*PATH

ENABLING TECHNOLOGY INTEROPERABILITY WITH STANDARD-BASED TEMPERATURE AND EQUIPMENT INVENTORY DATA

Richard Anderson, Sophie Newland

BENEFITS OF INTEROPERABILITY

Incompatible technologies limit innovation, encouraging single-provider systems with high initial and ongoing costs that are frequently too expensive for low-resource settings. To facilitate the sustainable deployment of global health technologies at scale, national immunization programs benefit from deploying interoperable technology components that can better support their specific vaccine management requirements in the context of limited resources and infrastructure.

Key features:

1. Modular in nature, with interfacing parts that interact using defined interoperability standards, the components can be substituted independently of other system components (e.g., the selection of temperature-monitoring technologies can be separated from the technology choice for managing the temperature data and from technology selections for analyzing and visualizing these data to support decision-making.)

2. Data from multiple sources (e.g., census; World Health Organization Performance, Quality and Safety (PQS) standards; and Master Facility Lists) can be accessed and analyzed by multiple applications.

3. Standardized datasets help provide decision-making value to different users.

ROLE OF DATA STANDARDIZATION

The standardization of data content, coding, and communication formats enables developers to design interoperable technologies—technologies that can perform through use of standardized content and a shared coding framework regardless of the underlying system. Within the immunization space, data standardization that achieves technology interoperability could offer program managers the flexibility to choose modular components that best meet their vaccine management needs.
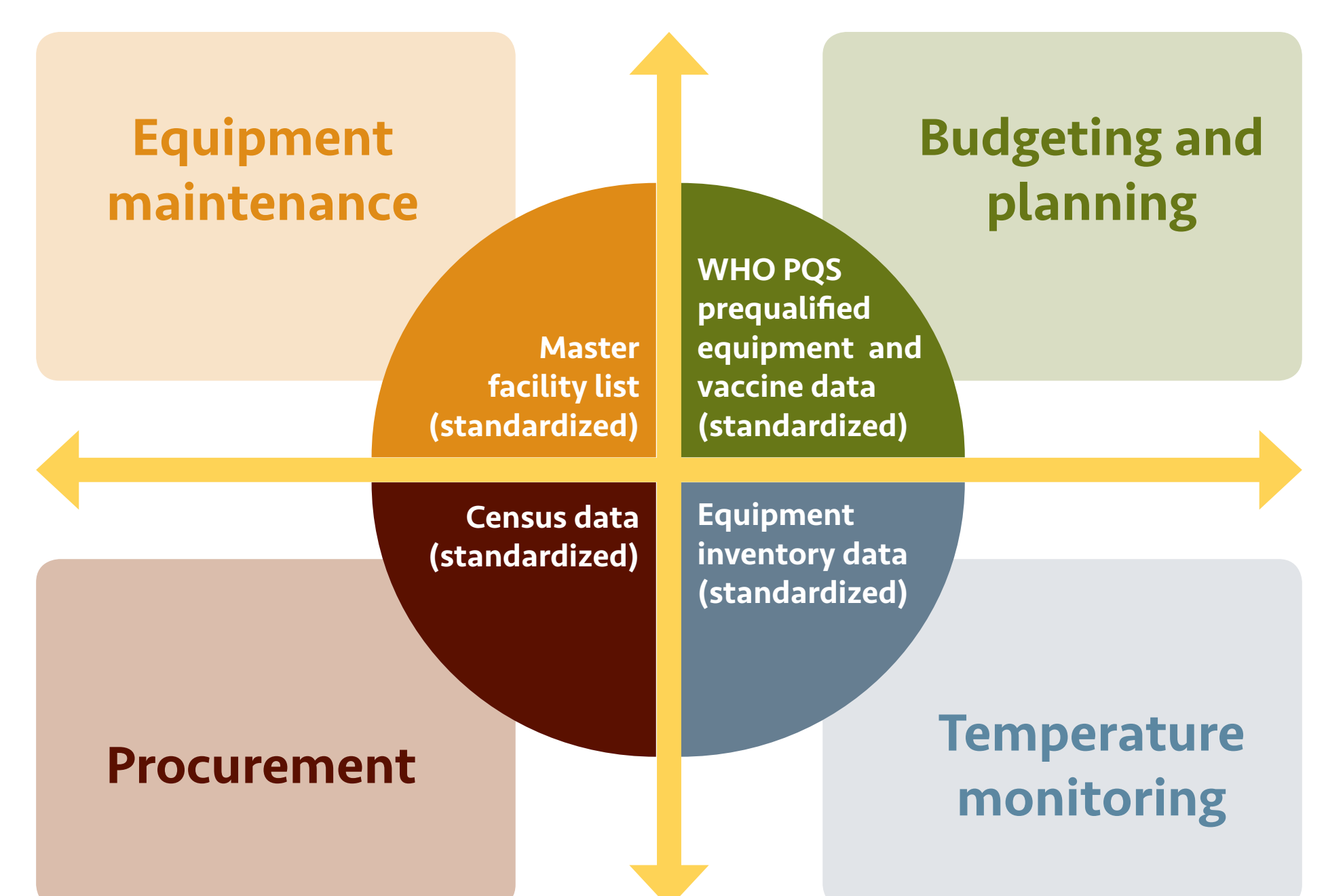
Data standardization will increase technology innovation and interoperability when global data standards are accessed by technology developers as part of defining their design requirements.

"**[Open standards] can avoid vendor lock-in, support new modular solutions which interoperate with an installed base of technologies and devices, and open the door for lower-cost providers (some based in developing countries themselves) to take part in health technology innovation without needing to create and manufacture an entirely new platform.**"[1]

NEXT STEPS

Global and country stakeholders must work together to develop equipment inventory and temperature-monitoring data standards, helping to create a shared language between technology developers and immunization programs.

Figure 2: **Data standardization facilitates the analysis of multiple databases.**

Data standardization enables analysis of multiple national and international databases, including equipment inventory databases, to support a range of applications (e.g., equipment maintenance, planning, procurement, and monitoring).

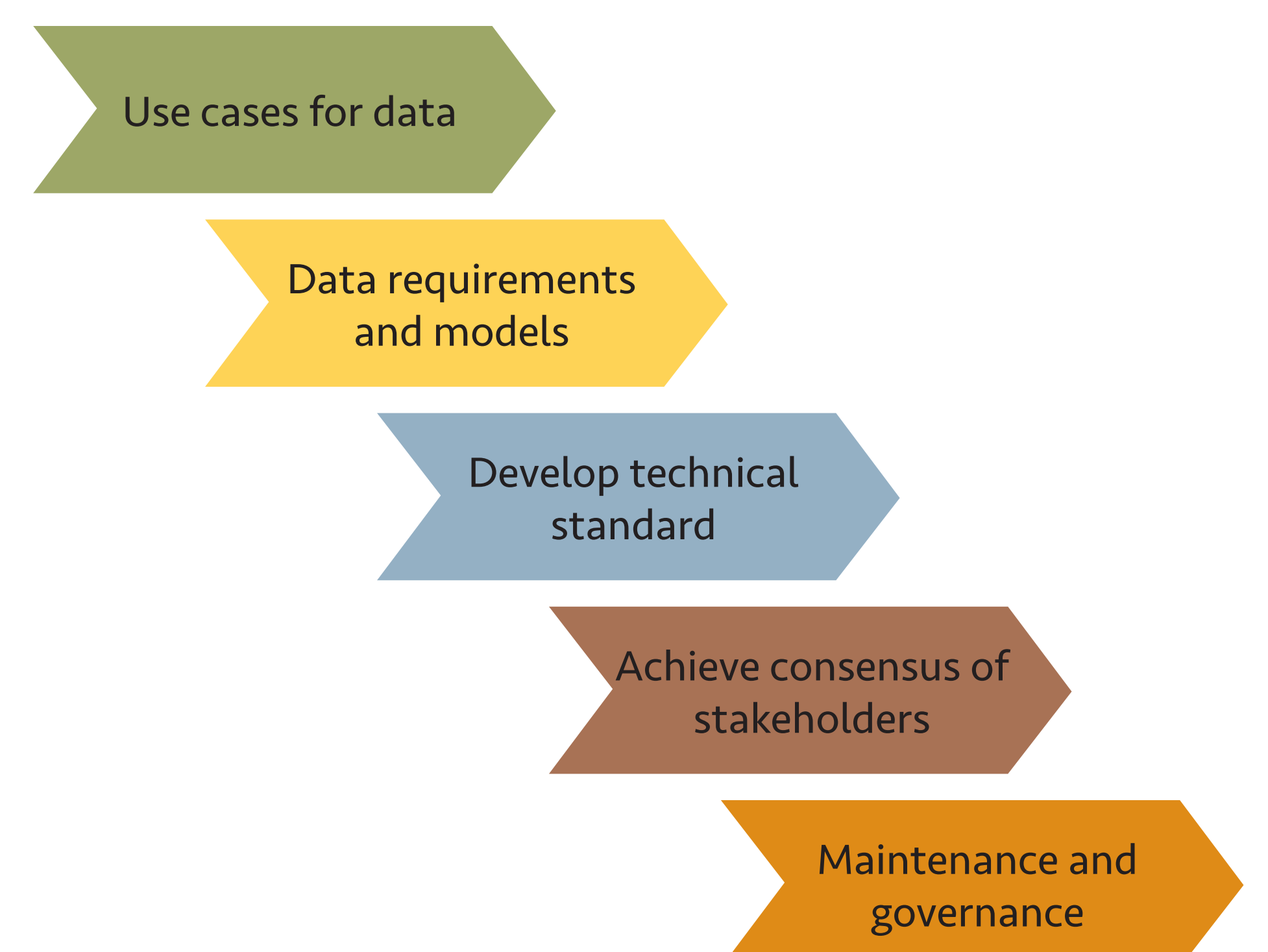Figure 3: **Example process for developing data standards.**

Use cases for data

Data requirements and models

Develop technical standard

Achieve consensus of stakeholders

Maintenance and governance

Figure 1: **Example definitions used in simplified equipment inventory data.**

Facility
FacilityInfo: Composite
Demographics: Composite
Infrastructure: Composite
Logistics: Composite

Demographics
Population: Numeric
ImmunizationPop: Numeric

Infrastructure
ElectricSource: Numeric
GridAvailability: Enumeration
GasAvailability: Enumeration
SolarClimate: Boolean
SiteClimate: Boolean

FacilityInfo
FacilityID: String
FacilityName: String (UTF-8)
FacilityType: Enumeration
AdminRegion: Composite
GISCoordinates: String

Logistics
StorageType: Enumeration
DeliveryType: Enumeration
SupplyInterval: Numeric
ReserveStock: Numeric
MainSupplyPoint: String
SecondarySupplyPoint: String

Refrigerator/Freezer
UniqueID: String
CatalogID: String
TrackingID: String
InstallationYear: Numeric
WorkingStatus: Enumeration
Utilization: Enumeration
PowerSource: Enumeration

RefrigeratorCatalogEntry
CatalogID: String
ModelName: String
Manufacturer: String
PowerSource: Enumeration
Type: Enumeration
GrossRefVolume: Numeric
NetRefVolume: Numeric
GrossFreezeVolume: Numeric
NetFreezeVolume: Numeric

1. Masum H, Lackman R, Barleson K. Developing global health technology standards: what can other industries teach us? *Globalization and Health*. 2013;9(1):49. Available at: www.globalizationandhealth.com/content/9/1/49.