evaluation results for the Model Factory trainees, and the results of training satisfaction survey, shall be prepared. If the results of training satisfaction survey and participant evaluations are not satisfactory (see minimum service requirements), the UNPD has the right to request the renewal of the training.

3.13. At the end of each training, successful participants shall be given a certificate for the completion of training.

3.14. Technological Infrastructure Trainings are expected to be delivered by the Key Technical Personnel unless otherwise proposed by Proposers.

4. OTHER REQUIREMENTS:

4.1. WARRANTY, MAINTENANCE AND SUPPORT SERVICES

4.1.1. The Deliverables (all software, hardware and peripherals provided by Contactor) shall be deemed accepted by the UNDP upon completion of the acceptance tests described in this document. If all or some deliverables fail to pass the acceptance tests, the UNDP shall deliver to Contractor a detailed written statement of nonconformities to be corrected prior to acceptance of the Deliverables. Unless otherwise agreed to in writing by the parties, Contractor will reinstall corrected Deliverables within a reasonable amount of time after receipt of such statement of nonconformities. Following redelivery of corrected Deliverables, a new acceptance test shall be immediately conducted by the UNDP.

4.1.2. Warranty for the Deliverables shall start upon the successful completion of the final acceptance test to be conducted after the establishment of the whole technological infrastructure and last for 2 (two) years.

4.1.3. Maintenance and support services defined in this document during the warranty period shall be provided by Contractor with no additional cost except for cases where the failure of or the damage to Deliverables is caused by the User during unpacking, improper installation, relocation, rearrangement, misuse, etc. The UNDP/Ministry will not pay for any necessary expenses directly associated with, attributable to and readily identifiable with the repair, installation, test, and return of the Deliverables, including the shipping and handling as well as the costs related with the manpower and the materials, to correct the non-conformity of the Deliverables with the contract.

4.1.4. If Contractor and the User/UNDP/Ministry mutually agree that the damage or failure is caused by the User, the Contractor shall provide necessary services to correct the damage or failure at Contractor's prevailing prices, rates, policies, and terms mutually agreed.

4.1.5. Contractor shall warrant that all software, as installed and configured on Model Factories'

systems and subject to maintenance releases, will perform in accordance with and conform to the specifications described in this document.

4.1.6. The Contractor shall guarantee that the installed hardware is fit for purpose and capable of implementing the functions described in this document. Any hardware with defects/damages or not functioning properly shall be replaced or repaired by the Contractor within the warranty period at the Contractor's sole cost and expense.

4.1.7. Contractor shall provide support and maintenance services for the installed hardware and software via telephone and electronic mail, and site visits when necessary, consistent with the hours of operation. To enable Contractor to provide effective support, the User will establish auto remote access based on remote access procedures compatible with Contractor's practices. Contractor will be responsible for ensuring the security of the remote connection. Proposers shall define the call process in detail in their proposal to meet the maintenance and support service requirements described in this document.

4.1.8. Contractor is expected to provide the following maintenance and support services for the installed software and applications. Proposers shall demonstrate in their proposals how they will satisfy the expected services.

- Scheduled assistance for installations, upgrades, and revisions
- Standard software releases and updates
  - Defect corrections (as warranted)
  - Planned enhancements.
  - Release notes
- Technical troubleshooting and issue resolution
- Email/Phone Support call logging and notification
- Free eSupport access 24 x 7 with the following online benefits:
  - Update contact information
  - Access published documentation.
  - Access available downloads
  - Access Support knowledge base
  - Participate in Discussion Forums
- Limited training questions (15-minute guideline)
- Customer Care Program
  - Technical support bulletins
  - Communication on new products and services
  - On-site visits (as required)
- Design review for potential enhancements or custom modifications

4.1.9. Contractor shall provide the UNDP/Ministry/User with a single point of contact for all hardware and software support and maintenance service requests, i.e., the User will communicate with only a single company for all service requests. The Contractor shall warrant that each of its employees, independent contractors or agents assigned to perform any Services or provide any technical assistance in configuration, development and implementation, training, use and related services shall have the skill, training, and background reasonably commensurate with the level of performance or responsibility required, so as to be able to perform in a competent and professional manner.

4.1.10. Contractor shall guarantee to provide spare parts, operational materials, consumables, or any other items or materials required to operate or maintain the technological infrastructure within the warranty period and under the Maintenance, Support, and Repair Services Agreement to be signed. The Proposers shall specify in their proposals the scope of their maintenance and support services for the hardware, e.g., remote troubleshooting; repair and replacement (return for repair service, advance hardware replacement, on-site hardware replacement, spare stock

handling, onsite troubleshooting).

4.1.11. Contactor shall provide the UNDP/Ministry/User with a schedule for any necessary preventive maintenance activities for hardware, e.g., operational monitoring, preservation, visual inspections, measurements, replacement of wear and sacrificial parts.

4.1.12. The Services shall be performed with the Model Factories' full cooperation on the premises of the Model Factories or online where applicable. The Contractor shall observe the Model Factories' rules and policies relating to the security thereof, access to or use of all or part of the Model Factories' premises and any of the Model Factories' property, including proprietary or confidential information.

4.1.13. Contractor shall provide maintenance and support services in accordance with three types of call priorities 1 (High), 2 (Medium), and 3 (Low). The criteria to establish guidelines for these priorities are as follows:

- Priority 1 – High

High priority issues consist of Errors for which there is no means of workaround, causing (i) unrecoverable "crashes" of the Deliverables, (ii) ongoing unrecoverable loss or corruption of data, or (iii) loss of essential functionality of the installed infrastructure and applications for which there is no means of workaround. Examples of high priority issues include:

- o System Down (Software Application, Hardware, Operating System, Database)
- o Inability to process collected or entered data.
- o Program errors without workarounds
- o Incorrect calculation errors impacting a majority of records.
- o Aborted postings or error messages preventing data integration and update.
- o Performance issues of severe nature impacting critical processes and functions.

- Priority 2 – Medium

Medium priority issues consist of Errors that may be causing (i) ongoing recoverable loss or corruption of data for which there is no workaround, (ii) loss of essential functionality of the installed infrastructure and applications that has a workaround, or (iii) loss of non-essential software functionality that does not have a workaround. Examples of medium priority issues include:

- o System errors that have workarounds
- o Calculation errors impacting a minority of records.
- o Report's calculation issues
- o Security issues
- o Performance issues not impacting critical processes.
- o Usability issues

- Priority 3 – Low

Low priority issues consist of Errors that may be causing (i) loss of non-essential functionality of the installed infrastructure and applications that has a workaround or (ii) difficulties in the user interface. Examples of low priority issues include:

- o Report formatting issues
- o Training questions, how to, or implementing new processes.
- o Aesthetic issues
- o Recommendations for enhancements on system changes
- o Questions on documentation

4.1.14. Contactor shall correct reported Errors in accordance with the following provisions. All time references below are clock hours or calendar days, unless otherwise specified.

- Priority 1 Errors

    - o Contractor will provide the customer with a telephone number for emergency support to be used by the User at any time on a seven (7) day a week, twenty-four (24) hours a day basis to report Priority 1 Errors.
    - o Contractor will provide an initial response to all Priority 1 Errors within one (1) hour following the report of issue.
    - o Contractor will use commercially reasonable efforts to resolve Priority 1 Errors within twenty-four (24) hours or identify a mutually agreeable correction plan within twenty-four (24) hours following the report of Error.

- Priority 2 Errors

    - o The User shall use the standard call support center telephone number or web service for emergency support during normal business hours.
    - o Contractor will provide an initial response to all Priority 2 Errors within four (4) working hours following the report of the Error.
    - o Consultant will use commercially reasonable efforts to resolve Priority 2 Errors within seven (7) working days following the report of the issue.

- Priority 3 Errors

    - o The User shall use the standard call support center telephone number or web service for emergency support during normal business hours.
    - o Contractor will provide the User a tracking number for all Priority 3 Errors within five (5) business days following the report of issue.
    - o Contractor will use commercially reasonable efforts to resolve Priority 3 Errors within twenty-one (21) working days following the report of the issue.

4.1.15. In case of the need for material supply and the possibility of an extension of the response times in 4.1.15, the Contractor will notify this situation to UNDP and/or Ministry of Industry and Technology in written and will also indicate the period. This period must be a reasonable period in market conditions (For material to be supplied from domestic and foreign sources, this period cannot exceed 1 week and 3 weeks, respectively.). Otherwise, UNDP will be able to get the work done by 3rd parties and compensate the Contractor's receivables from the cash guarantee and / or the letter of guarantee if there is no cost.

4.1.16. After completion of warranty period, Contractor shall guarantee to provide maintenance, support, and repair services for at least 10 years under a new Maintenance, Support, and Repair Services Agreement to be signed between Contractor and the Ministry. (Maintenance, Support, and Repair Services Agreement will be transferred to Model Factories in due course of transference by the Ministry of Industry and Technology.) Annual maintenance and support fee shall be determined each year by mutual agreement of the parties taking into account industry standards.

G. Deliverables and Schedules/Expected Outputs

All deliverables for the assignment shall be submitted in English and Turkish. Target submission dates given in below table must be strictly monitored with consideration of firm project end date which is 31 March 2022. (Technological Infrastructure Training documents associated with Activity 3 shall be submitted only in Turkish language.)

All versions (i.e., draft, revised, implementation) of deliverables of this contract are subject to reviewal of UNDP in close consultation with implementing partner based on this "Terms of Reference" and "Technical Proposal of the Contractor". The Contractor shall schedule submission of deliverables to meet target delivery dates indicated in below table.

All proposers shall submit a detailed project schedule to demonstrate conformance with the target delivery dates requested in below table. Delivery dates indicated below are target submission dates to UNDP for Approval. However, UNDP may reject deliverables and request contractor to revise them in line with the comments suggested by UNDP.

Table for activity, deliverables, and schedules:

	No.	Activity	Deliverable	Target submission dates (calendar days) to UNDP for Approval
1. Preparation of Roadmap for the Installation and Integration of Technological Infrastructure and Provision Trainings services	1.1	Analysis and Elaboration of Existing State of Model Factories (Ankara, Bursa, Konya, Kayseri) after Physical Inspection	Detailed roadmap which includes but not limited to requirements/specification, technological infrastructure design and scope for training materials and programs	Within 30 days after contract signature
	1.2	Finalization of Technological Architecture		
	1.3	Scope for training materials and programs		
2. Installation and Integration of Technical Infrastructure	2.1	Provision, Installation and Integration of IOT Infrastructure	IoT installation report, IoT network installation report, IoT Platform installation and integration report, Test plan report. Minimum number of licenses that will allow the system to function as described in this document for each Model Factory, associated hardware and other necessary equipment.	Within 75 days after Contract signature
			Acceptance tests report	Within 90 days after contract signature.
	2.2.	Provision, Installation and Integration of MES Software	MES Software installation report, MES Software integration report, Test plan reports. Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously for each MF,	Within 105 days after contract signature.

			associated hardware and other necessary equipment.	
			Acceptance tests report	Within 120 days after contract signature
	2.3	Provision, Installation and Integration of ERP Software	ERP Software installation report, ERP Software is integrated with MES system, Test plan report, Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously for each MF, associated hardware and other necessary equipment.	Within 135 days after contract signature
			Acceptance tests report	Within 150 days after contract signature
	2.4	Development of the AR and VR applications	VR application development report AR application development report Necessary licenses for one user for each Model Factory, associated hardware and other necessary equipment.	Within 120 days after contract signature
			Test plan report	Within 135 days after contract signature
			Acceptance tests report	Within 150 days after contract signature
	2.5	Acceptance test of the entire technological infrastructure using the use cases defined in the RFP document	Acceptance tests report for the entire technological infrastructure.	Within 170 days after contract signature
3. Training the staff of Model Factories on the use of the installed technological infrastructure	3.1	Development of the curriculum and training program	The curriculum and training program	Within 150 days after contract signature
	3.2	Delivery of approved training program	Training result report including the number of trainees and certificates provided after trainings.	Within 190 days after contract signature

H. Key Performance Indicators and Service Level

UNDP has the right to demand following tasks to be repeated by the contractor in case the contractor fails to meet the minimum standard of services acceptable. Contractor shall perform the requested tasks at no additional cost to UNDP.

- Revision of requirements and specification report to develop clear and comprehensive roadmap approved by UNDP.
- Revision of design of the automation architecture and physical architecture to provide clear and comprehensive design which meets requirement specifications better and hinder any possible risks.
- Reinstallation/reprogramming of the unfunctional devices and pieces of IoT network related to IOT infrastructure when necessary until the systems successfully work with each other.
- Reinstallation/integration and revision of technological infrastructure (hardware and software) until

the systems work with each other successfully.

- Reinstallation/integration and revision of technological infrastructure until the system works as single piece without a need for additional software or hardware installations.
- Revision of both training curriculums to increase the efficiency of the trainings for participants.
- Repetition of the trainings and/or scheduling additional sessions until the expected output is received in accordance with the ToR.

Table for Key performance Indicators and corrective actions:

The minimum standard services to be attained/conducted by the Contactor for each task are shown in the following table. UNDP has the right to demand following tasks to be revised/repeated by the contractor in case the contractor fails to meet minimum standard of services acceptable. Contractor shall perform the requested corrective actions indicated in the table at no additional cost to UNDP.

	No.	Task	Minimum standard of services accepted	Corrective actions / Contractual Remedies unless minimum standards are met
1. Preparation of Roadmap for the Installation and Integration of Technological Infrastructure and Provision of Trainings services	1.1	Elaboration of Existing State of Model Factories after Physical Inspection	- The delivered requirement specification reports are clear and comprehensive (customer, architectural, structural, behavioral, functional, non-functional, performance, design, integration dimensions of requirements are well identified) - UNDP approve the requirement specification reports	- UNDP shall request revisions in the requirements specifications report.
	1.2	Finalization of Technological Architecture	Automation Architecture - The architecture (hardware and software) is clear and comprehensive. - It contains all the necessary hardware and their connections together with necessary accessories. - The flow of data (for information sharing and control purposes) at the field level are clearly shown, well-explained together with relevant hardware and protocols. - The flow of data at higher levels (MES, ERP, etc.) are identified, their structure well-explained together with relevant hardware and software that handle them. - The justification that the architecture is capable of meeting all the requirements explained in this document is provided.	- UNDP shall request revisions in the automation architecture.
			Physical Architecture -The architecture is clear and comprehensive. The location of all hardware pieces together with necessary accessories (e.g., RFID readers, andon panels, access points) are shown on a to-the-scale	- UNDP shall request revisions in the physical architecture.

			layout of each Model Factory. - The justification that the architecture is capable of meeting all the requirements explained in this document is provided.	
2. Installation and integration Technological Infrastructure ,	2.1	Integration and Installation of IoT Infrastructure	- For each Model Factory, all newly requested IOT hardware are installed (necessary additional sensors, Andon panel, Andon lights, RFID readers, RFID antennas, pick-by-light system, etc. and are functional individually.) - All existing and newly installed IOT devices are networked properly. - Each hardware piece used in the network (fieldbus, controlbus, gateway, access points, etc.) is functional. - All existing and newly installed IOT devices are integrated properly. - Data from each device can be read. The control of each actuator through the network is possible. - All components (e.g. database system, historians, etc.) are functional. - The test plan is clear and comprehensive and presents a timeline. (contains tests about all the requirements on the IOT infrastructure and platform.) - The test plan is approved by the Acceptance Commission established by UNDP. - Acceptance tests are conducted within the indicated timeline and all tests are successful. - The test results shall be approved by the Acceptance Commission established by UNDP.	- UNDP shall request re-installation/re-programming of the unfunctional devices. - UNDP shall request re-installation/re-programming of the unfunctional pieces. - UNDP shall request re-installation/re-programming of the unfunctional pieces or re-installation of the entire network (whatever is necessary to make the network functioning as a whole). - UNDP shall request revisions on the test plan. - UNDP shall request re-installation/re-programming of the unfunctional pieces or re-installation of the entire network (whatever is necessary to make the network functioning as a whole). - UNDP will identify the reasons for failure to meet expected outputs and reserves the right to have the contractor increase the number of teams at no additional cost in order to compensate for the poor performance to ensure the target dates are achieved.

	2.2	Installation and Integration of the MES software	- MES software is installed. - The proof that the software is capable of meeting all the requirements explained in this document is provided. - MES software is well-integrated with the IOT system. - The proof of low latency and correctness (real time access to the IOT system for bidirectionally communicated correct data) is demonstrated. - The test plan is clear and comprehensive and presents a timeline. (contains tests about all the requirements on the MES software, IOT, and their integration). - The test plan is approved by the Acceptance Commission established by UNDP. - Acceptance tests are conducted within the indicated timeline and all tests are successful. - The test results shall be approved by the Acceptance Commission established by UNDP	- UNDP shall request revisions/changes on the software. - UNDP shall request revisions/changes on the software and/or installation until the integration is satisfactory. - UNDP shall request revisions on the test plan. - UNDP shall request re-installation/re-programming of the unfunctional modules or re-installation of the entire software (whatever is necessary to make the existing infrastructure functioning as a whole). - UNDP will identify the reasons for failure to meet expected outputs and reserves the right to have the contractor increase the number of teams at no additional cost in order to compensate for the poor performance to ensure the installation and integration of the MES software.

	2.3	Installation and Integration of ERP System	- ERP software is installed. - The proof that the software is capable of meeting all the requirements explained in this document is provided. - ERP software is well-integrated with the MES system. - The proof of low latency and correctness (real time access to the MES system for bidirectionally communicated correct data) is demonstrated. - The test plan is clear and comprehensive and presents a timeline. (contains tests about all the requirements on the ERP software and MES-ERP integration). - The test plan is approved by the Acceptance Commission established by UNDP. - Acceptance tests are conducted and all tests are successful. - The test results shall be approved by the Acceptance Commission established by UNDP.	- UNDP shall request revisions/changes on the software. - UNDP shall request revisions/changes on the software and/or installation until the integration is satisfactory. - UNDP shall request revisions on the test plan. - UNDP shall request re-installation/re-programming of the unfunctional modules or re-installation of the entire software (whatever is necessary to make the existing infrastructure functioning as a whole). - UNDP will identify the reasons for failure to meet expected outputs and reserves the right to have the contractor increase the number of teams at no additional cost in order to compensate for the poor performance to ensure the installation and integration of the ERP System.

	2.4	Development of the VR and AR applications	- The VR application is delivered with all the necessary additional hardware. - The VR application is capable of virtualizing all the assembly benches and allow operators to carry out assembly operations in a virtual world (i.e., the movements of operators are exactly the same as if they were assembling in a physical world) - The virtual components are realistic. - The application is approved by the Acceptance Commission established by UNDP. - The AR application can recognize parts from the camera feedback. - The AR application can provide necessary work instructions and warnings as necessary - The AR application is capable of highlighting the relevant places virtually on the physical object as per the work instructions or warnings. - The application is approved by the Acceptance Commission established by UNDP. - The test plan is clear and comprehensive and presents a timeline. (shall test for all requirements explained in this document) - Acceptance tests are conducted within the indicated timeline and all tests are successful. - The test results shall be approved by the Acceptance Commission established by UNDP.	- UNDP shall request revisions on the VR application. - UNDP shall request revisions on the AR application. - UNDP shall request revisions on the test plan. - UNDP shall request revisions/reprogramming on the VR/AR applications if they fail the tests. - UNDP will identify the reasons for failure to meet expected outputs and reserves the right to have the contractor increase the number of teams at no additional cost in order to compensate for the poor performance to ensure the development of the VR and AR applications.
	2.5	Acceptance test of the entire technological infrastructure using the use cases defined in the RFP document	- A clear and comprehensive test plan with a timeline that includes all 9 use cases and all components (IOT system, MES, ERP, digital twin, etc.) is developed. - Test plan shall be approved by Acceptance Commission established by UNDP. - Acceptance tests are conducted within indicated timeline and all tests are successful. - The test results shall be approved by the	- UNDP shall request re-installation/re-programming of the unfunctional modules/software or re-installation of the entire system (whatever is necessary to make the existing infrastructure functioning as a whole). - If the acceptance tests are not conducted within the indicated timeline and/or successful, UNDP will identify the reasons

			Acceptance Commission established by UNDP.	for failure to meet expected outputs and reserves the right to have the contractor increase the number of teams at no additional cost in order to compensate for the poor performance to ensure the target dates are achieved. -
3. Training for technological infrastructure (software and hardware)	3.1	Delivery of the curriculum and training program with necessary adaptations made for the product of each Model Factory	- The training curriculum is clear and comprehensive (Includes all 9 use cases adapted for the product of each Model Factory, and equips the trainees with all necessary technical, theoretical, and practical skills to use the installed technological infrastructure.) - The training material is comprehensive, and clear. - The training curriculum and material shall be approved by the Acceptance Commission established by UNDP.	- UNDP shall request revisions on the curriculum. - UNDP shall request revisions on accompanying material. - UNDP reserves the right to request mobilization of additional personnel for the preparation and delivery of a clear and comprehensive curriculum timely.
	3.2	Delivery of the approved training program	- 10 trainers for each Model Factory receive the training. - Training evaluation survey is conducted with the participation of trainers. - Average satisfaction rate of the trainers is at least 85%. - Trainers are assessed via a comprehensive practical test. - Each trainer performs at least 85%.	- UNDP shall request repetition of the training. - UNDP shall request dismissal of the disqualified trainer and mobilization of additional qualified trainer for the repetition of the trainings.

I. Governance and Accountability

UNDP governs subject contract, and the Contractor will be directly accountable to UNDP. Reporting shall be made to UNDP and the approval/acceptance of output shall be sought from UNDP only.

The Contractor may interact/meet with stakeholders namely MoIT and Chambers, however, Projects Coordinator of UNDP shall be notified of those meetings and the meeting shall be conducted with the presence of a UNDP Representative.

J. Facilities to be provided by UNDP.

UNDP will not provide any physical facility for the services of the Contractor. The proposer shall ensure that experts are adequately supported and equipped for performance of the requirements stipulated in this RFP.

K. Expected duration of the contract/assignment.

Contract is expected to be signed in September 2021 and expire on 18 March 2022. Expected Contract duration is about 6 Months.

A work week will consist of five days, Monday – Friday (both inclusive). Contractor's personnel shall not work on Saturdays-Sundays and Turkey's Official Holidays unless otherwise agreed with Model Factory Staff. Contractor's personnel will work in business hours, and total working hours per day will not exceed 8 hours.

L. Duty Station

The duty stations for the assignment are Ankara, Bursa, Kayseri and Konya. Travel and other costs in duty stations shall be covered by the Contractor.

M. Professional Qualifications of the Successful Contractor and its key personnel

1. General Qualifications of Service Provider(s)

The Contractor shall provide adequate staff in terms of expertise and time allocation in order to complete the tasks required and to achieve the overall and the specific objectives of the Contract in terms of time, cost and quality. The Contractor should establish a team consisting of following Key Personnel to conduct the activities and provide the deliverables.
The contractor shall possess experience on the following:

- **1.1.** Having experience on design, installation and integration of Technological Infrastructure (Hardware and Software) given in Technical Specifications.
- **1.2.** Having technical capacity to establish the necessary infrastructure for hardware and software systems given in Technical Specifications for MFs.
- **1.3.** Having experience in preparing training curriculum on digital transformation and/or digitalization
- **1.4.** Having a network of consultants and experts that have been working on digital transformation in manufacturing sector.

2. Key Personnel **(CVs of following Key Personnel (Team Leader, Province Coordinators, Senior Experts) shall be submitted along with the Proposals)**

The proposers are expected provide information on the allocation of key and other personnel (team leader, province coordinators, senior experts, experts) mentioned below (total working days for each staff) to each deliverable in line with the proposed approach and methodology. This allocation should be compatible with nature of each deliverable.

Team Composition and minimum required time allocation:

Position	Number of Position	Time allocation for each position
Team Leader	1	30% of working
Province Coordinators	4	50% of working
Senior Experts	4	75% of working
Experts	12	100% of working

2.1. 1 (one) Team Leader

Team leader shall have experience in Industry 4.0 technologies and digital transformation and be the focal point for the UNDP CO during the implementation of the Project. Team leader is expected to bring the know-how of the Contractor and manage the whole implementation process vis-à-vis UNDP CO. The team leader is required to allocate minimum 30% of working time against total contract implementation period and ensure the full accountability on achievement of Contract activities. Proposers shall determine the number of working days to be required by the Team Leader and develop their implementation plans and Financial Proposals accordingly.

Team Leader	**Minimum Requirements**	**Assets**
General Qualifications	– University Education in Engineering (e.g. industrial, mechanical, mechatronic, electromechanical, product, process, plant) – Advanced in spoken and written Turkish and English.	– Advanced degree (MSc, PhD) Engineering (e.g. industrial, mechanical, mechatronic, electromechanical, product, process, plant)
General Professional Experience	– At least 12 years of general professional experience	– Additional years will be considered as an asset
Specific Experience	– At least 8 years of specific experience in digital transformation, Industry 4.0 technologies, and production management systems in the manufacturing industry – At least 5 years of specific experience in managing digital transformation projects in the manufacturing industry. – Managed at least 5 digital transformation projects in the manufacturing industry	– Additional years will be considered as an asset. – International experience relevant to the assignment will be an asset – Additional years in managing digital transformation projects will be considered as an asset. – Additional number of managed digital transformation projects in the manufacturing industry will be considered as an asset. – Experience in projects with multiple parties will be considered as an asset.

2.2. 4 (four) Province Coordinators -(1 (one) for each Province)

Province coordinators shall be responsible for coordinating all the field activities and inform regularly to Team Leader and UNDP as required. Province coordinators are expected to have a specific work experience in digital transformation in manufacturing industry in order to lead the junior experts over the course of the project.
Province Coordinators are required to allocate minimum 50% of working time against total contract implementation period and ensure the full accountability on achievement of Contract activities. Proposers shall determine the number of working days to be required for the Province Coordinators and develop their implementation plans and Financial Proposals accordingly.

Province Coordinators	Minimum Requirements	Assets
General Qualifications	– University Education in Engineering (e.g. industrial, mechanical, mechatronic, electromechanical, product, process, plant), or related field. – Advanced in spoken and written in Turkish	– Advanced degree (MSc, PhD) in engineering and/or social science – Fluency in English
General Professional Experience	– At least 10 years of general professional experience.	Additional years will be considered as an asset
Specific Experience	– At least 7 years of specific experience in digital transformation, Industry 4.0 technologies, and production management systems in the manufacturing industry – At least 3 years of specific experience in managing digital transformation projects in the manufacturing industry. – Managed at least 3 digital transformation projects in the manufacturing industry.	– Additional years will be considered as an asset. – International experience relevant to the assignment will be an asset. – Additional years in managing digital transformation projects will be considered as an asset. – Additional number of managed digital transformation projects in the manufacturing industry will be considered as an asset. – Experience in projects with multiple parties will be considered as an asset.

2.3. 4 (four) Senior Experts for the deployment of Technological infrastructure ((1 (one) for each province)

Senior Experts shall be responsible for the technical support to design, installation and integration of the technological infrastructure activities in target provinces. They will be based in the target provinces and expected to have solid experience in industry 4.0 technologies and digital transformation.
Senior Experts are required to allocate minimum 75% of working time against total contract implementation period and ensure full accountability on achievement of Contract activities.
Proposers shall determine the number of working days to be required for the Senior Experts and develop their implementation plans and Financial Proposals accordingly.

Senior Experts (A)	Minimum Requirements	Assets
General Qualifications	– University Education in Engineering (e.g. industrial, mechanical, mechatronic, electromechanical, product, process, plant), business administration, economics or related field. – Advanced in spoken and written Turkish	– Advanced degree (MSc, PhD) in engineering and/or social science – Fluency in English
General Professional Experience	– At least 8 years of general professional experience	Additional years will be considered as an asset
Specific Experience	– At least 6 years of specific experience in the deployment of digital transformation, Industry 4.0 technologies, and production management systems in the manufacturing industry – At least 3 years of specific experience in digital transformation projects in the manufacturing industry – Participated in at least 3 digital transformation projects in the manufacturing industry	– Additional years will be considered as an asset. – International experience relevant to the assignment will be considered as an asset. – Additional years in digital transformation projects will be considered as an asset. – Additional number of digital transformation projects in the manufacturing industry will be considered as an asset. – Experience in projects with multiple parties will be considered as an asset.

Other Personnel (CVs of following personnel (experts) shall NOT be submitted along with Proposals)

2.4. 12 (twelve) Experts – (3 (three) for each province)

Experts shall be responsible for the smooth implementation of the activities in target provinces. Experts are expected to provide supervision during the implementation of the activities on digital transformation as well. Experts shall also contribute to the development of curriculum on digital transformation or provide technical support and expertise to the Contractor throughout the Contract execution. **Experts are required to allocate %100 of working time against total contract implementation period and ensure the full accountability on achievement of Contract activities.**
Proposers shall determine the number of working days to be required for the experts and develop their implementation plans and Financial Proposals accordingly.

CVs of Experts shall not be submitted along with the Proposals. During Contract implementation CVs will be submitted to UNDP for approval prior to start of any activity. And proposed CVs shall meet the following minimum requirements given in below table for each expert. UNDP reserves the right to request replacement in case of poor performance or lack of sufficient expertise.

Experts	Minimum Requirements	Assets
General Qualifications	– University Education in Engineering (e.g. industrial, mechanical, mechatronic, electromechanical, product, process, plant) or related field. – Advanced in spoken and written Turkish	– Advanced degree (MSc, PhD) in engineering and/or social science – Fair in English
General Professional Experience	– At least 4 years of general professional experience.	– Additional years will be considered as an asset
Specific Experience	– At least 3 years of Specific Experience relevant to the assignment (digital transformation, industry 4.0 technologies, etc)	– Additional years will be considered as an asset

** Technological Infrastructure Trainings are expected to be delivered by the afore-mentioned Key Personnel unless otherwise proposed by Proposers.

Proposers shall **specify if any additional personnel are required other than the afore-mentioned personnel** for fulfilling the overall requirements of the RFP in accordance with the Terms of Reference in their proposals.

N. Price and Schedule of Payments

Milestones of payment:

Payments will be effected to the contractor on percentage basis in line with the milestones listed in the following table, upon acceptance of deliverables by UNDP in consultation with the Acceptance Commission to be established by UNDP. Please refer to Section G. Deliverables and Schedules/Expected Outputs for details on the activities and respective deliverables.

Deliverable 1.1, 1.2, 1.3	10%
Deliverables 2.1, 2.2, 2.3	20%
Deliverables 2,4, 2,5	50%
Deliverables 3	20%

If the Contractor is registered and operating in Turkey, the payment shall be realized in Turkish Liras (TRY). Payment amount will be converted from United States Dollar (USD) to Turkish Liras (TRY) by the UN operational rate of exchange valid on the date of money transfer. Otherwise, the payments shall be affected in United States Dollar.

UN Operational Exchange rates can be accessed through
https://treasury.un.org/operationalrates/OperationalRates.php

SECTION 6: RETURNABLE BIDDING FORMS / CHECKLIST

This form serves as a checklist for preparation of your Proposal. Please complete the Returnable Bidding Forms in accordance with the instructions in the forms and return them as part of your Proposal submission. No alteration to format of forms shall be permitted and no substitution shall be accepted.
Before submitting your Proposal, please ensure compliance with the Proposal Submission instructions of the BDS 22.

Technical Proposal Forms:

Have you duly completed all the Returnable Bidding Forms?	
▪ Form A: Technical Proposal Submission Form	☐
▪ Form B: Bidder Information Form	☐
▪ Form C: Joint Venture Form	☐
▪ Form D: Qualification Form	☐
▪ Form E: Format of Technical Proposal	☐
▪ Form H: Proposal Security Form	☐
Have you provided the required documents to establish compliance with the evaluation criteria in Section 4?	☐

Financial Proposal Forms
(Must be submitted through e-tendering as password protected files)

▪ Form F: Financial Proposal Submission Form	☐
▪ Form G: Financial Proposal Form	☐

FORM A: TECHNICAL PROPOSAL SUBMISSION FORM

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

We, the undersigned, offer to provide the services for [Insert Title of services] in accordance with your Request for Proposal No. [Insert RFP Reference Number] and our Proposal. We are hereby submitting our Proposal, which includes this Technical Proposal and our Financial Proposal sealed under a separate envelope.

We hereby declare that our firm, its affiliates or subsidiaries or employees, including any JV members or subcontractors or suppliers for any part of the contract:

a) is not under procurement prohibition by the United Nations, including but not limited to prohibitions derived from the Compendium of United Nations Security Council Sanctions Lists;

b) have not been suspended, debarred, sanctioned or otherwise identified as ineligible by any UN Organization or the World Bank Group or any other international Organization.

c) have no conflict of interest in accordance with Instruction to Bidders Clause 4;

d) do not employ, or anticipate employing, any person(s) who is, or has been a UN staff member within the last year, if said UN staff member has or had prior professional dealings with our firm in his/her capacity as UN staff member within the last three years of service with the UN (in accordance with UN post-employment restrictions published in ST/SGB/2006/15);

e) have not declared bankruptcy, are not involved in bankruptcy or receivership proceedings, and there is no judgment or pending legal action against them that could impair their operations in the foreseeable future;

f) undertake not to engage in proscribed practices, including but not limited to corruption, fraud, coercion, collusion, obstruction, or any other unethical practice, with the UN or any other party, and to conduct business in a manner that averts any financial, operational, reputational or other undue risk to the UN and we *embrace the principles of the United Nations Supplier Code of Conduct and adhere to the principles of the United Nations Global Compact.*

We declare that all the information and statements made in this Proposal are true and we accept that any misinterpretation or misrepresentation contained in this Proposal may lead to our disqualification and/or sanctioning by the UNDP.

We offer to provide services in conformity with the Bidding documents, including the UNDP General Conditions of Contract and in accordance with the Terms of Reference

Our Proposal shall be valid and remain binding upon us for the period of time specified in the Bid Data Sheet.

We understand and recognize that you are not bound to accept any Proposal you receive.

I, the undersigned, certify that I am duly authorized by [Insert Name of Bidder] *to sign this Proposal and bind it should UNDP accept this Proposal.*

Name: _____

Title: _____

Date: _____

Signature: _____

[*Stamp with official stamp of the Bidder*]

FORM B: BIDDER INFORMATION FORM

Legal name of Bidder	[Complete]
Legal address	[Complete]
Year of registration	[Complete]
Bidder's Authorized Representative Information	Name and Title: [Complete] Telephone numbers: [Complete] Email: [Complete]
Are you a UNGM registered vendor?	☐ Yes ☐ No If yes, [insert UGNM vendor number]
Are you a UNDP vendor?	☐ Yes ☐ No If yes, [insert UNDP vendor number]
Countries of operation	[Complete]
No. of full-time employees	[Complete]
Quality Assurance Certification (e.g. ISO 9000 or Equivalent) (*If yes, provide a Copy of the valid Certificate):*	[Complete]
Does your Company hold any accreditation such as ISO 14001 related to the environment? *(If yes, provide a Copy of the valid Certificate):*	[Complete]
Does your Company have a written Statement of its Environmental Policy? *(If yes, provide a Copy)*	[Complete]
Contact person UNDP may contact for requests for clarification during Proposal evaluation	Name and Title: [Complete] Telephone numbers: [Complete] Email: [Complete]
Please attach the following documents:	▪ Company Profile, which should not exceed fifteen (15) pages, including printed brochures and product catalogues relevant to the goods/services being procured. ▪ Certificate of Incorporation/ Business Registration ▪ Tax Registration/Payment Certificate issued by the Internal Revenue Authority evidencing that the Bidder is updated with its tax payment obligations, or Certificate of Tax exemption, if any such privilege is enjoyed by the Proposer. ▪ Trade name registration papers, if applicable ▪ Local Government permit to locate and operate in assignment location, if applicable ▪ Official Letter of Appointment as local representative, if Bidder is submitting a Bid on behalf of an entity located outside the country ▪ Power of Attorney/Signature Circular

FORM C: JOINT VENTURE INFORMATION FORM

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

To be completed and returned with your Proposal if the Proposal is submitted as a Joint Venture.

No	**Name of Partner and contact information** *(address, telephone numbers, fax numbers, e-mail address)*	**Proposed proportion of responsibilities (in %) and type of services to be performed**
1	[Complete]	[Complete]
2	[Complete]	[Complete]
3	[Complete]	[Complete]

Name of leading partner (with authority to bind the JV during the RFP process and, in the event a Contract is awarded, during contract execution)	[Complete]

Proposers shall attach either one of the copies of the below documents signed by every partner, which details the likely legal structure of and the confirmation of joint and severable liability of the members of the said joint venture:

☐ Letter of intent to form a joint venture ***OR*** ☐ JV agreement

We hereby confirm that if the contract is awarded, all parties of the Joint Venture shall be jointly and severally liable to UNDP for the fulfillment of the provisions of the Contract.

Name of partner: _____ Name of partner: _____

Signature: _____ Signature: _____

Date: _____ Date: _____

Name of partner: _____ Name of partner: _____

Signature: _____ Signature: _____

Date: _____ Date: _____

FORM D: QUALIFICATION FORM

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

If JV, to be completed by each partner.

Historical Contract Non-Performance

☐ Contract non-performance did not occur for the last 3 years			
☐ Contract(s) not performed for the last 3 years			
Year	**Non- performed portion of contract**	**Contract Identification**	**Total Contract Amount** (current value in US$)
		Name of Client: Address of Client: Reason(s) for non-performance:	

Litigation History (including pending litigation)

☐ No litigation history for the last 3 years			
☐ Litigation History as indicated below			
Year of dispute	**Amount in dispute** (in US$)	**Contract Identification**	**Total Contract Amount** (current value in US$)
		Name of Client: Address of Client: Matter in dispute: Party who initiated the dispute: Status of dispute: Party awarded if resolved:	

Previous Relevant Experience

Please list only previous similar assignments successfully completed in the last 5 years.
List only those assignments for which the Bidder was legally contracted or sub-contracted by the Client as a company or was one of the JV partners. Assignments completed by the Bidder's individual experts working privately or through other firms cannot be claimed as the relevant experience of the Bidder, or that of the Bidder's partners or sub-consultants, but can be claimed by the Experts themselves in their CVs.

Project name & Country of Assignment	**Client & Reference Contact Details**	**Contract Value**	**Period of activity and status**	**Types of activities undertaken**

Bidders may also attach their own Project Data Sheets with more details for assignments above.

Proposers shall attach Statements of Satisfactory Performance for above listed Contracts. Statements of Satisfactory Performance shall include the information recorded in above table at minimum, in order to be considered as proof documents.

Financial Standing

Annual Turnover for the last 3 years	Year 2018	USD
	Year 2019	USD
	Year 2020	USD
Latest Credit Rating (if any), indicate the source		

Financial information (in US$ equivalent)	**Historic information for the last 3 years**		
	2018	2019	2020
	Information from Balance Sheet		
Total Assets (TA)			
Total Liabilities (TL)			
Current Assets (CA)			
Current Liabilities (CL)			
	Information from Income Statement		
Total / Gross Revenue (TR)			
Profits Before Taxes (PBT)			
Net Profit			
Current Ratio			

Proposers shall attach copies of the audited financial statements (balance sheets, including all related notes, and income statements) for the years required above complying with the following condition:

a) Must reflect the financial situation of the Bidder or party to a JV, and not sister or parent companies;
b) Historic financial statements must be audited by a certified public accountant;
c) Historic financial statements must correspond to accounting periods already completed and audited. No statements for partial periods shall be accepted.

FORM E: FORMAT OF TECHNICAL PROPOSAL

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

The Proposer's proposal should be organized to follow this format of Technical Proposal. Where the proposer is presented with a requirement or asked to use a specific approach, the bidder must not only state its acceptance, but also describe how it intends to comply with the requirements. Where a descriptive response is requested, failure to provide the same will be viewed as non-responsive.

SECTION 1: Proposer's qualification, capacity and expertise

1.1 General organizational capability which is likely to affect implementation: management structure, financial stability and project financing capacity, project management controls, extent to which any work would be subcontracted (if so, provide details).

- 1.1.1 Management Structure and Organigram (Is it sound and relevant with the requirements?
- 1.1.2 Age of Firm
- 1.1.3 Financial Stability and Project Financing Capacity
- 1.1.4 Project management control mechanisms, strength of project management support
- 1.1.5 Extent to which any work would be subcontracted, to whom, how much percentage of the work, the rationale for such, and the roles of the proposed sub-contractors and how everyone will function as a team.

1.2 Relevance of specialized knowledge and experience on similar engagements done in the region/country.

- 1.2.1 Documented experiences in installation and operationalization of IOT Network in a manufacturing environment
- 1.2.2 Documented experiences in installation and operationalization of MES (Manufacturing Execution System)
- 1.2.3 Documented experiences in installation and operationalization of ERP System.
- 1.2.4 Documented experiences in installation and operationalization of VR/AR Applications.
- 1.2.5 Documented experiences in installation and integration of technological infrastructure (hardware and software described in this document) in a manufacturing environment.
- 1.2.6 Tracked record of successful cooperation with universities, research institutes, chambers and/or education centers to develop curriculum and methodologies on digital transformation.

1.3 Quality assurance procedures and risk mitigation measures. Proposer shall provide the approach to be deployed for assuring quality of the assignment and mitigating risk. (The proposers shall submit a risk management plan for all tasks outlined in Section 5.F that consists of risk identification and analysis (qualitative and quantitative) as well as risk response planning and monitoring. Risk mitigation matrix shall be produced)

1.4 Organizational Commitment to Sustainability

1.5 "Gender and Women's Empowerment Policy of the Proposer" (The Proposers shall explain their current gender and women's empowerment policies in place and the facilities especially provided to women employees.)

SECTION 2: Proposed Methodology, Approach and Implementation Plan

This section should demonstrate the bidder's responsiveness to the TOR by identifying the specific components proposed, addressing the requirements, providing a detailed description of the essential performance characteristics proposed and demonstrating how the proposed approach and methodology meets or exceeds the requirements. All important aspects should be addressed in sufficient detail and different components of the project should be adequately weighted relative to one another.

2.1 **Understanding of the requirement: Have the important aspects of the task been addressed in sufficient detail? Are the different components of the project adequately weighted relative to one another?** Describe important aspects of each deliverable and their relevance to each other over the course of the project.

2.2 **Description of the Offeror's approach and methodology for meeting or exceeding the requirements of the Terms of Reference** (Detail overall process and prescribe the list of activities to be performed for accomplishment of the contract in accordance with the Terms of Reference. The proposers shall describe all activities they will undertake in detail in order to implement the key tasks outlined in Section 5.F. The proposers are urged to use 5W1H methodology rather than giving responses like "Accepted" or "Will be done" in their explanations.) Offerors should give special importance to showing how previous experience can relate or be applied to this project. The proposers shall also provide information on the allocation of key personnel (total working days for each staff) to each deliverable. This allocation should be compatible with nature of each deliverable))

2.3 **Details on how the different service elements shall be organized, controlled and delivered** (The proposers shall provide the list of all hardware, software, and peripherals to be used for digital transformation of each Model Factory (Ankara, Bursa, Konya, Kayseri) including their specifications separately. The proposers shall describe in detail how they will meet the specifications for hardware, software, and services defined in Section 5.F including installation and integration of IOT System, MES, ERP System, Database Management System, Virtual Reality and Augmented Reality, Pick by Light System, Deployment of Hardware, Integration of all systems, Architecture in line with Automation Pyramid, Use Cases, Developing and Delivering Training Curriculum on Technological Infrastructure)

2.4 **Description of available performance monitoring and evaluation mechanisms and tools; how they shall be adopted and used for a specific requirement** (The proposers shall explain their processes for incorporating their quality policy regarding planning, managing, monitoring, and controlling project and product quality requirements in order to meet the stakeholders' expectations including the mechanisms, tools, techniques, and metrics. Proposer shall also submit a communications management plan that provides communications requirements (parties, medium, information type, schedule, escalation processes and timeframes for moving issues upwards in the organization, etc.) among stakeholders (contractor, subcontractors, Model Factories, UNDP, etc.) Describe involvement of Senior Management in performance monitoring and evaluation process. Please indicate if your company has a performance monitoring and evaluation plan. Prescribe the precautions/actions to be adapted in case of poor performance and undesirable outcome.

2.5 **Assessment of the implementation plan proposed including whether the activities are properly sequenced and if these are logical and realistic** (The proposers shall estimate activity durations, sequence activities, and submit a project schedule taking tasks outlined in Section 5.F into account and assuming that activities in four Model Factories will be implemented simultaneously. Provide a Gantt Chart or Project Schedule indicating the detailed sequence of activities that will be undertaken and their corresponding timing. Explain how each package contribute overall project

2.6 **Demonstration of ability to plan, integrate and effectively implement sustainability measures in the execution of the contract.** (The contractor shall present a sustainment plan covering the years 1 – 5 for the technological infrastructure established at Model Factories including after sales and technical support services (repair & maintenance, hardware and software updates, etc.) together with service quality metrics.)

SECTION 2A: Bidder's Comments and Suggestions on the Terms of Reference

Provide comments and suggestions on the Terms of Reference, or additional services that will be rendered beyond the requirements of the TOR, if any.

SECTION 3: Management Structure and Key Personnel

3.1 Qualifications of key personnel proposed. Provide CVs for the following key personnel that will be provided to support the implementation of this project using the format below. CVs should demonstrate qualifications in areas relevant to the Scope of Services.

3.1.1 1 (One) Team Leader

3.1.2 4 (Four) Province Coordinator for each Province (Ankara, Bursa, Kayseri, Konya)

3.1.3 4 (Four) Senior Expert for each Province (Ankara, Bursa, Kayseri, Konya))

Format for CV of Proposed Key Personnel

Name of Personnel	[Insert]
Position for this assignment	[Insert]
Nationality	[Insert]
Language proficiency	[Insert]
Education/ Qualifications	*[Summarize college/university and other specialized education of personnel member, giving names of schools, dates attended, and degrees/qualifications obtained.]*
	[Insert]
Professional certifications	*[Provide details of professional certifications relevant to the scope of services]*
	Name of institution: [Insert] Date of certification: [Insert]
Employment Record/ Experience	*[List all positions held by personnel (starting with present position, list in reverse order), giving dates, names of employing organization, title of position held and location of employment. For experience in last five years, detail the type of activities performed, degree of responsibilities, location of assignments and any other information or professional experience considered pertinent for this assignment.]*
	[Insert]
References	*[Provide names, addresses, phone and email contact information for two (2) references]*
	Reference 1: [Insert] Reference 2: [Insert]

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experiences, and other relevant information about myself.

_____ _____

Signature of Personnel Date (Day/Month/Year)

FORM F: FINANCIAL PROPOSAL SUBMISSION FORM

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

****IMPORTANT NOTE**:**
This Form shall be submitted as a password protected document through e-tendering.

We, the undersigned, offer to provide the services for Digital Transformation of Ankara, Bursa, Kayseri and Konya Model Factories in accordance with your Request for Proposal No. UNDP-TUR-RFP(MF)-2021/02 and our Proposal. We are hereby submitting our Proposal, which includes this Technical Proposal and our Financial Proposal submitted as a separate password protected document.

Our attached Financial Proposal is for the sum of [Insert amount in words and figures].

Our Proposal shall be valid and remain binding upon us for the period of time specified in the Bid Data Sheet.

We understand you are not bound to accept any Proposal you receive.

Name: _____

Title: _____

Date: _____

Signature: _____

[*Stamp with official stamp of the Bidder*]

FORM G: FINANCIAL PROPOSAL FORM

Name of Bidder:	[Insert Name of Bidder]	Date:	Select date
RFP reference:	[Insert RFP Reference Number]		

****IMPORTANT NOTE**:**
This Form shall be submitted as a password protected document through e-tendering.

The proposer is required to prepare the Financial Proposal following the below format and submit it through e-tendering as a separate password protected document. Any Financial information provided in the Technical Proposal shall lead to Proposer's disqualification.

The Financial Proposal should align with the requirements in the Terms of Reference and the Proposer's Technical Proposal.

Currency of the proposal: United States Dollars (USD)

Table 1: Summary of Overall Prices

	Amount(s)
Professional Fees (from Table 2)	
Software and Hardware Cost (from Table 3)	
Other Costs (from Table 4)	
Total Amount of All-inclusive Financial Proposal (USD)*	

***Total Amount of Financial Proposal shall be the basis for financial evaluation of the proposals and maximum contract amount for the successful proposer. Contractor shall not be entitled to receive any additional amount beyond this amount.**

Table 2: Breakdown of Professional Fees

Name	**Position**	**Number of Position**	**Fee Rate**	**No. of Days**	**Total Amount**
			A	*B*	*C=A xB*
	Team Leader	1		41	
	Province Coordinators	4		68	
	Senior Experts	4		102	
	Experts	12		136	
To be determined	Other Personnel (Please specify)				
	Subtotal Professional Fees (USD) :				

Table 3: Breakdown of Software and Hardware Cost

Description	**Qty**	**Unit Price**	**Total Amount**
	A	*B*	*C=A x B*
Andon Lights	16 (7 for Ankara MF, 2 for Bursa MF, 7 for Kayseri MF)		
Virtual Reality Headsets	8 (2 for Ankara MF, 2 for Bursa MF, 2 for Kayseri MF, 2 for Konya MF)		
Augmented Reality Smart Glasses	7 (2 for Ankara MF, 1 for Bursa MF, 2 for Kayseri MF, 2 for Konya MF)		
3D Printer	3 (1 for Ankara MF, 1 for Bursa MF, 1 for Konya MF)		
Smart Watches	8 (2 for Ankara MF, 2 for Bursa MF, 2 for Kayseri MF, 2 for Konya MF)		
Industrial Tablets	6 (5 for Bursa MF, 1 for Konya MF)		
Panel PCs	24 (11 for Ankara MF, 4 for Bursa, 2 for Kayseri MF, 7 for Konya MF)		
Touchscreen monitor	4 (1 for Ankara MF, 1 for Bursa MF, 1 for Kayseri MF, 1 for Konya MF)		
Andon Boards	8(2 for Ankara MF, 2 for Bursa, 2 for Kayseri MF, 2 for Konya MF)		
Servers and any necessary peripherals	6 (2 for Ankara MF, 2 for Bursa MF, 2 for Konya MF)		
IOT System	Minimum number of licenses that will allow the system to function as described in this document for each Model Factory		
MES Software	Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously for each MF		
ERP Software	Minimum number of licenses that will allow 5 (five) users to use the software and 10 (ten) terminals to connect simultaneously for each MF		
AR-VR Applications	Necessary licenses for one user for each Model Factory		
Other Software and Hardware Costs: (please specify)			
		Subtotal Software and Hardware (USD):	

Table 4: Breakdown of Other Costs

Description	UOM	Quantity	Unit Price	Total Amount
International flights	Trip			
Subsistence allowance	Day			
Miscellaneous travel expenses	Trip			
Local transportation costs	Lump Sum			
Out-of-Pocket Expenses	Lump Sum			
Warranty, Maintenance and Support Services	Lump Sum			
Other Costs: (please specify)				
			Subtotal Other Costs (USD):	

Table 5: Breakdown of Price per Deliverable

Activity description	Professional Fees	Software and Hardware Costs	Other Costs	Total
1. Preparation of Roadmap for the Installation and Integration of Technological Infrastructure and Provision Trainings services				
1.1 Elaboration of Existing State of Bursa Model Factory after Physical Inspection				
1.2 Finalization of Technological Architecture				
1.3 Scope for training materials and programs				
2.Installation and Integration of Technological Infrastructure				
2.1 Provision, Installation and integration of the IOT infrastructure				
2.2 Provision, Installation and integration of the MES software				
2.3 Provision, Installation and integration of the ERP software				
2.4 Development of the Virtual Reality and Augmented Reality applications				
2.5 Acceptance test of the entire technological infrastructure using the use cases defined in the RFP document				
3.Training the staff of Model Factories on the use of the installed technological infrastructure (software and hardware)				
3.1 Development of the curriculum and training program				
3.2 Delivery of approved training program				

FORM H: FORM OF PROPOSAL SECURITY

Proposal Security must be issued using the official letterhead of the Issuing Bank.
Except for indicated fields, no changes may be made on this template.

To: UNDP

[Insert contact information as provided in Data Sheet]

WHEREAS [Name and address of Bidder] (hereinafter called "the Bidder") has submitted a Proposal to UNDP dated Click here to enter a date. to execute Services [Insert Title of Services] (hereinafter called "the Proposal"):

AND WHEREAS it has been stipulated by you that the Bidder shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security in the event that the Bidder:

a) Fails to sign the Contract after UNDP has awarded it;
b) Withdraws its Proposal after the date of the opening of the Proposals;
c) Fails to comply with UNDP's variation of requirement, as per RFP instructions; or
d) Fails to furnish Performance Security, insurances, or other documents that UNDP may require as a condition to rendering the contract effective.

AND WHEREAS we have agreed to give the Bidder such this Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Bidder, up to a total of [*amount of guarantee*] [*in words and numbers*], such sum being payable in the types and proportions of currencies in which the Price Proposal is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of *[amount of guarantee as aforesaid*] without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

This guarantee shall be valid up to 30 days after the final date of validity of bids.

SIGNATURE AND SEAL OF THE GUARANTOR BANK

Signature: _____

Name: _____

Title: _____

Date: _____

Name of Bank _____

Address _____

[Stamp with official stamp of the Bank]