



Technology Solution Appraisal Tool

Department: Cooperation and Capacity Development

Division: Science, Technology & Innovation

Team Lead: Louai Farouk

Team Members:

- *Bashir Kagere*
- *Nedal Ali Ishaq*

Disclaimer

ISDBG does not guarantee the accuracy of the data included in this publication and accepts no liability for any consequence of their use. This publication is provided without any warranty of any kind whatsoever, either express or implied. Nothing herein shall constitute or be considered a limitation upon or waiver of the privileges and immunities of ISDB, all of which are specifically reserved.

Copyright Clause

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopied, recorded, or otherwise, without the prior written permission of the copyright holder, except for reference and citation, with proper acknowledgment.

Introduction

IsDB Member Countries (MCs) face significant developmental challenges related to key social and economic sectors, such as food security, climate change, high mortality, infectious and communicable diseases, poor education quality, limited access to safe drinking water, shortage in energy and environmental disasters, etc. The application of Science, Technology, and Innovation (STI) can be an effective tool in assisting IsDB MCs to address these challenges and hence contribute to the acceleration of inclusive and sustainable development.

New, existing, and emerging innovative technologies can play a critical role in addressing sectoral related challenges in IsDB Member Countries, making the acceleration of the deployment of practical and affordable technologies a key strategic focus area of IsDB/STI Division.

However, the potential impact of technology application along with its sustainability issues need to be examined carefully according to certain location-specific constraints, levels of development, resource requirements, transformational impact and return on investment, among others before deployment.

Rationale

One of the core focused areas of the STI Division is “Accelerating the Deployment of Practical Technologies across IsDB MCs”.

To facilitate this exercise, there is a need for a structured tool/Methodology to identify and evaluate deployable technological solutions that respond to the needs of IsDB MCs. The tool is Intended to provide a structured methodology for examining technologies as well as support the assessment of mainstreaming potential of identified technologies in IsDB sectoral interventions.

The Technology Solution Appraisal tool aims to examine the usefulness, adaptability, adoption and sustainability of various technologies (existing and emerging). It will provide crucial insights to the Bank and other relevant stakeholders in making informed decisions pertaining to investments in any technology.

Methodology

The concept behind the tool is to enable IsDB validate proven technologies claimed by their providers through a structured method that supports performance assessment of any individual technology as well as comparing multiple technologies in similar or different domains. A comprehensive desk review was undertaken to investigate similar tools used by international organizations, UN agencies and various companies concerned with technology assessment including UN Technology Bank (UNTB), ScienceDirect, Enginess Enterprise while taking into consideration the role of the Bank in promoting practical technology deployment for addressing MCs’ development challenges. Therefore, the tool has been customized to meet the needs of

IsDB MCs and be used as part of Technology Transfer/deployment processes prior to technology deployment. This appraisal tool will also be used as part of the technology evaluation that will be conducted under the Technology Deployment Cooperation Program.

The information required under this tool will mainly be collected from the technology provider in the place where the technology was piloted and adopted. Moreover, additional information will be sourced from the prospective beneficiary to assess the readiness/enabling environment and feasibility of deployment of the proposed solution. Overall, the tool is designed to be completed by IsDB STI staff in consultation with the technology provider and in certain exceptional cases involve a 3rd party independent evaluator to independently verify the accuracy of the inputs.

The proposed Technology assessment framework will be based on four main parameters focused on examining Technical, Economic, Social and Environmental Impacts of the technology. It will also include an assessment form for examining the deployment requirement of the Technology including the resources required and related Policy and Regulatory Framework.

Technical Impact: This parameter is used to assess the performance of any technology in terms of technical efficiency, technological maturity, ease of installations, reliability, lifetime, etc. (*Maddox, Boozer, & Forte, 2014*) (*Hou, Lu, & Han, 2008*)

Economic Impact: Evaluates the economic factors related to a specific technology, such as investment costs and operational costs on the implementation of any technology (*Vera Solutions, 2019*).

Social Impact: Assesses the impact of technology on the community, which includes social awareness and societal benefits (job creation, affordability, health impacts, etc.). It examines the pros and cons of technology deployment on the community. (*Siksnyte-Butkiene, Zavadskas, & Streimikiene, 2020*).

Environmental Impact: looks into the impact of technology on the environment, with a focus on lifecycle emissions, associated degradation impacts on land, water, air, etc. (*Ghosh & Bhowmick, 2014*).

Resource Requirements: looks at the resource requirements (raw materials, equipment, manpower, etc.) during the various stages of technology development and use (manufacturing and operation) (*Daim & Intarode, 2009*).

Policy and Regulatory Framework: Examines the existing policy and regulatory frameworks and assesses the impact of any technology adoption and deployment (*IRENA, 2014*).

The information provided under the six criteria would guide in analyzing the level of risks associated with a given technology using a proposed Risk Assessment.

The Assessment Tool

Purpose of the Technology Assessment Tool

The Technology appraisal tool can be used to understand and assess both emerging and mature technologies in various sectors including agriculture, energy, water, health, digital transformation, etc. It can be applied to examine the performance of any individual technology as well as to compare multiple technologies in similar or different domains.

This information is important as it will allow IsDB to better understand the technology, its requirements, its strengths, its innovation and how it can be adapted and adopted to the needs of IsDB Member Countries. This will assist IsDB in better explaining the technology to prospective users and organizations that may benefit from it. It would also be essential in the design of future projects that require the deployment of the technology.

Therefore, it is important that the form is filled with comprehensive and detailed information. Include 'N.A.' or Not Applicable if you find that the question does not apply to the technology in your sector. Any currency should be calculated in US\$.

The Form consists of the following Five sections:

- **Section A: Basic Information about the Technological Solution**, capturing technology related information including the sectoral challenge its addressing and whether it supports the creation of good and services, etc.
- **Section B: Information on the Solution Provider**, capturing information about the solution provider including institution information, registered status, profile, contact information and field related to SDGs, etc.
- **Section C: Technology Viability Assessment Form**, provides a set of guiding criteria in assessing the Technical, Economic, Social and Environmental Impacts of the technology
- **Section D: Technology Deployment Assessment Form**, a set of guiding criteria in assessing the Resource and related Regulatory Framework requirement for the deployment of the Technology.
- **Section E: Risk Assessment Metrics**: to assess risks associated with technology deployment.

A. Basic Information about the Technological Solution

1- Name of Technological Solution:

2- Sector/Thematic

Please specify the sectoral/thematic areas related to the technology (Health, Education, Energy, Water, Agriculture, ICT, etc.)

3- Brief Description

Please provide a brief description of the technology and its applications.

4- Challenge addressed by the technological solution

Please specify the development challenge addressed by the technological solution, indicating how the technology solves this challenge.

5- Technology Innovation

Please highlight the unique differentiating factor of the technology in comparison to your competitors. What makes the technology different?

6- Do you have any other competitors providing a similar solution?

Please provide up to three competitors that you believe provide the most similar solution.

<i>Name of Competitor</i>	<i>Website Address</i>	<i>Why is it better than the competitor?</i>

7- **Deployment potential:** Does the technology/app/method involved in your solution has a registered status as IPR (Intellectual Property Right) such as patent, trademark, industrial design, copyright, plant variety certificate, etc., protecting against illegal (unauthorized) use, offering for sale? **(Yes / No)** - *please specify*

B. Solution Provider of the Technology

8- Solution Provider Name: _____

9- Type of Entity: *Please select from the drop-down list*

- *Startup (less than 5 years of incorporation)*
- *SME*
- *Individual innovator*
- *Government institutions*
- *NGO*
- *Others, please specify*

10-Profile of Entity:

please add your entity profile including bios, experience, achievements, and international cooperation's.

11-Technology application: *please specify where your technology has been used/applied, indicating the track record of the entity in using this technology?*

12-Contact Information

- Name
- Country, City/Town
- Contact focal point information
- Name, First name
- Title – position in entity
- Address (street, City/town, postal code, province/state/canton, country)
- e-mail
- web site
- telephone
- fix line
- mobile
- other

13-Field of Technology/Industry

Please specify your field of technology / industry describing what product or service you provide and, who are your beneficiaries/customers/clients? What is the expected benefit of your product or service? What is the value proposition of your proposed work?

14-UN Sustainable Development Goals (SDGs) focused area/Industry

Please specify the SDGs related to your focused industry.

C. Technology Viability Assessment Form

Technical Assessment (Please provide technical specifications/ details in Annex-A):

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Technological Maturity: Assessment of readiness levels and maturity of a technology at the global level	Please select: 1-System prototype; 2- tested and piloted; 3-successfully implemented and operational;	
Reliability: how do you rate the ability of the technology to perform in a given period of time without any failure.	Time of continuous use per day (in hours)	
	Breakdown Frequency per year (please specify Number of breakdowns per year)	
Ease of Installation: How easily the components/parts of the technology can be installed	Man-hours (Number of persons * hours required. Please specify number of hours a person needs to work in order to install)	
	Please specify the technical skills needed to install the technology	
Scalability: Applications in other sectors with respect to technology	Measure scaleup potential in multi sectors (Please choose: Yes/No/customization needed)	
Utility Requirements: How much of the utilities is required to use the technology	Electricity consumption (#Units required)	
	Water consumption (#Units required)	
	Alternate energy consumption (Please specify)	

Operation: to measure the level of sophistication of operations of technology	Periodic Maintenance requirements (Please specify the frequency per /day/month/year)	
	Accessibility to repairs and maintenance: Who conducts the repairs and maintenance? (Please choose: 1- Technology provider, 2- capacity available in the country, 3-capacity development required)	
	Usability is how effectively and efficiently consumers can use a technology (Please specify the ease of use of the technology: 1=very easy, 2= easy, 3= difficult)	
	Technology lifespan (#Months/ Years)	
	Safety Measures (Please specify measures of safety associated with operation of the Technology.)	

Economic Assessment (Please provide cost-benefit analysis and ROI calculation details in Annex-B):

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Deployment Cost (Capital expenditure): Investment expenditure required to acquire a technology (equipment cost, service charge, etc.)	Cost of equipment/software application/Intellectual Property Rights cost (I PR) (Please specify based on the country in use \$)	

	Licensing/ Subscription cost costs fees (Please specify in \$)	
Operation and Maintenance Cost: Costs associated with operations and maintenance of the technology (raw materials, energy, labour, etc.)	Cost of raw materials and consumables (if any) (Please specify based on the country in use \$)	
	Estimated Service Maintenance cost (Please specify based on the country in use \$)	
	Estimated Labour cost (Please specify based on the country in use \$)	
	Estimated training cost to operate the technology (Please specify \$)	
	Expected annual depreciation rate (Please specify \$)	
	Repair Costs (Please specify \$)	
Expected Return on Investment: Annual return as a percentage of the capital cost	Investment returns/profitability rate (Percentage (%) sales to expenses)	
	Taxation requirements for deployment (% value)	
Benefit: benefits obtained as a result of using the technology	Benefit generated by increased production (Please specify)	
	Benefit generated by reduced costs (Please specify)	
	Other direct benefits generated that can be quantified (Please specify)	

	Other indirect benefits (that may not be quantified) (Please specify)	
--	--	--

Social Assessment: Please provide details on the social impact of the technology deployment in Annex-C

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Social Acceptance: Measures the level of acceptance of the technology among local stakeholders		
Awareness (about the technology and its impacts)	1- Low/2- Medium/3- High	
Perception - How is the technology perceived by the community	1- Low interest /2- Neutral/3- High interest	
Culture and Norms: Does the technology fit into the cultural and social norms of the recipient	(Yes/No), if No <i>Please explain</i>	
Number of Potential Beneficiaries: Number of people/members of the society, institutions benefitting from the technology	This includes direct and indirect beneficiaries (those closely linked to the technology and other secondary beneficiaries) Number of people = (please specify direct and in direct)	
	Number of Institutions = (please specify direct and in direct)	
Job creation potential: opportunities for new job creation		
Number of direct and indirect potential jobs/generated -	Number of jobs (please include full-time, part-time jobs)	
Gender diversity: Technology can be used by	Yes or no, If no Please elaborate	

all groups including people with special needs		
Standard of Living: Potential to improve the standard of living of citizens by providing access to essential services or goods offered by the technology		
Improving standards of living (in terms of income levels, wealth, etc.)	Contribution of the Technology to improving standards of living 1- Low/2- Medium/3- High Please explain	
Affordability	To what extent the technology is accessible to all segments of population? 1-Cheap and Affordable to all; 2- Specific group with medium income level; 3- High income only	

Environmental Impact: Please provide details on the environmental impact of the technology deployment in Annex-D

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Impact on Ecosystem: Impact of technology on the natural habitat of various living beings		
Impact on biodiversity (living beings)	1-3 (1=High, 2=Medium, 3=Low,	
Impact Air quality	1-3 (1=High, 2=Medium, 3=Low,	
Impact on water resources	1-3 (1=High, 2=Medium, 3=Low,	
Impact on land	1-3 (1=High, 2=Medium, 3=Low,	
Life Cycle Environmental Impact: impact of local pollutants and Greenhouse Gas Emissions (GHG)/ throughout the lifespan of a technology		
Emissions of harmful substances	1-3 (1=High, 2=Medium, 3=Low,	
GHG emissions	1-3 (1=High, 2=Medium, 3=Low,	
Noise pollution: Assess the level of unpleasant noise/sound produced because of using the Technology	1-3 (1=High, 2=Medium, 3=Low,	

D Technology Deployment Requirement

Resource Requirements Please provide details on the resources required to operationalize and maintain the technology in Annex-E):

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Raw Materials: Nature of raw materials required to assemble/build the technology	Type of raw material used (Please specify)	
	Availability of raw materials: Available/Scarce/ Not available	
	Substitutes for the raw material: Available/Scarce/ Not available	
Domestic availability of equipment used in the technology (assess the availability of local spare parts required)	Spare parts available/not available: If available, Please provide the list	
	Interoperability: ability of the new technology to work in sync with existing ones: Yes/ No	
	Opportunities for domestic reproduction of the parts: Yes/ No. Please specify	
Manpower/Skills: of skills required to operate the technology	Number of Manpower needed to operate the technology. Please Specify	
	skills required Please Choose: Skilled/semi-skilled or NOT skilled	
Training Needs: Is there any specific training required to operate the Technology	training needs: Yes or No, if Yes, Please specify the training needs cost/staff	
Technology Infrastructure requirements: what infrastructure is required to host the technology	Infrastructure needs may place a heavy burden on the deployment of a particular technology, so we need to understand any specific requirement: Please specify (e.g. 5G internet connection, green house, ICT lab, office space, etc.	

Policy and Regulatory Support (recipient of Technology) Please provide details on the policy and regulatory requirements to support the technology deployment in Annex-F):

<i>Parameters</i>	<i>Self-Assessment</i>	<i>Comments/ Justification/ Assumptions (if any)</i>
Technology Sourcing Country: Assess the ease in Technology Transfer/sourcing from global tech partners/companies	Ease of sourcing (planning, transportation, implementation, cost, etc) 1–3 (1=very easy, 2= easy, 3= difficult), if difficult please mention the reason(s)	
	Regulatory Matching (countries follow different standards, regulations, rules, etc.) 1–3 (1=high, 2=medium,3= low)	
	Trade restrictions/barriers Exist or not; if yes:1–3 (1=high level, 2= moderate level, 3= low level)	
	Intellectual property Rights (IPR) protection Exist or not;	

E. Risk Assessment Matrix Please provide details on the key identified risks of the technology in Annex-G

Risk	Likelihood (Low, Medium, High)	Impact Rating (Low, Medium, High)	Risk Mitigation/ Justification
Technology Sustainability : Assess the potential for losses due to technology failure			
Change in technology usage/obsolescence			
Competing emerging technologies			
Changes in policy and regulations supporting the			

diffusion/use of the technology, etc.			
Financial Risk: various financial risks associated with any technology			
Operational costs			
Payback period			
Political risk and uncertainty			
Resource Risk: Assess the potential risk associated with key resource availability			
Dependency on imports for raw material availability			
Global supply chain disruptions			
Labour requirement			
Raw material price volatility			

Social Risk: Potential risk of adoption of the Technology by the community	
Long-term impact on a community in terms of acceptance/social norms	
Impact on employment	
Impact on quality of life, affordability, health impacts	
Environmental Risk: Potential harm to the environment caused by any technology/project	
Long-term impact on the ecosystem, GHG emission potential, noise pollution, etc.	

Reference:

- 1) CSTEP. (2021). Technology assessment framework: Methodology note. (CSTEP-WS-2021-02)

- 2) Perkins School for the Blind - Title : Technology Assessment: Components of a Meaningful AT Assessment Url : <https://www.perkins.org/resource/technology-assessment-components-meaningful-assessment/>
- 3) Enginess – Title: How to Conduct a Technology Assessment: A Four-Step Guide Url: <https://www.enginess.io/insights/how-to-conduct-technology-assessment>

Please provide the necessary details in following Annexes

Annex – A (Detailed Technical Specification)

Annex – B (Cost-benefit analysis and ROI calculation)

Annex – C (Details on the social impact of the technology deployment)

Annex – D (Details on the environmental impact of the technology deployment)

Annex – E (Details on the resources required to operationalize and maintain the technology)

Annex – F (Details on the policy and regulatory requirements to support the technology deployment)

Annex – G (Details on the key identified risks of the technology)

Annex – H (Provide Photos and publication materials if any)