Guidance for the Implementation of GS1-enabled Automatic Identification and Data Capture (AIDC)

September 2023







### Acronyms

2D	two-dimensional barcode; specifically, the GS1 DataMatrix
AIDC	automatic identification and data capture
CMS	central medical stores
ERP	enterprise resource planning system
GTIN	Global Trade Item Number
HW	hardware
KPI	key performance indicator
MDM	master data management
МОН	Ministry of Health

- **MVP** minimum viable product (prototype)
- **PO** purchase order

SCIS	supply chain information system				
SDLC	software development life cycle				
SKU	stock keeping unit				
SOP	standard operating procedure				
SW	software				
UPS	uninterruptable power supply				
WMS	warehouse management system				

### Welcome to Guidance for Implementation of GS1-enabled AIDC

When organizations procure, store, and distribute and provide goods, they need a common means of sharing data about those transactions. GS1 provides those standards to uniquely identify products, locations, and containers to enable global supply chain management.

This document leverages those standards to promote automatic identification and data capture (AIDC), which refers to the methods of automatically identifying objects, collecting data about them, and entering that data directly into computer systems (i.e., without human involvement). AIDC enables trading partners to capture data flows that align with the physical movement of products, while reducing costs and better securing the supply chain.

By following the suggested considerations, this document will help the implementor close the gaps between existing practices and an ideal AIDC implementation.

#### These standards are for you

If you have a background in GS1 standards and are working with ministries of health, regulatory authorities or development partners, this document can guide your preparation for adoption of AIDC technologies and practices. This document explores various considerations to help you prepare for working with solution partners and countries on a path to adopting GS1 standards that will reduce burden, improve data integrity, and eliminate manual entry of machine-readable content.

To broaden your understanding, be sure to read the links to Supporting Resources throughout this document.

# A complete set of resources to support your AIDC implementation



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# **Content Covered**



#### Introduction to AIDC

Definitions, good practices, and helpful resources



#### Hardware Overview

Tiers and use cases



#### Implementation Framework

Assess readiness, define process flows and master data, build/test, verify/monitor, release and stabilize



#### **Expected Benefits**

Accuracy, efficiency, visibility

# Introduction to AIDC







### What is AIDC – Automatic Identification and Data Capture

- Leading Practices / Global Standards USAID GHSC-PSM is sharing leading practices for adoption of GS1 standards for countries seeking to improve warehouse management operations.
- Direct Data Capture GS1 AIDC allows direct capture of data using scanners.
- Enhanced Data Entry This includes unique identifiers, plus other details that may be manually entered today, such as batch numbers, lot numbers, expiration dates, and serial numbers.
- Error Checking With built-in validation, the GS1 Global Trade Item Number (GTIN) is essential for AIDC and good warehouse management practices.



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### What makes GS1 AIDC different?

### 0

**Universal:** collaborate using a global standard that allows for differences in systems & equip.

#### 2

**Comprehensive:** standards were defined by the healthcare user community across all operations.

#### 3

Accurate: provides reliable, consistent data from supplier to end user.

#### 4

**Visible:** real-time tracking helps country directors, planners, and ministries of health (MOH) as they manage shortages, weather, natural disasters, product expiry and recalls.

### 5

**Efficient:** provides common standards, mistake-proofing and process automation that ensure access to goods and data.

# **AIDC Leading Practices**

### 0

**Stakeholder engagement** – alignment, budgeting, and planning ensure success: high adoption rates and low resistance to change.

### 4

**Data integrity** – all activity depends on accurate, reliable data – catalogs, forecasts, transactional history, and other master data.

### 2

**Strong governance** – create better outcomes for those receiving goods and to ensure adherence to GS1 AIDC standards.

### 5

Hardware selection – plan and coordinate the work first, then purchase and test hardware to avoid costly mistakes. Have enough spares in country to cover emergencies.

#### 3

**Change management** – minimize disruption and reinforce positive behaviors as new approaches are adopted.

### 6

**Solid training** – covering both the core processes and any exceptions; leads to higher productivity, fewer mistakes, and user satisfaction with hardware (HW), software (SW), and policies.

# Implementation Framework







### Implementation Framework

Assess Readiness

and software. For

may require minimal

with technical details.

**Define Process Flows** & Master Data

Design business processes and ensure AIDC data readiness. Existing data structures may differ from GS1 standards. Plan any updates to item catalog. For detailed guidance, see the Data **Discovery and Conversion** Framework.

Integrate core processes and ensure exceptions are handled prior to using automation. Test all communication between hardware and WMS or ERP. Note: Legacy conversion may be needed to support the transition to GS1 AIDC data structures.

Build

& Test

& Monitor

Deploy new data,

software, hardware, and

flow between devices,

back-end systems, and

and procedures.

firmware, monitoring the

your catalog. Ensure users

are trained in new policies

Verify

Release & Stabilize



Release changes in production in close coordination with the entire team. Make sure upgrades and patches are applied over time. Coordinate with solution partner and stakeholders.

Explore potential gaps in policy, process, hardware, example, an existing WMS hardware purchases, while a brand-new implementation may require greater effort. Plan to work with a solution partner to help

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# Practical Approaches to Deployment

#### Stay agile, learn fast and rely on your staff

#### 2 Take small steps in fast, distinct phases

• Gather requirements, assess processes and gaps, integrate with WMS/ERP, select tools and validate processes with frequent feedback from users

#### **3** Prove value with an MVP

- Minimum Viable Product: what is the least effort to get the desired result
- Prove the hypothesis, before committing more resources or buying all the hardware

#### Or pivot to another approach

- You can walk away from a small effort, while learning from it; keep MVPs small and fast
- Maximize value of funding by focusing on the expected outcomes; keep checking throughout

#### 5 Model one process / keep it simple

- Confirm the HW, SW, and interfaces
- Start with receiving and put-away; then expand
- Process must support workers, creating good inventory data and material flows

#### 6 Sample Hypotheses

- Perpetual inventory is enabled by AIDC, saving time finding goods and correcting data
- Well implemented AIDC relies on leading WMS practices, global standards, and the right scanners
- Stakeholders benefit from AIDC, since data is more reliable and actionable.

#### **7** Use objective measures; keep measuring

- Are we making progress? How do we know?
- For example: faster receiving, fewer data fixes, quicker training of new staff, better awareness

## Implementation Framework – Assess Readiness







# **Process Maturity Model**

Leadership

- Processes are conducted using AIDC
- Product MDM is integrated with SCIS
- KPIs drive performance

### Breakthrough

- Logistics processes are readied for real-time data capture
- Product master data is aligned with GS1 standards
- SCIS is readied for AIDC

### Emerging

- Logistics processes are system-driven
- Labeling requirements support GS1 standards
- Foundation SCIS is GS1 compliant
- Processes are documented
- Product master data is managed in SCIS
- Discovery conducted for GTIN alignment

# Program Planning



- Executive sponsorship To provide necessary resources and attention, sponsors should actively support implementation.
- **Clear objectives and metrics** To align with GS1 standards, objectives and metrics should be defined, tracked, and assessed for continuous improvement.
- **Change management and SOPs** These guide the use of AIDC devices and help manage exceptions with standard operating procedures; process decomposition mapping can help identify gaps.
- **Project plan** This is used to track against timeline, budget, and scope; and to highlight key milestones, responsibilities, and risk management steps.
- **IT support** This is necessary to support integration of handheld devices, apply firmware/certs, and ensure wireless connectivity for all devices.
- **GS1 standards** Use solution partners with demonstrated experience deploying GS1 AIDC.
- Data analytics It is not too early to consider how AIDC data will flow into enterprise systems.

# **Development Planning**

### 0

Solution partners and stakeholders — Coordinate with stakeholders, focus on outcomes, communicate milestones (development, testing, conversion, deployment), and share results openly.

### 4

Acceptance criteria — Define measures of success to ensure readiness at each step. Handheld device user interface is working as expected. Data flows bidirectionally and transactions are updated in warehouse management systems. Inventory balances and item catalogs are updated with minimal effort.

### 2

**Process inputs** — Assess the readiness and availability of these critical elements prior to starting: master data (aligned with ERP and GS1 standards), handheld devices (available on site), systems (WMS/ERP), and service providers are vetted; and software development life cycle (SDLC) steps are defined (see right).

### 5

**Workforce empowerment** — Pay attention to the people doing the work, since best-inclass operations require well-trained, motivated operators and technicians who have been properly trained on hardware, systems, and business processes, and provided role-based SOPs.

#### 3

**Software development life cycle**—Make sure software and hardware is working correctly in a test environment before promoting those changes into a production environment. Typically, these steps are: development, unit test/system test, user acceptance test, and production/go live. By following a rigorous process, you will have better results – higher quality, fewer defects and minimal impact to ongoing operations.

### The Right Person in the Right Role



# Sample Project Plan – Aligned with Implementation Framework

		Task	Task Nama	Duration	Producessor						
		TUSK		(days)	i reuecessor	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6
		1	Project Management	180		•					
I II II		2	Leadership Briefing & Kick Off	2							
Assess Rea	Assess Readiness +	3	Develop RFQ for solution partner	15							
		4	Ongoing project oversight	180							
		5	Discovery and Gap Analysis	14		<b>*</b>					
		6	Integration with WMS / ERP	5	2						
<u> </u>	Define Process Flows	7	Assess current procedures / SOPs	5							
<u> </u>	& Master Data	8	Establish baseline metrics	4							
للتو		9	Design and Prototype	75					•		
		10	Set objectives for AIDC MVP	5	3						
		11	Define data maps and transforms	30							
		12	Set up envitonment & HW for MVP	10							
	Build & Tost	13	Conduct user acceptance tests	30							
$\leq$		14	Monitor Results and Adjust	30			T				
-		15	Capture UAT results	5	13						
		16	Update/additional SOPs, Use Cases	15							
		17	Iterate MVPs to reach goals	5							
	Varify & Manitor	18	Define support and FAQs	5							
		19	Implementation / Deployment	30					•	•	•
		20	Perform Data Migration	10	18						
* + +		21	Validate Interfaces	10							
*-( <b>Q</b> )-*	Release & Stabilize +	22	Conduct end user Training	10							
		23	Go Live and Deployment	10						•	<b>♦</b> —●
<b>•</b>		24	Scaling and production support	5	22						
		25	Document lessons learned	5							
		26	<b>Operations and Maintenance</b>	10							<b>~~</b>
		27	Transfer ownership to local staff	5	25						
		28	Draw down support from partners	5							

# Sample Project Expectations

Assess Readiness



- Project supported by MOH Digital Health Strategy
- Starting GSI Education & Awareness training
- AIDC initiative authorized to improve data accuracy and supply chain efficiencies

#### Phase I Objectives:

- Pilot at CMS
- Transactions: Order Receiving, Put Away, Stock Movements, Label Print

Define Process Flows & Master Data



- System capabilities assessed
- Defined WMS SOPs
- Defined requirements for AIDC GSI-compliant solution
- Product master data discovery completed
- SKUs aligned with GTINs

#### Select Solution Provider:

 Selected AIDC Solution that supports country's WMS/ERP





- Solution provider designs solution for WMS & SOPs
- Barcode hardware procured and configured
- User Acceptance Test identifies issues with WMS integrations which are fixed

#### **Go Live Preparation:**

- Warehouse shelving updated with location barcode labels
- Wi-Fi and barcode hardware installed and configured

Verify & Monitor



Conduct end-to-end Systems

loaded into the production

system and Product Master

hardware testing completed

Go Live in Production:

• Hyper-production-care to

support users in new

processes and policies

Data Management SOPs

developed and deployed

• User training and final

Integration Testing

• Product Master Data is

\*



- Production support issues captured, and resolutions prioritized
- Software updates are tested, and resolutions validated

Release

& Stabilize

• Phase I Lessons Learned

#### AIDC Phase II Planning:

- Determine region/district warehouses to deploy
- Add transactions: Interwarehouse shipments, Stock Take, Dispense.

Implementation Framework – Define Process Flows







### Define Process Flows – Core Processes

Receive GTIN Product Ch	ange Part Location Pre-print License Plate
Receive Non-GTIN Product	Replenishment Pick & Pack
Putaway Product Par	rt/Location Inquiry Box Label Match

Inventory Control	Cycle Count	Physical Inventory	Inventory Adjustments		Inventory Adjustments Slotting	
Master Data	Locations	ltems	Vendors	Customers	User N	lanagement

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# AIDC Core Processes: SOP Booklet

- A core set of warehouse operations business processes central to an AIDC implementation
- Processes include:
  - Receiving
  - Put-away
  - Inventory movements within a warehouse
  - Shipments (Pick/Pack and Ship)
  - Physical inventory/stock take
- Informed by reference implementations such as Uganda, Zambia and Rwanda business process designs – genericized for broader applicability
- Intended to be used as a starting place for countries to build suitable SOPs to be leveraged in testing, training and deployment



# Define Process Flows – Sample SOP

- Identify business processes and steps to be performed using AIDC; see put-away example here.
- Develop SOPs and training guides that describe the steps to be performed using data collection devices, and any supporting tasks operators perform manually.
- **SOPs** typically include these core processes:
  - Purchase order (PO)/transit receiving
  - Putaway
  - Inventory movements
  - Pick/pack/ship
  - Physical inventory
  - Supporting tasks: inquiry, adjustments, printing



# Adjust for Exceptions in Your Process

- Every business process will have exceptions and nuances that need to be catered to
- How ERP/WMS interacts/integrates with the AIDC solution
- Country-specific business rules and controls
- How product master data is stored and managed
- Process support/operator tasks key to helping users manage common process exceptions

- Managing both GS1 compliant and noncompliant product
- Operating with incomplete master data with interventions needed specific to the resident system(s)
- PO differences may be several
  - Is the PO in the system when goods arrive?
  - Are there specific procedures for partial receipts?
  - Are there unique values to be captured upon receipt (e.g., manufactured date)
- GTIN > SKU mapping differences
  - many-to-one vs many-to-many
- Implementation models
  - Phased by products, geography, depth of distribution network

# Adjusting SOPs for Common Exceptions - Examples



Purchase order receiving may require additional fields for processing

- Some processes require manufactured date captured to measure shelf life
- Some processes require validation of manufacturer recorded on the PO
- Some processes will capture the supplier's invoice number/bill of lading on the receipt

How non-labeled product is received will vary based labelling strategy

Put away receipts may be directed, or operator determined

Warehouse locations may not be captured/defined in the system

• When locations are defined, some processes will not allow override when inventory balances are incorrect

Shipment processes vary significantly across different ERPs and how they are configured for each client

- How picking may be performed with single person or team picking
- How mixed product containers are packed and recorded
- How pick/pack is inspected and verified
- How shipping containers are labeled and how contents are defined in ERP (do box labels need to be matched to packing labels; are packing labels used?

Integration with ERP and ERP business rules can alter process steps from generic SOPs

# Guidance on Reusability

- Descriptions and supporting Business Process Flow Steps are concise and generic to enable reuse
- Specific language and context can be added/ adjusted to fit the country's environment (e.g., ERP/WMS-specific features and functions, countryspecific business processes)
- SOPs are user-centric to support training and testing and can be validated during User Acceptance Testing
- Use the generic SOP to set the bar for implementation partner deliverables

#### **Business Process Flow Steps**

BP Step #	Step Name	Step Description
I	Security Validation	See SOP for Handheld Device Login. The ERP System will validate role-based security to authenticate user credentials, determine user privileges using role-based security, and determine the user warehouse location and default barcode printer.
2	Enter PO Number	The user selects the <b>Receive PO</b> menu option and enters a valid PO number to be received. The <b>ERP System</b> validates it is a valid PO and retrieves the PO information.
3	PO Lines Displayed	The <i>ERP System</i> retrieves the open PO Lines available to be received and displays PO, PO Lines, PO Release, <i>SKU/Part</i> <i>Identifier</i> , Qty Received, Qty Remaining, and Unit of Measure (UOM).
4	GS1 Label?	The user determines if the item to be received has a GS1 label containing the Global Trade Item Number (GTIN), Batch/Lot ID, and Expiry. If Yes, proceed with this process; if No, go to Process B.
5	Scan GTIN for Validation	The user will scan the GS1 label, and the system will verify the GTIN against Product Master Data in the <i>ERP System</i> to retrieve the PO line for the specific <i>SKU/Part Identifier</i> .
6	GTIN Aligned to Stock Keeping Unit (SKU)?	If the GTIN is not aligned in Product Master Data (PMD) to the <i>SKU/Part Identifier</i> , the user is required to contact the Product Master Data Management (PMDM) team to update the GTIN. If the GTIN is aligned, the <i>ERP System</i> validates if the product is Lot Controlled and captures the Batch/Lot and Experimentation formative CG4 bits.
7	Case Quantity in Product Master Data?	After the <i>ERP System</i> validates the GTIN for the <i>SKU/Part</i> <i>Identifier</i> , it will validate if the packaging hierarchy is established to determine that Case Quantity Net Content is defined in Product Master Data. If Yes, proceed to next step; if No, the user is required to contact PMDM to update Case Net Content for the product.
8	Enter Number of Cases	After the ERP System validates the GTIN for the SKU/Part Identifier and Case Quantity, the user will be prompted for Number of Cases to be received. Note that Case Quantity must be for the quantity representing the specific Batch/Lot and Expiry if this is a Lot Controlled product. If the shipment is across multiple Batch/Lots, receive these in separate steps.
9	Enter Number of Eaches	If the shipment includes additional units not in cases, or if Case Quantity is not captured for the product, the user is prompted for Number of Eaches to be received. Note that Each Quantity must be for the quantity representing the specific Batch/Lot and Expiry if this is a Lot Controlled product. If the shipment is across multiple Batch/Lots, receive these in separate steps.
10	Purchase Order Receive Transaction	The Handheld Device will send the receiving transaction to the ERP System to perform the receiving transaction. Continue to the next Batch/Lot for this PO Line or to the next PO Line until PO Arrival is complete.

## Implementation Framework – Define Master Data







### Define Master Data – Product and Location Data



with GS1 standards, supporting GTIN as a secondary identifier with packaging hierarchies defined per manufacturer. Here are two key references for product master data and systems readiness:

Data discovery and conversion framework for details on master data discovery (<u>LINK</u>)

GS1 SCIS requirements—to verify ERP/logistics system support of GS1 standards (LINK)





including a full decomposition of racks, shelves, and bins.

Ideally the warehouse will use a Global Location Number (GLN) as well to be used as a reference number in transactions with external parties. for ongoing master data maintenance of products and locations.

See the Product Master Data Management Reference guide and Tool Kit for additional resources to support this function (<u>LINK</u>)

# Implementation Framework – Build and Test







# Build and Test – Entrance Criteria



AIDC devices — This includes hardware such as barcode scanners, mobile computers, or other handheld devices capable of capturing and transmitting the data found on GS1 and other barcodes. Use cases may vary, but devices should be capable of scanning 2D barcodes.



Wireless network —A reliable wireless network is necessary to transmit data from AIDC devices to the backend systems. The network should be designed with sufficient bandwidth and access points to provide good coverage.



**Uninterruptable power supply** —UPS protection is needed to ensure systems and processes can continue operation and allow teams to function even during brief outages. These devices also condition power, protecting sensitive electronics. **Master data management** —Not only catalog data, but all necessary master data must be prepared and updated as new products are introduced into the supply chain. This involves both process rigor and technical guardrails to ensure the best starting point for operations.



**Backend systems** —Inventory, warehouse management, or ERP systems should be integrated with AIDC solutions, such that data is stored and processed in real time.



**Training and support** —This includes training on device operation, data management, and process management and may involve changing business practices to accommodate new processes or technology. Do not underestimate the need of support staff during the transition.

# Hardware Tiers



 Handheld computers are durable, with keypads, screens, ruggedized housings, and long battery life. They can handle high-volume scanning, image capture, and document scanning. Example use case: inventory and warehouse management, including receiving, put-away, pick/pack, and catalog lookups



 Mid-tier scanners have drop ratings and good resistance to dust and moisture. They are wireless and read linear and 2D barcodes under less-thanideal conditions, with some decoding capabilities. Example use case: inventory management



- Wedge scanners are so named because they connect between a keyboard and computer, passing keystrokes by scanning rather than typing an entry. They tend to be durable and reliable, with wired or wireless connectivity. They may be limited to linear barcodes and generally lack a user interface. Example use case: point of dispense.
- Mobile devices include smart phones and tablets. They run Android or iOS applications tailored to one specific use. Devices are not typically ruggedized and have fragile screens. They can scan barcodes with a camera and have wireless connectivity. Example use case: consumer or field-based data collection

Your use cases will determine how much functionality you need. Look for scanners that integrate well with current infrastructure, and make sure they can scan 2D data carriers in order to maximize your investment in GS1 AIDC infrastructure.

### Handheld Computers – Ease of Use and Accurate Scans



**Handheld computers** provide versatile, reliable, and user-friendly interactions to capture GS1 data, with guided prompts throughout. They are suggested for use in warehouse settings to enable seamless acquisition of product and inventory data. They can:

Note: Images of handheld devices are included to illustrate features and form factors, not to endorse a particular make or model.

- Display instructions and prompt by keyboard or touch screen;
- Integrate with existing WMS and ERP systems, easing implementation;
- Scan linear and 2D / DataMatrix barcodes for future-proofing;
- Protect against dust, rain, and spills along with drop protection—
   IP65\* devices are used in warehouses around the world;
- Provide wireless connectivity and fast charging for all-day use; and
- Share a common Android operating system for simple maintenance, patching, and operations.
- \*IP = Ingress protection rating. Higher is better: the scale runs from 0 to 6, with the two digits representing protection against solids and liquids, respectively.

# Build and Test – Process, Data, and Dependencies

Gather existing process documentation and define current state

Assess value-added work and begin process mapping Identify dependencies and exceptions



- Highlight points where scanning or data entry take place
- Define expected benefits in consensus with core roles and functions
- Use the GS1-enabled <u>AIDC Generic</u> <u>SOP Booklet</u> to develop core process maps



- Focus on MDM and scanning: these represent opportunities for success when addressed early
- Checklists may include converting SKUs to GS1 GTIN, and other conversion tasks



- Transactions supported, infrastructure (wired, wireless, range, stability), backend AIDC systems, and scanning hardware
- What points of departure are commonly seen, and how can they be managed differently with GS1 AIDC?

# Build and Test – Acceptance Criteria



This "Definition of done" describes how completed work is measured, like MDM, device configuration, interface testing, data integration, and user procedures as presented on devices.

 It is helpful to leverage metrics that reflect the intent and expected outcomes of the SDLC, such as project schedule variance, overall data integrity, issue response/resolution time, and some measure of user adoption.

#### **Objective evaluation and testing** controls what is released to production.

- Early prototypes in testing or development environments will have lower thresholds.
- Anything entering planned-for-production release will have more rigorous reviews.

#### **GS1 AIDC considerations** required, at minimum:

- Printers and labels support GS1 standards
- Shelving/staging enable lean flow and accurate scanning/cycle counting
- Batteries are available with cradles/chargers
- UPS provides conditioned/uninterrupted power for sensitive devices
- Documentation guides consistent accurate operation

# Implementation Framework –Verify and Monitor







# Verify and Monitor – Process, Technology, Training



- Consider local policies and organizational objectives as you proceed. Make sure the deployment is providing the expected value (e.g., first-time accuracy, speed, flexibility).
- Verify processes and data flows in small-scale prototypes, then certify the people, procedures, and integrations used in the process.
  - WMS and ERP systems should be updated by automated processes, prompted by applications running on handheld devices.
- **Provide ongoing support to warehouse workers**, answering questions and troubleshooting problems. Adjust your processes and technology accordingly.
  - Make sure the process is not just running error-free but is actually achieving the expected outcomes for the organization.

Implementation Framework – Release and Stabilize







### Release and Stabilize – Realize Value and Measure Results

Ongoing releases and patches should be coordinated with stakeholders with a defined cutover checklist and stakeholder communication.

- Continue to monitor logs and interfaces to ensure WMS and ERP systems are being updated.
- Keep warehouse workers directly involved with sustainment—they know what works.

Focus on adherence to GS1 AIDC standards.

- GS1 AIDC standards enable the first step in your journey. The next steps are yours.
- Promote continuous improvement (*kaizen*) following GS1 and your team's suggestions.
- Hold each other accountable for any lapses in following leading practices.
- Communicate current metrics to stakeholders at each step of the way for data-driven change.

Do not forget MDM in daily operations and longer-term monitoring.

- Enterprise reporting depends on having accurate catalog data and transactional history. Do not underestimate the importance of this work. You cannot manage what is not measured.



# Measure Success – Sample Key Performance Indicators (KPIs)

GS1 AIDC impacts can be measured by capturing the current state of inventory accuracy, receiving, order fulfillment, and cycle times.

To assess the impact of any process improvement, it is necessary to measure the same KPIs over time. The choice of metrics is important from the start.



Inventory Accuracy – measured by comparing cycle counts to current inventory balances in WMS or ERP

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**Order Cycle Time** – from order creation to shipping; lower is better



**On Time In Full** – number of orders shipped complete divided by all orders over the same time period; higher is better



**Dock to Stock** – time required from receiving to put-away into stock



Warehouse Direct Labor per Unit Shipped – total annual warehouse labor cost divided by annual boxes shipped

# GS1 AIDC Summary







# How This Guidance Helps – GS1 AIDC Adoption

Core concepts and benefits

Implementation framework Assess, define, build, verify, release Measure results before and after



- GS1 AIDC definitions and leading practices
- Suggested hardware specifications for WMS
- Governance and stakeholder involvement lead to success—not technology alone
- How GS1 standards improve first-time data capture, reducing rework, mistakes



- Work with solution partners to define current state process gaps and future state SOPs
- Focus on master data management, accurate catalogs, and mistake-proofing processes. Then consider which scanners will support.
- Plan work, develop checklists, and include all critical dependencies so nothing is missed
- Define acceptance criteria to measure outcomes from prototype to production



 Focus on value creation—what matters for donors, staff, and ministries of health

# Annex: Country AIDC Case Studies







# Ethiopia – Health Commodity Management Information System (HCMIS), USAID DELIVER Project





#### Background

- Launched My Commodities system, combining global procurement data with the country's national WMS software
- Developed an open-source smartphone application that allowed scanning to be preformed on smart phones and data automatically pushed to the data mart dashboard

#### Results

- Enabled users to conduct 80 scans across multiple packaging levels in under 30 minutes at the CMS
- Tracking and tracing successfully demonstrated from the CMS to 2 major distribution points and subsequent health centers in-country

#### Lessons Learned

- Using globally standardized bar codes and integrating data systems reduces manual steps for recording inbound and outbound goods and mitigates the chance of human error via mis-entry of data
- Without a proper digital information system to receive the scanned data, the value of AIDC greatly diminishes



More Than Bar Codes Integrated Pharmaceutical Logistic System in Ethiopia

# Pakistan – Contraceptives Logistics Management Information System (cLMIS), USAID DELIVER Project

#### Background

- Developed the cLMIS system, combined the software with a web interface for global procurement information, and invested in a mobile-based handheld scanner to improve procurement strategy and optimization
- Although the country had experience using barcodes since 2012 for inventory management purposes, there was
  a lack of an inventory management information system at the district level, which posed a challenge to
  consolidating the captured bar code data

#### Results

- Reporting rates reached 100 percent for all three provinces in the spring of 2016
- Transparent, evidence-based forecasting and supply planning allowed USAID to place orders within the available annual budget parameter

#### Lessons Learned

 Extending information system installation and applying bar codes at the primary package will be required if tracking and tracing is to be extended down to the district level since the SDPs receive product in primary packaging most commonly



<u>More Than Bar Codes</u> <u>Deliver Project - Pakistan</u>

# Uganda – Joint Medical Store (JMS) Implementation



#### Background

- In 2022, USAID contracted GHSC-PSM to support JMS to select and implement AIDC solution
- PSM contracted technology firm, Radley, to implement the installation and usage of GTINs at JMS

#### Results

- Eliminated the hand-keying of receipts
- Improved product master data to include case and pallet multipliers for all products

#### Lessons Learned

- AIDC requires consistent and accurate Product Master Data; using the Watchdog process to identify incomplete data prior to needing that data in receiving is paramount to success
- Orders should be made in quantity multiples of cases or pallets to fully benefit from the automation and enable the system to operate using GTIN or internal product identifiers.
- It's worth noting the exception that not all products being manufactured today are GSI-compliant, so it's important to mitigate these exceptions through applying proprietary (AI)241-encoded GSI barcode labels at receiving

USAID presentation during the 37th GSI Healthcare Conference in Paris, France, "Achieving Supply Chain Efficiency Through Innovation" led by GHSC-PSM/USAID

# Tanzania – Digitizing Immunization Systems through Vaccine Barcoding





#### Overview

- Since 2014, this project led by PATH and supported by GAVI has worked with the Tanzania Ministry of Health (MOH) under the immunization and vaccine development (IVD) program to implement the better immunization data (BID) initiative in Tanzania
- Introduced a holistic package of interventions in Tanzania., including information system products, evidence-based practices, and capacity-building to empower health workers at all health system levels toward data-driven action

#### Results

- Percentage decreases in time spent on key functions: 50-60% for tracking stock movement, counting, expiry date, and ordering; 2-5% for demand planning and data cleansing; 2-4% for reverse logistics associated with the location, identification, return and receipt of recalled health commodities
- I,063 health facilities in Tanga, Mwanza, and Kilimanjaro Regions were transitioned to a completely digital system between 2019-2021, leading to an average increase of 5,730 more children registered for vaccination at each regional site.

#### **Lessons Learned**

- There is a need for assessing the context/environment in which the digital system will be implemented, setting clear guidelines to govern the process of paperless transition, and closely supervising health facilities to provide continuous capacity-building during/after transition to paperless.
- Health care worker retention and is important for program continuity, as well as defining the user experience requirements for programmatic expansion.



Tanzania Leading the Way Digitizing Immunization Systems in Tanzania

## Nicaragua – Pfizer 2D Barcode Pilot Program





#### Overview

- The Pfizer pilot program focused on 3 different distribution levels (central, regional, local) and demonstrates the benefit of barcode scanning on vaccine tracking and visibility
- This activity served as the pilot for extending 2D barcoding across all vaccines managed by the MOH—working to capture GTIN, lot number, and expiry date on packaging.

#### Results

- With an increase to 100% stock visibility across all levels of the system, transaction automation was enabled to drastically speed up the data entry process and eliminate human error—leading to a 68% reduction in time spent per transaction (from 1 minute to 18 seconds), and the need for adjustments to 0.5% (1 out of 223).
- Improved security with central data repository, reduced data management costs, and reduction in security breaches

#### **Lessons Learned**

- Real-time inventory reporting allows for quicker decision-making at intermediate and central levels
- For project longevity and sustainability, there is an ongoing need for government participation, pharma EPI program alignment, alliance across partners engaged, and continuing to prioritize



Breakthrough Technology