Target Software Standards

2023

ISG dIGITAL TRANSFORMATION wORKING gROUP

2023

Contents

[Glossary 3](#_Toc141589317)

[List of Figures 3](#_Toc141589318)

[Acknowledgements 4](#_Toc141589319)

[Version History 4](#_Toc141589320)

[Background 1](#_Toc141589321)

[History and Methodology 1](#_Toc141589322)

[Level of Specificity 1](#_Toc141589323)

[Maintain Relevancy 1](#_Toc141589324)

[Market Innovation 1](#_Toc141589325)

[Limited Scope 1](#_Toc141589326)

[Purpose and Objectives 1](#_Toc141589327)

[Lifecycle 2](#_Toc141589328)

[Living Document Process 2](#_Toc141589329)

[Solution(s) Design Principles 2](#_Toc141589330)

[Logistics Processes 3](#_Toc141589331)

[Terminology and the Core Process 4](#_Toc141589332)

[Requirements 4](#_Toc141589333)

[Requirements – Common 7](#_Toc141589334)

[Warehouse Management System 7](#_Toc141589335)

[Requirements – System, Interoperability and Analytics 13](#_Toc141589336)

[Product Master Data 13](#_Toc141589337)

[Facility Master Data 14](#_Toc141589338)

[Supplier Master Data 14](#_Toc141589339)

[Interoperability 14](#_Toc141589340)

[Extensibility 15](#_Toc141589341)

[Analytics and Reporting 16](#_Toc141589342)

[Requirements – Extended – dependent on the supply chain design 20](#_Toc141589343)

[Transportation Management 20](#_Toc141589344)

[Order Management 25](#_Toc141589345)

[Forecasting and Planning 27](#_Toc141589346)

[Track and Trace 28](#_Toc141589347)

[Requirements – Non-Functional 29](#_Toc141589348)

[Hosting Options 29](#_Toc141589349)

[Connectivity 30](#_Toc141589350)

[User Experience 31](#_Toc141589351)

[Security 31](#_Toc141589352)

[Annex 32](#_Toc141589353)

[Potential Future Emerging Standards and Requirements 32](#_Toc141589354)

[Contact us & Feedback link 33](#_Toc141589355)

[KPI details 33](#_Toc141589356)

[Connection to SCISMM 33](#_Toc141589357)

[RFP Scoring Template(s) 33](#_Toc141589358)

[Additional Resources 33](#_Toc141589359)

# Glossary

**API** Application Programming Interface

**ASN** Advanced Shipping Notice

**CCE** Cold Chain Equipment

**DC** Distribution Center

**eLMIS** Electronic logistics management information system

**EPCIS** Electronic Product Code Information Services

**FHIR**  Fast Healthcare Interoperability Resources

**GDSN** Global Data Synchronization Network

**GLN** Global Location Number

**GS1** Global Standards Organization

**GS1-CBV** Global Standards Organization – Core Business Vocabulary

**GTIN** Global Trade Identification Number

**LMIC** Low and Middle Income Countries

**OLA** Operational Level Agreement

**PoS** Point of Service

**PQS**  Performance, Quality and Safety

**SLA** Service Level Agreement

**SSCC** Serial Shipping Container Code

**TSS** Target Software Standards

**WMS**  Warehouse Management System

# List of Figures

[Figure 1 – Technology Lifecycle 2](file:///C%3A%5CUsers%5CStewStremel%5CDownloads%5CTSS%20dev%5CDRAFT%20-%20TSS%20-v2.5.6.docx#_Toc141589257)

[Figure 2 - Supply Chain Capabilities by Processes View 3](#_Toc141589258)

[Figure 3 - Supply Chain Capabilities 5](#_Toc141589259)

# Acknowledgements

Special thanks and acknowledgements go out to the many people that have helped to draft the document and provide critical feedback: Abhinaw Shrivastava, Ashraf Islam, Breno Horsth, Carl Fourie, Christine Lenihan, Cornelis de Groot, Craig Drown, David Crewe Brown, Gabriel Cunha, Gary Willetts, George McGuire, Gisele Poby, James Cranwell Ward, James McKinnon, Jean Miller, Jeni Stockman, Kelly Hamblin, Lakshmi Balachandran, Lindabeth Doby, Lungi Okoko, Maeve Magner, Manuel Celestino Lavayen, Maryam Fanaei Najafabadi, Michael Egharevba, Michael Rea, Michelle Seidel, Murjanatu Othman, Nuran Idris, Olusoji Bolanle Bolajoko, Parambir Gill, Per Kronslev, Phidelis Suwedi, Ramy Guirguis, Sachin Jagtap, Sanji De Silva, Sean Blaschke, Stew Stremel, Swaroop Jayaprakash, Taeksoo Kim, Trevor Lambiotee, Vinay Mandala, Zabihullah Kamran.

# Version History

|  |  |  |
| --- | --- | --- |
| Release | Date | Summary |
| 2.5.6 | 2023-07-30 | Initial Version |
| 2.5.7 | 2023-08-24 | Correct color coding on requirements resource level |

# Background

## History and Methodology

In 2018 a group of key stakeholders came together to develop the first set of “Target Software Standards” (TSS) for electronic logistics management information systems (eLMIS) and cold chain appliance asset management. The transition from paper-based management of in-country supply chains to digital systems led to the (a) growing need for market-driven software solutions and increased awareness and (b) a better understanding of what an eLMIS is and how it can improve supply chains.

Despite the advantages and success of the first TSS, the community has identified four key areas of opportunity to incorporate into an updated TSS: the importance of the level of specificity, the need to maintain relevancy, the ability to connect with the market of solution providers, and the challenges of a limited scope focused only on eLMIS.

|  |  |
| --- | --- |
| Level of Specificity | The first version of the TSS did not provide enough specificity to help (a) the software vendors understand the functional requirements and (b) governments select between potential applications.  |
| Maintain Relevancy | Technology changes quickly and there was no methodology or process established to ensure the TSS continues to evolve in response to these changes, nor a mechanism to gather input from stakeholders on an ongoing basis. |
| Market Innovation | Along with maintaining relevancy over time is the need to ensure that market innovation continues to be recognized and is a part of the process moving forward. |
| Limited Scope | A high-functioning, health care delivery supply chain is supported by an eLMIS that connects with a broader context to support. The prior version of the TSS did not consider the many ways in which an eLMIS must connect and work with key supply chain and health system processes such as procurement, planning and forecasting, electronic health records, and dispensing. |

# Purpose and Objectives

Low to Middle Income countries (LMIC) continue to enhance and evolve their approach to the delivery of health services to their citizens. The usage of technology is rapidly expanding and changing the nature of these services. “Digital transformation,” the act of using technology to enhance and transform business processes, is accelerating rapidly across all capabilities including procurement, planning, health care delivery and supply chain operations. This is more than the simple digitalization of the paper processes, but a steady transformation of systems to take advantage of the new capabilities presented.

The version of the TSS considered in this document is intended to provide an effective listing of requirements that describe supply chain processes in the context of a larger ecosystem. The primary audience are those with either a supply chain or technology background. These requirements are intended to be used by (a) software vendors to match their offerings more effectively to the needs of this community, and (b) country governments to better enable the building of RFP requirements and scoring mechanisms to match the requirement definitions presented here.

# Lifecycle

All technology exists in a lifecycle. There is a constant cycle in the selection, use, and replacement or retirement process that every organization is progressing through as they manage their technology investments.

This document is primarily focused on (phase 2 in the diagram) advising software vendors on key capabilities that are needed for the LMIC context and (phase 3 in the diagram) for countries looking to select a new system. It is not intended to cover the other phases of the lifecycle (phase 4, Implementation & Upgrade, phase 5 Measure & Evaluate and phase 1, Strategy). However, it will reference several key resources in the appendix for the readers’ consideration.

Figure – Technology Lifecycle

## Living Document Process

To maintain relevancy and responsiveness to evolving needs over time in the fast-changing world of technology, this document will go through an annual renewal process. This process will be initiated by the publishing of an open request for comment. The RFC results will be collated and followed with an open workshop session to review and develop consensus on the recommended changes. These changes will then be presented to the ISG and once accepted the new version published to the community.

## Solution(s) Design Principles

A country’s supply chain is a large ecosystem of tools and processes to produce the needed results to effectively manage the flow of the right commodities and information to the right location at the right time. To help guide the development and selection of software to help meet these many different needs, the following minimum solution design principles are used:

* **Fit for Purpose and Fit for Use**: Software must be appropriate for the context and infrastructure in which it is to be used. The usability of the software must be appropriate to those who are using it. Therefore, it is best to use software for its strengths and to limit its use for workflows and contexts where it wasn't intended to be used.
* **Diversity**: It takes more than one piece of software to provide all the services needed to run an effective supply chain.
* **Maturity**: Different countries and different portions of a country’s supply chain can, and will, be at different levels of technological maturity. What is appropriate in one context may not be appropriate in another.
* **Commonality**: Common master data for facility/location, product, and supplier is critical for maintaining data quality for effective decision making, and it is essential to success.
* **Interoperability:** As the number of software applications increases, the need to manage how data is connected, shared, maintained and governed with external systems also increases. These systems can be within the same department, cross-departmental and external to the organization and/or country.

# Logistics Processes

The logistics process dictates where and how commodities are stored, distributed and who makes these key decisions at each step in the value chain. The logistics processes continually exchange data and connect with the larger supply chain processes for forecasting & planning, procurement, ordering, storage, transportation, and the emerging capabilities to support End to End visibility and Track & Trace.

Countries can and will have multiple design approaches to how their supply chain’s function. The software employed must support this diversity with flexibility. The primary focus of this TSS is on the role of eLMIS. It is important to note that in most cases, commodities are moving across organizational boundaries, transitioning from logistics organization staffed by dedicated supply chain professionals to health care delivery personnel that are acting as a storeroom manager. This transition is highlighted in the graphic below in the transition from Central to Regional/District warehouses to Service Delivery Points.



Figure - Supply Chain Capabilities by Processes figure

Regardless of the design used, at each location in the supply chain where commodities are stored there are core responsibilities in common that must be met on handling the commodities **entering** the supply chain, managing their location and **movement** through the supply chain, tracking their **exit** from their portion of the supply chain. These core responsibilities will be referred to under the Inbound Processing, Inventory Management and Outbound Processing requirements.

*\*It is recommended to the reader to use the editable image of the supply chain capabilities by processes figure to match their individual supply chain to showcase what capabilities are needed at each level for their specific context. This activity will allow the reader to then filter down to which capabilities are of the greatest interest for prioritization.*

While every location in the supply chain has these core responsibilities, every location also has the need to share data. Every point in the supply chain has this responsibility to share the minimum stock disposition to assess the overall health and needs of the supply chain. To do this, facility / location identification, product identification and supplier identification must be mastered and aligned across sites. The extended responsibilities of Forecasting and Planning, Supplier & Contract Management, Procurement Management, Order Management, and Transportation Management activities are heavily affected by the supply chain design chosen and correspondingly affect what capabilities are needed at each location.

### Terminology and the Core Process

The term Warehouse Management is one that is frequently used to describe the combined features needed to run a large full-scale warehouse with multiple buildings dedicated to a supply chain hub and staffed with dedicated supply chain professionals. This can lead to confusion when attempting to describe the same type of functionality when used at a Health Facility such as hospital or a Health Post that has a single room for storing inventory.

Health Facilities and Health Posts have differing needs and frequently have health care workers that are performing supply chain functions. When commodities enter these locations, the buildings, personnel and software are handled and supported by a different organization than that supporting the warehouses. These locations have the greatest variability in the environmental and infrastructure conditions for power, connectivity, and temperature controls, and staffing needs, dictating what types of technology are appropriate. This has traditionally been labeled as ‘eLMIS’ in the global development context. The most analogous term in the commercial context would be Storeroom Management.

While the capabilities overlap between a fully dedicated warehouse and that of eLMIS/storeroom, the appropriateness of the software in use does not. eLMIS software serves a different set of users and is most frequently used with a different level of infrastructure. However, in this document, when describing ‘Warehouse Management’ the intent is that we are describing the capabilities for use at that of an eLMIS/storeroom location.

# Requirements

The following pages offer system standards and guidelines for countries, supply chain technical teams, and vendors looking to build out and strengthen digital supply chain capabilities. These “requirements” are for describing the use of target solution(s) capabilities and are grouped together to align with the concepts in common. The requirements are divided into four groupings: ‘Common Core’, ‘Common System, Interoperability and Analysis’, ‘Extended’ and ‘Non-Functional’. Common Core and Interoperability and Analysis requirements are those that all locations in a supply chain must support. The Extended Requirements are functions that are about connecting to the larger supply chain capabilities.



Figure - Supply Chain Capabilities

**Recognizing the design principles of ‘Fit for Use’, ‘Fit for Purpose’, ‘Diversity’ and ‘Maturity’ a single application or solution to meet all the capabilities described in this document has not been found to be practical to meet a country’s needs**. It is strongly recommended that countries should prioritize which capabilities they need to maximize process efficiency, then select software that meets those capabilities, and are the most effective with interoperability options. As implementations progress over time, if implementation is aligned on global standards and interoperability, the resources needed will decrease because readiness and scalability will increase.

Each requirement is identified on a continuum of ‘Essential’, ‘Advanced’ and ‘Emerging’. Country governments can use the capability requirements as a guideline to select what priorities they have and in what order to pursue them. Essential requirements are intended to be considered a minimal viable offering and are most appropriate for lower resource/lower maturity settings whereas Advanced are intended for higher resource/higher maturity settings. Emerging requirements are for early consideration where the market direction is yet unsettled, but that are important and strategic enough to be considered when evaluating road maps. It is recommended that countries periodically assess their technical maturity levels using tools such as the GHSC-PSM Supply Chain Information System Maturity Model\*.

Each requirement is also categorized by the level and reliability of available resources such as infrastructure and skilled personnel. Three **example** levels of resource settings have been considered as detailed below and should be viewed as a continuum. The purpose of the resource setting level is to help guide the solutions that are Fit for Use for the environment.

* **Low Resource Setting** – This represents downstream supply chain facilities such as health posts that may not have access to a desktop or laptop. Operations would mainly focus on managing inventory, requesting replenishments, and issuing stock. Operations would be performed on mobile devices (i.e., feature phone, smart phone, or tablet) in such settings. Low resource settings often lack access to people skilled in supply chain operations. Such settings also lack consistent and reliable access to the internet and hence require offline system capabilities to perform operations and sync with the main system once online.
	+ Examples could include remote health facilities, health posts and community health workers.
* **Medium Resource Setting** – This represents supply chain facilities that have a limited number of desktops or laptops with limited internet access both in bandwidth and connectivity. These devices may not be dedicated to supply chain functions but also used for other purposes as well. Operations in such settings may not involve a high volume of commodities and transactions. Such facilities may not require extensive location or bin management to manage inventory. Users in such settings are skilled at performing basic inventory operations such as receiving, using simple barcode scanners.
	+ Examples include district warehouses, service delivery points, secondary care hospitals or health facilities.
* **High Resource Setting** - This represents larger warehouses that involve a higher volume of transactions and commodities. The users in such warehouses have access to multiple workstations such as desktops or laptops. Such locations are located where internet connectivity is mostly reliable. Users in such locations are skilled in performing extensive warehouse and collaboration processes such as order management, procurement, receiving and location management and have dedicated supply chain staff. Users may also have access to performing operations using handheld mobile computers.

Examples include central warehouses, central medical stores, regional hubs and tertiary care hospitals.

## Requirements – Common

Requirements in common to all locations - regardless of the supply chain design employed - where commodities are received, stored, and passed on to another location or issued for use. A typical eLMIS would include a combination of certain Warehouse Management Systems (WMS) capabilities such as inbound processing, inventory management, and certain order management system capabilities such as requisition order management and transfers. A basic last-mile eLMIS solution would be expected to have at least the capabilities for a low-resource setting.

Each warehouse or eLMIS/storeroom location must go through these basic steps of receiving commodities, storing them, and passing them on for fulfillment or use. These steps must also be coordinated with the requisition management, order management and transportation management functions that may be handled in a separate system or in a primarily paper-based approach.

**Resource Level Legend**

|  |  |
| --- | --- |
| **Low Resource Setting** | Requirements specifically applicable to low resource setting, but also applicable to medium and high settings |
| **Medium Resource Setting** | Requirements specifically applicable to medium resource setting, but also applicable to high setting (Not applicable to low settings) |
| **High Resource Setting** | Requirements specifically applicable to high resource settings only (Not applicable to low and medium settings) |

| **Warehouse Management System**The capabilities necessary to managing the flow of stock into the facility, its current disposition, and the flow of stock out of the facility. | **Setting** | **Essential** | **Advanced** | **Emerging** |
| --- | --- | --- | --- | --- |
| **Inbound Processing** | System provides capability to receive product packages that do not come with GS1 barcodes or proprietary/non-GS1 barcodes by allowing users to manually enter product package details including batch number, quantity, and expiry date. | **L** | **X** |  |  |
| System is capable of blind receiving products when advanced shipment notice details are not available in the system, by capturing shipment details while receiving of the product, quantity, batch number and expiry date from the packing list. | **L** | **X** |  |  |
| System provides offline capabilities to perform basic operations such as receiving and syncs with the main database when the device is connected back online. Offline activities will go through a validation for error/mismatch/duplications. | **L** | **X** |  |  |
| System does validations of entered data to check for mandatory fields and data integrity | **L** | **X** |  |  |
| System provides capability to scan GS1 1D and 2d and/or proprietary/non-GS1 barcodes on product packaging barcode labels using barcode scanners to receive products against advanced shipment notices captured in the system. | **L** |  | **X** |  |
| System allows users to record the storage location of products once they are put away. | **M** | **X** |  |  |
| System allows capture of advanced shipment notices with details including shipment number, purchase order number, product information, unit of measure and quantity along with batch numbers and expiry dates if available and provide a forward view of the scheduled arrival based on estimated date of delivery. | **M** | **X** |  |  |
| System provides capability to see forward schedule of deliveries based on updates received from advanced shipment notices. | **M** | **X** |  |  |
| System can generate a goods receipt note with details such as product quantities received against ordered quantity and any quantities rejected along with rejection or receipt condition notes. | **M** | **X** |  |  |
| System generates put away tasks once products are completely received. | **M** |  | **X** |  |
| System generated put away tasks can be printed and/or assigned electronically. | **M** |  | **X** |  |
| System generated put away task include allocating stock to empty storage locations to the received products. | **M** |  | **X** |  |
| System calculates warehouse space dynamically based on inbound shipments, products’ volume, and storage availability. | **M** |  | **X** |  |
| System provides the ability to capture serial numbers, if available, as part of advanced shipment notices. | **M** |  | **X** |  |
| System provides capability to print barcodes for those products whose packages come without a barcode label with relevant information such as GTIN or local product identifier (if GTIN not available), batch number, quantity and expiry date.  | **M** |  | **X** |  |
| System provides the ability to quarantine products in a quality control location based on inspection.  | **M** | **X** |  |  |
| System generates receiving discrepancy reports after items are inspected and discrepancies are identified.  | **H** | **X** |  |  |
| System captures warehouse equipment details and personnel skill details to help in assignment of put away tasks.  | **H** |  | **X** |  |
| System automatically assigns put away tasks to warehouse personnel based on factors such as workload, skills, and storage space.  | **H** |  | **X** |  |
| System provides the capability for users to perform put away tasks using handheld devices/mobile computers and records the storage location of products once they are put away. | **H** |  | **X** |  |
| System can integrate directly with suppliers and logistics providers to exchange advanced shipment notices/shipments along with status updates.  | **H** |  | **X** |  |
| System alerts warehouse personnel of inbound shipments, based on the captured advanced shipment notices and estimated delivery dates, to enable planning for space and labor.  | **H** |  | **X** |  |
| System alerts issues related to storage spaces dynamically.  | **H** |  | **X** |  |
| System captures and shares inbound processing exceptions with other systems such as procurement to enhance planning, vendor performance mgmt. and recalls.  | **H** |  | **X** |  |
| **General Inventory Management** | System tracks available inventory details with information such as product identifier, batch number, expiration date and quantity. | **L** | **X** |  |  |
| System provides offline capabilities to perform basic operations such as inventory updates, and syncs with the main database when the device is connected back online. | **L** | **X** |  |  |
| System performs validations of entered data to check for mandatory fields and data integrity. | **L** | **X** |  |  |
| System provides the capability to perform inventory counts using handheld devices.  | **L** |  | **X** |  |
| System tracks inventory in the stored locations with information such as product identifier, batch number, expiration date and quantity.  | **M** | **X** |  |  |
| System generates warnings for near-expiries when historical consumption patterns are not sufficient to deplete stock before expiration. | **M** |  | **X** |  |
| System can determine inventory replenishment needs based on factors such as reorder level, order-up-to-level, inventory position, safety or buffer stocks, and consumption in a manner that is configurable per product. | **M** |  | **X** |  |
| System can integrate with order management system to generate replenishment orders based on replenishment needs. | **M** |  | **X** |  |
| System can integrate with other systems such as Order Management to provide real time inventory data such as receipts, stock on hand and adjustments.  | **M** |  | **X** |  |
| System generates cycle count tasks randomly and physical count tasks based on warehouse count schedule, and allows printing them for warehouse personnel to perform tasks per location. | **M** | **X** |  |  |
| System allows supervisors to accept/reject count discrepancies and automatically adjusts inventory based on acceptance or rejection.  | **M** | **X** |  |  |
| System provides capability to configure warehouse locations including aisles and bins and define what category of products get stored where.  | **H** |  | **X** |  |
| System able to assign reservations to inventory to enable distribution planning. | **H** |  | **X** |  |
| System is capable of commissioning and capturing serialized identifiers (e.g., GTIN and Serial Number). System must be able to capture aggregation and disaggregation of packing hierarchies for serialized objects. | **H** |  |  | **X** |
| System assigns inventory counts automatically to warehouse personnel based on workload and skills. | **H** |  | **X** |  |
| System is capable of capturing temperature excursion alarms by CCE unit and share events with upstream systems. | **M** | **X** |  |  |
| System has a disposal code for when VVM has exceeded. | **M** | **X** |  |  |
| System can capture and maintain CCE unit profiles (make, model, capacity, age, energy source, etc.). | **M** | **X** |  |  |
| System can capture and maintain CCE Locations (installed, stored, service site). | **M** | **X** |  |  |
| System can integrate with CCE to update functional status.   | **M** | **X** |  |  |
| System can identify CCEs requiring replacement based on age of equipment, performance trend and service history. | **M** | **X** |  |  |
| System can integrate with CCE unit to capture temperature readings. | **H** |  | **X** |  |
| System can integrate with cold chain transport container to capture temperature readings. | **H** |  | **X** |  |
| System supports WHO PQS interoperability standards. | **H** |  | **X** |  |
| System maintains CCE spare parts & tool sets profiles. | **H** |  | **X** |  |
| System maintains spare parts & tools inventory (location, quantity, replenishment rule, transaction). | **H** |  | **X** |  |
| System can generate a CCE service schedule, including maintenance activity tracking for services requested, services performed and service outcomes. | **H** |  | **X** |  |
| System can Analyze CCE performance.    | **H** |  | **X** |  |
| System maintains a list of CCE service providers by CCE type. | **H** |  | **X** |  |
| **Outbound Processing** | System allows capture of product details including batch number, expiration date and quantity that was issued out, and accordingly updates inventory. | **L** | **X** |  |  |
| System provides offline capabilities to perform the operation of issuing out stock and updates local inventory, and syncs with the main database when the device is connected back online. | **L** | **X** |  |  |
| System performs validations of entered data to check for mandatory fields and data integrity. | **L** | **X** |  |  |
| System allows capture of requisition/outbound order details including requisition number, product details, quantities.  | **M** | **X** |  |  |
| System generates outbound shipments, with details such as shipment number and product details, based on associated outbound order in the system. | **M** | **X** |  |  |
| System can integrate with order management system to provide real time updates regarding outbound shipments.   | **M** | **X** |  |  |
| System generates picklists based on various configurable criteria such as FIFO, FEFO, LIFO and use by dates. | **M** | **X** |  |  |
| System can integrate with other systems to share shipment information and status updates electronically.  | **M** |  | **X** |  |
| System generates picklist tasks that can be printed out for warehouse personnel to perform.   | **M** | **X** |  |  |
| System captures details of picked products including batch number, quantity and expiration date and associates them with shipments.  | **M** |  | **X** |  |
| System provides ability to pack products in required pack sizes and generates and prints packing labels.  | **H** |  | **X** |  |
| System consolidates and optimizes picklists and picking tasks based on factors such as warehouse location, order priority and product category.  | **H** |  | **X** |  |
| System provides capability for users to perform picking task using handheld devices.  | **H** |  | **X** |  |
| System can print packing slips/ pack lists along with shipping documents that will be used by receiving location to validate delivered commodities. | **H** |  | **X** |  |
| The shipping documents will have weight & dims based on master data/attributes. | **H** |  | **X** |  |
| System is capable of assigning carrier information to shipments.  | **H** |  | **X** |  |

## Requirements – System, Interoperability and Analytics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Product Master DataThe process of managing key master data is required to effectively support the systems in use and interoperate with the larger technology ecosystem. This product master data must be aligned with national essential medicines list and has information on category/classification, Route of Administration, Dosage Form and Strength with a method to keep the product list current. Additionally, the system must support other types of products including single use medical devices, diagnostic imaging, surgical supplied, etc.) | Setting | Essential | Advanced | Emerging |
| Product Master Data | System provides offline capabilities for users to create placeholder product identifiers and other product information in offline mode to facilitate processes such as blind receiving for products that are not yet created in the system. | **L** | **X** |   |  |
| System synchronizes master data from higher tier systems, either manually or on a schedule when internet is available.  | **L** |  | **X** |  |
| System allows capture of standardized product information including images in a centralized way.  | **M** | **X** |  |  |
| System provides the capability to map and link standardized product identifiers such as Global Trade Item Numbers (GTINs) with national identifiers, if and when required.  | **M** | **X** |   |  |
| System provides users the ability to create, update and delete product information based on security role. | **M** | **X** |   |  |
| System captures history of changes made to product information records.  | **M** | **X** |   |  |
| System provides workflows to manage updates to product information and approvals to accept updates based on security role.  | **M** | **X** |   |  |
| System provides the ability to upload master data from data sources such as manufacturers received in spreadsheet formats. | **M** | **X** |  |  |
| System can also classify product items based on multiple classification systems such as UNSPSC (pharma) and GPC (medical devices), etc. | **M** | **X** |  |  |
| System can integrate with other systems to exchange product information.  | **H** |   | **X** |  |
| System can integrate with data providers’ systems such as manufacturer systems and Global Data Synchronization Network (GDSN) data pool to receive standardized data.  | **H** |   |   | **X** |
| System can integrate with data providers’ systems such as manufacturer systems and Global Data Synchronization Network (GDSN) data pool to provide feedback when product/attribute data is incorrect. | **H** |   |   | **X** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Facility Master DataThe process of managing key master data is required to effectively support the systems in use and interoperate with the larger technology ecosystem. | Setting | Essential | Advanced | Emerging |
| Facility Master Data | System allows capture of facilities information in a standardized and a centralized way.  | **M** | **X** |   |  |
| System captures population size of each facility’s catchment area to support campaign planning. | **M** | **X** |  |  |
| System provides the capability to map and link standardized location identifiers such as Global Location Numbers (GLNs) with national identifiers, if and when required. | **H** |  |  | **X** |
| System can integrate with other systems to exchange standardized facility information.  | **H** |  | **X** |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Supplier Master DataThe process of managing key master data is required to effectively support the systems in use and interoperate with the larger technology ecosystem. | Setting | Essential | Advanced | Emerging |
| Supplier Master Data | System allows capture of supplier master data such as supplier identifier, name, and address along with location details.  | **M** | **X** |   |  |
| System can integrate with systems to share supplier master data.  | **H** |   | **X** |  |
| System can map GLNs to supplier information such as supplier locations.  | **H** |   | **X** |  |
| System provides a supplier portal where suppliers can provide their details in a standardized way.  | **H** |   | **X** |  |

| InteroperabilityThe ability to share transactional data between one or more systems on a repeatable and automated basis. | Setting | Essential | Advanced | Emerging |
| --- | --- | --- | --- | --- |
| Flat File | The ability to import and export data from the system in a flat file format such as CSV, TSV, XLSX(e.g. SQL exports). | **L** | **X** |  |  |
| API | The ability to connect with and allow connection from other systems via an API over protocols such as REST, SOAP (for legacy), etc.  | **M** |  | **X** |  |
| That have industry standard API documentation to ease discovery and integration (e.g. [[Open API](https://www.openapis.org/)](https://www.openapis.org/) / Swagger, WSDL). | **M** |  | **X** |  |
| Specific Standards | Technologies must provide standard means of accessing data within the system that does not lock the client into proprietary data formats or storage mechanisms. See the section on *Emerging Standards\** at the end of this document for recommendations on standards that should be considered as a value add for future compatibility. | **H** |  |  | **X** |
| Cold Chain Temperature Monitoring (via remote temperature monitoring device) | Capture temperature reading by CCE unit (follows the PQS Temperature Monitoring performance specification WHO/PQS/E006/DL01.1) and share data with upstream systems.  | **H** |  | **X** |  |
| Capture temperature excursion alarms by CCE unit (follows the PQS Temperature Monitoring performance specification WHO/PQS/E006/DL01.1 ) and share data with upstream systems. | **H** |  | **X** |  |
| Capture Performance, Environmental, Administrative, and Use attributes by CCE unit (follows PQS EMS Data Standards WHO/PQS/E006/DL01.1) and share data with upstream systems. | **H** |  | **X** |  |
| Capture temperature reading by transport container (follows the PQS Temperature Monitoring performance specification WHO/PQS/E006/DL01.1 ) and share data with upstream systems. | **H** |  | **X** |  |

| Extensibility The ability to keep a system up-to-date and extend its existing capabilities to meet specific requirements. These requirements would apply to all resource settings. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| Software Source | If the system is an open-source tool, the system must have open, easy access to source code: A standard version control system (e.g., GitHub) must be used to ensure that source code access is fast, easy to download, compile, and execute code.If the system is a closed source/proprietary tool describe what level of access is provided to source code that will be specific to the implementation and applicable configurations, customizations, and extensions. | **X** |  |  |
| What is the license model for the Software and how does this affect any customizations? (e.g., is it AGPL, MIT, etc.). | **X** |  |  |
| Vibrancy | If the system is an open-source tool, describe the vibrancy of the development community for the system by sharing the number of people and organizations that are contributing to maintaining the code.If the system is a closed source/proprietary tool describe the number of and experience levels of software implementation partners and vendors specific to different regions such as Africa and Asia. | **X** |  |  |
| Updates and Upgrades | The system must have a method for providing updates (minor versions) and/or upgrades (major releases) to be regularly applied to the system in a predictable and repeatable fashion. Additionally, the system will have regular/routine maintenance performed to keep the underlying infrastructure current. | **X** |  |  |
| Customizations and Extensions | The system must have a method for providing customizations and extensions that are developed for the system and what impact these have when performing upgrades.Describe the extent to which the tool can support requirements through ‘out the box’ features or through flexible configurations as opposed to customizations and extensions that require additional coding and maintenance. | **X** |  |  |
| Product Backlog | The provider of the system must have a way for users to provide input on features and changes are prioritized for inclusion in the base product offering of the system and how these make their way into the upgrade cycle. |  | **X** |  |

| Analytics and Reporting The ability to track key performance indicators, produce standard reports and allow for custom report development and analytics on the data. These requirements would apply to all resource settings. All threshold KPI’s should be configurable by the administrator of the system. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| KPI’s(Base Minimums; see appendiXfor links to extended documentation) | KPI data points | System shall have the ability to gather the necessary data points to produce the minimum KPIs designated below. | **X** |  |  |
| KPI definitions | System shall have the ability to adjust a KPI to meet the country’s needs. i.e., the ability to define the time range. | **X** |  |  |
| **Metric** | **Formula** | **UOM** | **Level** | **Point** | **Frequency** |  |
| On-Shelf Availability (OSA) |  | % | Customer level  | * PoS
* Central DC
 | Weekly | **X** |  |  |
| On-Time, In-Full (OTIF) |  | % | Customer level | * PoS
* Central DC
 | Weekly | **X** |  |  |
| Order Cycle-Time (CT) |  | # | Customer level | * PoS
* Central DC
 | Weekly | **X** |  |  |
| Forecast Accuracy (FA) |  | % | Product level | Entire in-country health SC | Quarterly | **X** |  |  |
| Product Loss |  | % and $ | Product level | Entire in-country health SC | Monthly | **X** |  |  |
| Quality Test Rate |  | % | Product level | Entire in-country health SC | Quarterly / monthly | **X** |  |  |
| Product Quality Adherence |  | % | Product level | Entire in-country health SC | Quarterly / monthly | **X** |  |  |
| Stocked According to Plan (SATP) |  | % | Customer level | * PoS
* Central DC
 | Quarterly | **X** |  |  |
| Inventory Turns |  | # | Product level | * Central DC
 | Quarterly / monthly | **X** |  |  |
| Total SC Cost as % of Distributed Product Value |  | % | Customer and/or distribution channel level | * Central DC
 | Quarterly / annually | **X** |  |  |
| LMIS Order Reporting Rate |  | % | Customer level | * PoS
 | Per reporting deadline | **X** |  |  |
| Closed vial wastage |  | % | Product level | * PoS
* Central DC
 | Quarterly / monthly | **X** |  |  |
| Functional status of cold chain equipment |  | % | Customer level | * PoS
* Central DC
 | Quarterly / monthly | **X** |  |  |
| Temperature alarm rates |  | # | Customer level | * PoS
* Central DC
 | Quarterly / monthly | **X** |  |  |
| Basic Reports | Transactional reports (order, invoice, pick list, packing list, shipment notification, shipment confirmation, proof of delivery, returns with reason code, stock adjustments on physical counts). | **X** |  |  |
| Inventory reports: product quantity per location (absolute quantity, months or weeks of stock), product aging (by expiry), closed vial wastage rate, open vial wastagerate4, low stock alert. | **X** |  |  |
| CCE reports: volumetric capacity available (per unit, per location), temperature excursion rates and durations, CCE need attention, CCE non-functional, average CCE downtime, CCE service schedule, service due, service pending, technician responsible, service outcome. | **X** |  |  |
| SMS/email/direct messaging and dashboard notifications for all exceptions and escalation logic for aging exceptions. | **X** |  |  |
| Sorted and filtered lists of facilities, commodities, inventory cards, and transactions for all products, requisitions, shipment notifications and confirmations, and proofs of delivery. | **X** |  |  |
| Forecast reports for time periods & levels: forecasted requirements, constrained requirements (see forecasting & supply planning), future stock positions. | **X** |  |  |
| Data quality, including on-time reporting, and completeness of data (e.g. sites reporting for the period). | **X** |  |  |
| Installed CCE capacity analysis: total available capacity availability and gaps against current and future capacity needs, based on inputted assumptions including supply intervals, vaccine presentations, population growth. |  | **X** |  |
| Performance Reports | Full Stock Availability, all tiers. | **X** |  |  |
| Stocked According to Plan, all tiers. | **X** |  |  |
| Stock-out Duration, all tiers. | **X** |  |  |
| On-Time, In Full delivery (OTIF), all tiers. | **X** |  |  |
| Forecasted Demand Ratio (forecast accuracy). | **X** |  |  |
| Closed Vial Wastage, all tiers. | **X** |  |  |
| Temperature Alarm Rate and (where possible) Average Duration, all units. | **X** |  |  |
| Functional Status and (where possible) Average Downtime of Cold Chain Equipment. | **X** |  |  |
| Coverage Supply Ratio (coverage reported vs. items utilized). | **X** |  |  |
| Operational Reports | System downtime. | **X** |  |  |
| System usage (by user, by team / facility / other). | **X** |  |  |
| System backup status (success/failure, size, time taken). | **X** |  |  |
| System utilization (CPU, memory, disk, network). | **X** |  |  |
| System scheduled jobs status (success/failure, schedule, time taken). | **X** |  |  |
| Master data accuracy per Product, Supplier, Facility. |  | **X** |  |
| System failures and warnings. | **X** |  |  |
| Custom Reports | System allows for a system administrator or power user to customize basic reports to meet their specific needs. In addition, describe the system’s capability to integrate with advanced analytics tools such as PowerBI and Tableau for custom reports and analytics. |  | **X** |  |
| System can produce a report that shows the Inventory disposition of a product based on Funding Source of the original procurement. |  |  | **X** |

## Requirements – Extended – dependent on the supply chain design

Each of the following set of requirements is dependent on the supply chain design implemented to decide on how relevant they are for use at each location.

| Transportation ManagementManaging the process of route management, transportation execution, freight audit and payment. | Setting | Essential | Advanced | Emerging |
| --- | --- | --- | --- | --- |
| Route Management | System assigns optimal routes based on vehicle space, sequence, and distance to different destinations while providing options to manually adjust or override routes. | **H** |   | **X** |  |
| System can optimize routes based on various criteria including volume, urgency, and distance etc.  | **H** |   | **X** |  |
| System uses real time updates of weather/traffic and coordinated updates from shipping and receiving systems for route optimization. | **H** |   | **X** |  |
| System provides simulation-based network and route optimization options.  | **H** |   | **X** |  |
| System captures and shares inbound processing exceptions with other systems such as procurement to enhance planning, vendor performance management and recalls.  | **H** |   | **X** |  |
| Transport Execution | System provides the ability to generate proofs of delivery and update transportation statuses manually.  | **M** | **X** |   |  |
| System can use master data (weights & dims to provide truck size for each delivery. | **M** |  | **X** |  |
| System captures real-time transportation statuses (shipped, in-transit, delivered etc.) based on electronic updates from drivers.  | **H** |   | **X** |  |
| System can integrate with other systems to share transportation statuses and provide other updates.  | **H** |   | **X** |  |
| System can integrate with transporter’s vehicle tracker (GPS) application for real time movement visibility.  | **H** |   | **X** |  |
| System captures electronic proofs of delivery and automatically shares them real time with all connected supply chain systems.  | **H** |  | **X** |  |
| System can integrate with vehicle sensors or smart vehicle monitors to track data elements such as tire pressure, fuel consumption and speed limits. | **H** |   |  | **X** |
| Freight Audit and Payment | System allows upload of freight invoices and payment details.  | **M** | **X** |   |  |
| System can automatically link freight invoices with associated shipments and deliveries.  | **H** |   | **X** |  |
| System allows reconciliation and consolidation of freight bills and invoices.   | **H** |  | **X** |  |
| System adjusts, audits, and allocates freight bills to respective orders/shipments.  | **H** |   | **X** |  |
| System provides ability to process payments to logistics vendors.  | **H** |   | **X** |  |

| **Supplier and Contract Management**Managing sourcing and contracting strategies, handling tender management, and tracking supplier performance. | **Setting** | **Essential** | **Advanced** | **Emerging** |
| --- | --- | --- | --- | --- |
| **Sourcing** | System maintains annual procurement plans and can identify sourcing requirements.  | **H** | **X** |  |  |
| System uses inventory data and demand data to determine sourcing requirements that feed into annual procurement plans.  | **H** | **X** |  |  |
| System allows supply planning at national level and each supply chain level to determine sourcing requirements.  | **H** | **X** |  |  |
| System monitors and alerts for expiring contracts in advance  using configurable time blocks (i.e. default of 12 month). | **H** | **X** |  |  |
| System uses procurement plans to establish procurement budgets and ceilings for suppliers.   | **H** | **X** |  |  |
| System creates individual procurement plans using configurable time blocks (i.e. default of 12 month) rolling forecasts for products that might require new contracts.  | **H** | **X** |  |  |
| System captures new contracting requirements along with procurement specifications.  | **H** | **X** |  |  |
| System can use multiyear forecast data to determine sourcing needs.  | **H** | **X** |  |  |
| System uses product classification and master data to source items and be able to aggregate orders for management and reporting purposes. | **H** | **X** |  |  |
| System automatically validates contract values against the established budget and ceilings.  | **H** |  | **X** |  |
| System allows multiple sourcing strategies such as direct drop shipping and vendor managed inventory.  | **H** |  | **X** |  |
| System allows collaboration with sourcing stakeholders such as suppliers, manufacturers, and freight forwarders.  | **H** |  | **X** |  |
| System uses distribution and consumption data along with lead time and logistics costs to calculate sourcing needs and frequency.  | **H** |  | **X** |  |
| **Tender Management** | System provides standard contract templates for different contract types such as firm fixed price and blanket purchase agreement.  | **H** | **X** |  |  |
| System provides ability to capture contract specifics such as supplier details, product information, pricing information, period of performance and necessary contractual terms.  | **H** | **X** |  |  |
| System validates mandatory fields of the contract and checks for data integrity. | **H** | **X** |  |  |
| System tracks contract approvals.  | **H** | **X** |  |  |
| System allows uploading contracts, addendums, and changes as part of original approved contract.  | **H** | **X** |  |  |
| System provides the ability to manage RFx events to facilitate competitive bidding.  | **H** |  | **X** |  |
| System allows contract addendums and changes and maintains history/audit of those changes.  | **H** |  | **X** |  |
| System provides a contract management workflow that allows reviews and approvals.  | **H** |  | **X** |  |
| System allows collaborative reviews and approvals through electronic signatures with suppliers and procurement & risk teams through portals.  | **H** |  | **X** |  |
| **Supplier Information Management** | System allows capture of supplier name, address, sites that can be cross-referenced across sourcing and contractual documentation.  | **H** | **X** |  |  |
| System validates mandatory fields of supplier data and checks for data integrity.  | **H** | **X** |  |  |
| System utilizes transactional data uploaded in the system to analyze supplier performance.  | **H** | **X** |  |  |
| System provides a supplier portal for suppliers to register and provide supplier master data with GLN.  | **H** |   | **X** |  |
| System uses uploaded transactional data to explore strategic sourcing and analyze spendings by product category.  | **H** |   | **X** |  |
| System uses transactional data with product and supplier master data for automated KPI and performance analysis.  | **H** |   | **X** |  |
| System is integrated with other systems to share supplier information for operational and financial processes.  | **H** |   | **X** |  |
| System can rate suppliers and alerting for performance exceptions.  | **H** |  | **X** |  |

| **Procurement Management**Managing the creation, processing, and invoicing of the purchase orders and the visibility into the fulfillment progress. | **Setting** | **Essential** | **Advanced** | **Emerging** |
| --- | --- | --- | --- | --- |
|  |
| **Procurement Processing**   | System generates unique purchase order numbers and provides the ability to capture purchase order details including header details such as address and line details such as product information, quantity, and price.  | **M** | **X** |   |   |
| System leverages product master data to select from when generating orders. | **M** | **X** |  |  |
| System does purchase order validations such as checking for mandatory fields and data integrity.    | **M** | **X** |   |   |
| System allows purchase order modifications with along appropriate reasons and maintains history/audit of modifications.  | **M** | **X** |   |   |
| System identifies process exceptions such as delays.  | **M** | **X** |   |   |
| System is capable to tracking various purchase order workflow statuses.  | **M** | **X** |   |   |
| System can integrate directly with suppliers to exchange purchase orders and order updates.  | **H** |   | **X** |   |
| System can integrate with other operational systems to share procurement information for visibility and various processes such as payments.  | **H** |   | **X** |   |
| System automatically notifies process exceptions to authorized personnel and allows them to resolve through the system.  | **H** |   | **X** |   |
| System is capable of interfacing with eProcurement portals to exchange information for publishing tenders and results of tendering for further contract management. | **H** |  | **X** |   |
| System can integrate with order management system/module to facilitate direct drop shipping.  | **H** |   | **X** |   |
| Systems can integrate with warehouse management system to automatically initiate replenishment orders based on inventory needs.  | **H** |   | **X** |   |
| **Fulfillment** | System is capable of tracking purchase order fulfillment statuses with timestamps.  | **M** | **X** |   |   |
| System can create advance shipment notices linked to purchase order line/s.  | **M** | **X** |   |   |
| System allows creation of multiple advance shipment notices against a purchase order.  | **M** | **X** |   |   |
| System allows capture of receipts, along with details such as batch number, quantity, and expiration date, against advanced shipment notices.   | **M** | **X** |   |   |
| System updates purchase order status based on status of associated advanced shipment notices and closes out the purchase order based on completion of receipts against advance shipment notices.  | **M** | **X** |   |   |
| System can integrate with other operational systems as well as supplier systems via electronic data interchange (EDI) or other appropriate mechanism to exchange data such as purchase order modifications and status updates and inbound advanced shipment notices.  | **H** |  | **X** |   |

| Order ManagementManage the process of capturing, approving, allocating and tracking the requests against inventory. | Setting | Essential | Advanced | Emerging |
| --- | --- | --- | --- | --- |
| Requisitioning and Distribution | System provides the ability to create simple inventory requests with product and quantity details, in off-line mode to sync with the main database once the system is available online. | **L** | **X** |  |  |
| System allows creation of requisition orders to pull inventory from upstream facilities and distribution or transfer orders to push inventory to downstream facilities. | **M** | **X** |  |  |
| System generates unique order numbers and provides the ability to capture order details including header details such as delivery address and line details such as product information, quantity and price.  | **M** | **X** |  |  |
| System does order validations such as checking for mandatory fields and data integrity.  | **M** | **X** |  |  |
| System provides delivery estimates for requisition based on item lead times.  | **M** | **X** |  |  |
| System provides automated requisitions workflow management to coordinate approvals and rejections.   | **M** | **X** |  |  |
| System identifies processing exceptions such as delays and alerts appropriate personnel.  | **M** | **X** |  |  |
| System is capable of initiating and managing returns and recalls of damaged or sub-standard quality products and link the returns and recalls to original requisition order.  | **M** | **X** |  |  |
| System validates requisition automatically against available budget/funds pulled from financial systems.  | **H** |  | **X** |  |
| System can integrate with fulfillment locations (inventory systems) to provide visibility to inventory across the supply chain when placing a requisition.  | **H** |  | **X** |  |
| System schedules fulfillment of requisitions based on promised/requested delivery dates and inventory availability across fulfillment locations including future inventory.  | **H** |  | **X** |  |
| System provides delivery estimates for requisitions based on shipping location proximity, logistics & transportation lead time in addition to any item specific lead times.  | **H** |  | **X** |  |
| System dynamically updates delivery estimates based on information from other systems on changing conditions.  | **H** |  | **X** |  |
| System can integrate with other systems to exchange order information and updates.  | **H** |  | **X** |  |
| System can capture and process requisitions for non-catalog products to trigger linked sourcing and procurement process.  | **H** |  | **X** |  |
| System is capable of reconciling and tracking requisitions against supply/distribution plans.  | **H** |  | **X** |  |
| System is capable of automatically triggering requisitions based on demand/dispensing and inventory consumption patterns in downstream systems.  | **H** |  | **X** |  |
| System is capable of triggering and linking requisitions with procurements when warehouse inventory is not available.  | **H** |  | **X** |  |
| Requisition Fulfillment | System alerts users when requisition is ready to be fulfilled/ready for pickup and/or shipped. | **L** | **X** |   |  |
| System is capable of allocating inventories automatically based on availability and shelf life with the ability to override allocations if required.  | **M** | **X** |  |  |
| System is capable of printing requisition orders.  | **M** | **X** |   |  |
| System ensures that allocated inventory is not available for allocation to other requisition orders.  | **M** | **X** |   |  |
| System can integrate with fulfillment systems to share requisition order details and track fulfillment statuses/updates.  | **M** | **X** |   |  |
| System allocates optimal requisition fulfillment location based on multiple factors such as availability, proximity, and shelf life.  | **M** |   | **X** |  |
| System is capable of prioritizing, and allocating inventory locations to fulfill requisitions, based on changing circumstances like stock outs in a location. | **H** |   | **X** |  |
| System is capable of tracking detailed fulfillment stages end to end by integrating with other systems. | **H** |   | **X** |  |
| System is capable of dynamically adjusting inventory allocations based on changing scenarios shared by other systems such as WMS.  | **H** |   | **X** |  |
| System can link receipts to original requisitions to mark the requisitions as completely fulfilled or partially fulfilled depending on received vs ordered quantities. | **H** | **X** |  |  |
| System tracks and uses detailed fulfillment stages for exception management with the ability for users to take necessary action. | **H** |   | **X** |  |

| Forecasting and PlanningCapture and analyze demand data, supply of inventory, open purchases, and open replenishment for the purpose of forecasting and planning future needs.  | Setting | Essential | Advanced | Emerging |
| --- | --- | --- | --- | --- |
| Demand Planning | System is synced with demand data that is captured in transactional systems in any time bucket (weekly at minimum).  | **H** | **X** |   |  |
| System provides the ability to upload demand data.  | **H** | **X** |   |  |
| System retains three years of demand data to make rolling forecast in configurable time blocks (i.e. default of 12 month) using simple algorithms such as moving average.  | **H** | **X** |   |  |
| System provides the ability to set forecast horizon to produce an extended forecast in monthly buckets. | **H** | **X** |   |  |
| System checks for forecast accuracy to determine appropriate forecasting algorithm.   | **H** | **X** |   |  |
| System allows for forecast approvals by users.  | **H** | **X** |   |  |
| System captures demand data, historic demand data and any adjustments in historic data across geographies and product hierarchies.  | **H** | **X** |   |  |
| System analyses demand data for any outliers and smoothens data if anomalies are identified.  | **H** | **X** |   |  |
| System uses advanced forecasting models to calculate demand in time series conditions such as multiple exponential smoothing techniques, including the option for morbidity/population-based forecasting i.e. no of recipients/episodes x treatment protocol. | **H** |   | **X** |  |
| System provides advanced forecasting models that use factors such as population density, supply chain fluctuations, seasonality and special events that impact demand.  | **H** |  | **X** |  |
| System allows collaborative forecasting in pre-defined forecasting cycle such as monthly and allows for collaborative adjustments and approvals.  | **H** |   | **X** |  |
| System captures and maintains history of forecast adjustments along with reasons.  | **H** |   | **X** |  |
| System can use adjustment data to calculate forecast adjustment accuracy in addition to forecast accuracy.  | **H** |   | **X** |  |
| System maintains multiple product life cycle profiles and allows transfer of forecasts from a product version supporting planned phase-in/phase-out. .  | **H** |   | **X** |  |
| System provides the ability to maintain multiple demand scenarios.  | **H** |   | **X** |  |
| System can forecast based on triangulation of distribution, consumption and morbidity data. | **H** |   | **X** |  |
| Supply Planning | System provides supply planning template to capture and load inventory, demand/consumption, and supply data.  | **H** | **X** |   |  |
| System calculates net requirements by comparing demand against availability and planned/scheduled supply.  | **H** | **X** |   |  |
| System allows updates to supply plans based on changes in demand and supply conditions.  | **H** | **X** |   |  |
| System suggests corrective actions needed in the supply chain to prevent stock-outs or overstocking.  | **H** | **X** |   |  |
| System has a module to accept parameters describing a vaccination or mass drug administration campaign, and calculates additional supplies required. | **H** |  | **X** |  |
| System provides multiple demand and supply planning templates to facilitate simulation with alternative solutions to select best plan.  | **H** |   | **X** |  |
| System measures supply plan accuracy and identifies planning exceptions for planners to take action and resolve.  | **H** |   | **X** |  |
| System provides plan simulations with alternate solutions.  | **H** |   | **X** |  |
| System measures accuracy across multiple simulation plans and allows selecting the best plan.  | **H** |   | **X** |  |
| System provides real time collaborative planning with suppliers to consider supplier capacity and adjust plan based on supply chain exceptions.  | **H** |   | **X** |  |
| System provides integration of plan data with other supply chain systems and ecosystems such as HIS and regulatory to enable end-to-end visibility and enhanced digital collaboration.  | **H** |   | **X** |  |

| Track and TraceProcess of verification of a product and supporting traceability and tracking of products. Includes the handling of returns and recalls.Note: Commodity tracking, and Commodity Verification features are considered advanced features except for basic product identity verification. | Setting | Essential | Advanced | Emerging |
| --- | --- | --- | --- | --- |
| Commodity Verification | System can interpret globally standardized identifiers such as Global Trade Item Numbers (GTINs) from scanned GS1 (Global Standards) 1D and 2D barcodes on product packaging labels and/or pallet labelling (SSCC), and verify against either a national product master database or a commercial or global product master data repository like GDSN. | **M** |   | **X**  |  |
| System can interpret batch numbers and expiry dates, in addition to GTINs, from scanned GS1 1D and 2D barcodes on product packaging labels, and verify them against a central national database or a commercial or global repository. | **M** |   | **X** |  |
| System can interpret serial numbers, in addition to GTIN, batch number and expiry date, from scanned GS1 barcodes on product packaging labels, and verify them against a central national database or a commercial or global repository. | **M** |   | **X** |  |
| Commodity Tracking | System can track major milestone physical movements of commodities across the supply chain.  | **H** |   | **X** |  |
| System is capable of tracing products by batch numbers across the supply chain.  | **H** |   | **X** |  |
| System can integrate with other regional or global traceability systems to either exchange information such as master data (GTINs), transactional data (batch and serial numbers, event data) or to track, trace and verify commodities to address cross-border product falsifications. | **H** |  |  | **X** |
| System can initiate recalls of batches distributed within the country based on the traced commodities. | **H** |   | **X** |  |
| System can track and trace all physical commodity movements by scanning GS1 barcode on a physical product’s packaging label and associating the scanned data with master and transactional data.  | **H** |   |   | X |
| System is capable of tracking and tracing specific instance of the products by serial numbers across the supply chain.  | **H** |   |   | X |
| System must also capture results of flagged or inspected incidents. | **H** |  | **X** |  |
| System can initiate national supply chain level recalls based on global product quality alerts.  | **H** |   | **X** |  |

## Requirements – Non-Functional

| Hosting OptionsThere is often an extended debate on the approach to hosting and if a solution should be hosted on-premises, outsourced (including using a cloud provided service such as Microsoft Azure or Amazon AWS) or some form of hybrid. While the advantages of an outsourced or cloud solution are many and some countries will elect to host on-premises. Regardless of the hosting option the following requirements must be accounted for. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| SLA / OLA | The vendor providing the hosting options must fully describe the SLA (in the case of an outsourced option) or OLA (in the case of self-hosting) on the following key points:* Uptime % requirements and how uptime is to be measured
* How scheduled downtime for maintenance is handled

What form of credit is applied when an SLA/OLA condition fails to meet its objectives. | **X** |  |  |
| Data Control | When selecting an outsourced or cloud-based solution, the vendor must demonstrate how the control of the data remains with the country and what roles with the vendor will have access to the unencrypted data. | **X** |  |  |
| Data Export | When selecting an outsourced or cloud-based solution, the system must be able to generate full extracts of both detail and summarized data on a regularly shared with the country in an automated manner. |  | **X** |  |

| ConnectivityConnectivity and power requirements are a frequent challenge, and the system needs to be functional in low or intermittent conditions. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| Bandwidth Needs | System documentation shall describe the approximate bandwidth needed to perform basic functions of the system.  | **X** |  |  |
| Latency Sensitivity | System documentation shall describe how sensitive the application is to conditions of high latency where connectivity may be limited and slow. | **X** |  |  |
| Cache / Offline Needs | System documentation shall be able to describe how the system can cache content and/or work in offline mode when connectivity is not available. Describe how the application then handles synchronization of data once connectivity is restored. | **X** |  |  |
| Mobile Application | System has the capability to use mobile devices to view and execute basic workflow actions. |  | **X** |  |
| Mobile application systems are GPRS compatible for GSM data exchange. |  | **X** |  |
| Mobile application supports scanning of barcode and DataMatrix code. |  |  | **X** |

| User ExperienceThe system needs to be fit for use by the users throughout the lifecycle of the application. This includes the ability to meet language / label needs, screen configurations for readability and effective usage by the users and to maintain responsiveness as the system achieves full scale/deployment. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| Scalability / Capacity | System must be able to achieve the target full implementation scalability while maintaining effective user responsiveness. The target for full implementation must be described in terms of the number of products, trade items, users, suppliers and sites and total transactions over a five-year period. | **X** |  |  |
| Language | System administrator can maintain the system in multiple languages by being able to change labels and descriptions and help text. |  | **X** |  |
| Screen Configuration | System administrators can adjust screen configuration defaults and the changing of labels. |  | **X** |  |
| Documentation | System/vendor will create, present and provide updates to system documentation and how this is available to the end user. | **X** |  |  |
| System/vendor will create, present and provide updates to system administration documentation and how this is available to the technical and support users. | **X** |  |  |

| SecuritySecurity requirements must be based on the country’s information technology standards, and it is recommended that they follow ISO 27002 standards. Those presented below are to be seen as the bare minimums that must be accounted for. | Essential | Advanced | Emerging |
| --- | --- | --- | --- |
| Authentication | System administrator shall have the ability to configure the password complexity, password lockout threshold and password resets in compliance with the country’s information technology password policy. | **X** |  |  |
| Authorization | System administrator shall have the ability to provision users and assignment of security roles that will follow the ‘least privileged’ approach needed. | **X** |  |  |
| Auditing | System shall have a secure audit log of all changes to security settings and privileges. Transactional data shall have the ability to have key fields flagged for auditing as set by the system administrator.  | **X** |  |  |
| Encryption | Encryption in motion: system shall have the ability to encrypt all data in transit using industry standard encryption protocols such as SSL. | **X** |  |  |
| Encryption at rest: system shall have the ability to encrypt data at rest using industry standard encryption protocols such as PKI. |  | **X** |  |

# Annex

## Potential Future Emerging Standards and Requirements

The emerging standards section is intended to provide context and a general indication of the direction and trends for the near future.

When considering overall approaches to interoperability and emerging trends in the industry, it is strongly encouraged that new API interfaces be developed using a REST architecture with JSON formats. Any API used must have a structured API documentation methodology such as Open API (e.g., Swagger). Other legacy formats such as EDI/XML remain as acceptable.

There is a strong movement in the larger community towards the adoption of portions of the GS1 standards. As such, it is strongly encouraged that applications and interoperability approaches anchor to the GS1 Core Business Vocabulary (GS1-CBV). The GS1-CBV is intended to provide a basic capability that those using it will have a common understanding of the semantic meaning of the data. It is most used with GS1-EPCIS traceability events integrations, but that is not required to take advantage of utilizing a common business vocabulary to enable shared understanding.

The intersection between healthcare information systems and supply chain information systems is an emerging area of interest. While the role of how Fast Healthcare Interoperability Resources (FHIR) as the principal standard for such interoperability for healthcare is well established, the role of how it can and should interface with the supply chain information systems is not yet well defined and the community is looking for learning in this area.

When considering the overall supply chain and health care digital ecosystem there are many potential interoperability approaches and standards. From an architectural perspective OpenHIE and the usage of terminology services and alignment with Fast Healthcare Interoperability Resources (FHIR) remains a strong perspective. When it comes to master data exchange, business integrations (i.e. requisitions, order, shipment) and transactional event data which standard to adopt remains an open consideration for future working group alignment. In terms of temperature monitoring, it is worth noting that at the time of this writing that WHO EMS PQS E006/DL01-VP.1 will go into effect in January 2024 for new prequalification for new E003 appliances and in January 2026 all prequalified E003 appliances must be EMS compliant.

What is known is that to support Verification and Traceability initiatives that cut across both healthcare and supply chain systems, the usage of GS1 standards is key for product identification, capture, and tracking. Systems should, therefore, anchor to a method of using product master data that aligns with these GS1 standards and then have a methodology to enrich with local / country specific data. The methodology for gathering, enriching, and distributing this master data is widely varied.

Other future considerations for standards and requirement development are on the management and tracking of disposal/wastage codes and reverse logistics. Additionally, the process of handling product rationing when a product inventory is unable to fulfill reservations for a given time-period needs development. The systems and processes involved should record the quantity requested/reserved against the quantity issued allowing for greater accuracy in tracking unmet demand. Finally, the development of additional training materials needs to be developed to go along with the TSS, covering how to provide guidance to right size the requirements to specific context and scope.

## Contact us & Feedback link

* ***Email to*** coordinator@isghealth.org

## KPI details

* Data for Immunization Supply Chain (DISC) - [Indicator Reference Sheet](https://isc.technet-21.org/en/resources/indicator-reference-sheets)
* USAID Global Health Supply Chain Program - [NSCA KPI reference](https://www.ghsupplychain.org/nsca-key-performance-indicators)

## Connection to SCISMM

* [Supply Chain Information System Maturity Model | USAID Global Health Supply Chain Program Supply Chain Information System Maturity Model (ghsupplychain.org)](https://www.ghsupplychain.org/node/1483)

## RFP Scoring Template(s)

* Requirement Scoring Guide - ***Link TBD***

## Additional Resources

* [WHO Digital Health Platform Handbook: Building a Digital Information Infrastructure for Health Handbook](https://apps.who.int/iris/handle/10665/337449)
* [WHO Policy Brief on Traceability of Health Products](https://www.who.int/publications/i/item/policy-paper-on-traceability-of-medical-products)
* [WHO PQS performance specification – equipment monitoring for equipment monitoring systems](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/LinkPDF.aspx?UniqueID=8ca70f0b-cf6c-430d-86cd-97c56127828e&TipoDoc=PQS_x0020_Document_x0020_Type&GuidDoc=4bdbb11a-22dd-4d68-bc91-8dd88f32b45b)
* [WHO PQS performance specification – data logger and machine-to-machine interface for Equipment Monitoring Systems](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/LinkPDF.aspx?UniqueID=8ca70f0b-cf6c-430d-86cd-97c56127828e&TipoDoc=PQS_x0020_Document_x0020_Type&GuidDoc=f32305eb-f878-4987-8f86-314201e3ea1a)
* [WHO PQS performance specification – data standards for cold chain equipment monitoring](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/LinkPDF.aspx?UniqueID=8ca70f0b-cf6c-430d-86cd-97c56127828e&TipoDoc=PQS_x0020_Document_x0020_Type&GuidDoc=0c46c3ee-d944-4acf-860b-ba36090816e0)
* [WHO PQS performance specification – annex 1 – cold chain data objects](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/LinkPDF.aspx?UniqueID=8ca70f0b-cf6c-430d-86cd-97c56127828e&TipoDoc=PQS_x0020_Document_x0020_Type&GuidDoc=fa8f00ed-af03-4ec5-a47a-9e00e23e1160)
* [WHO PQS performance specification – annex 2 – JSON Schema](https://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/LinkPDF.aspx?UniqueID=8ca70f0b-cf6c-430d-86cd-97c56127828e&TipoDoc=PQS_x0020_Document_x0020_Type&GuidDoc=7e2cebbe-bfbd-4647-a510-0e077c0c5120)
* [Global Fund Technical Brief Procurement & Supply Chain Management](https://www.theglobalfund.org/media/9234/core_supplychains_technicalbrief_en.pdf)
* [Bridging the silos of supply chain information systems through a holistic maturity model — Digital Square](https://digitalsquare.org/blog/2021/3/22/bridging-the-silos-of-supply-chain-information-systems-through-a-holistic-maturity-model)
* [OpenHIE Framework](https://ohie.org/framework/)
* [A Navigator for Digital Health Capability Models, a User’s Guide\_1.0\_Final\_Feb2022.pdf (digitalsquare.io)](https://lib.digitalsquare.io/bitstream/handle/123456789/77728/A%20Navigator%20for%20Digital%20Health%20Capability%20Models_A%20Users%20Guide_1.0_Final_Feb2022.pdf?sequence=5&isAllowed=y)
* [GS1 – Common Business Vocabulary](https://ref.gs1.org/standards/cbv/)
* [ISO - Security Guidelines – ISO 27002](https://www.iso.org/isoiec-27001-information-security.html), Information security management systems
* [Version 1 of the original Target Software Standards](https://www.gavi.org/sites/default/files/document/target-software-standards-for-vaccine-supply-chain-information-systemspdf.pdf)