Integration, Interoperability and the role of data standards

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Integration

- Integration and interoperability - Related but distinct terms

Integration: meaning varies with contexts

In Mathematics- is precise, the calculation of integrals
In Social Sciences – more subjective, such as social cohesion

In HIS – varies with who you are and your location wrt HIS
Managers – how information can be combined to do certain tasks
Clinicians - what information should be combined in a EMR
ICT people – Protocols to make softwares speak to each other

Technical view: Collating several softwares into “one big system”
Public health view: Health programmes to collaborate and unify their data collection forms and routines
Organizational view: Coordinating programmes, budgets and resources for bringing more efficiencies and effectiveness

Horizontal and Vertical Integration

Vertical integration
Is typically “military style” along the line of command from the top to bottom in the hierarchy , or from top management to operational levels.

Enables a seamless flow of data between the patient and facility level up to higher administrative levels.

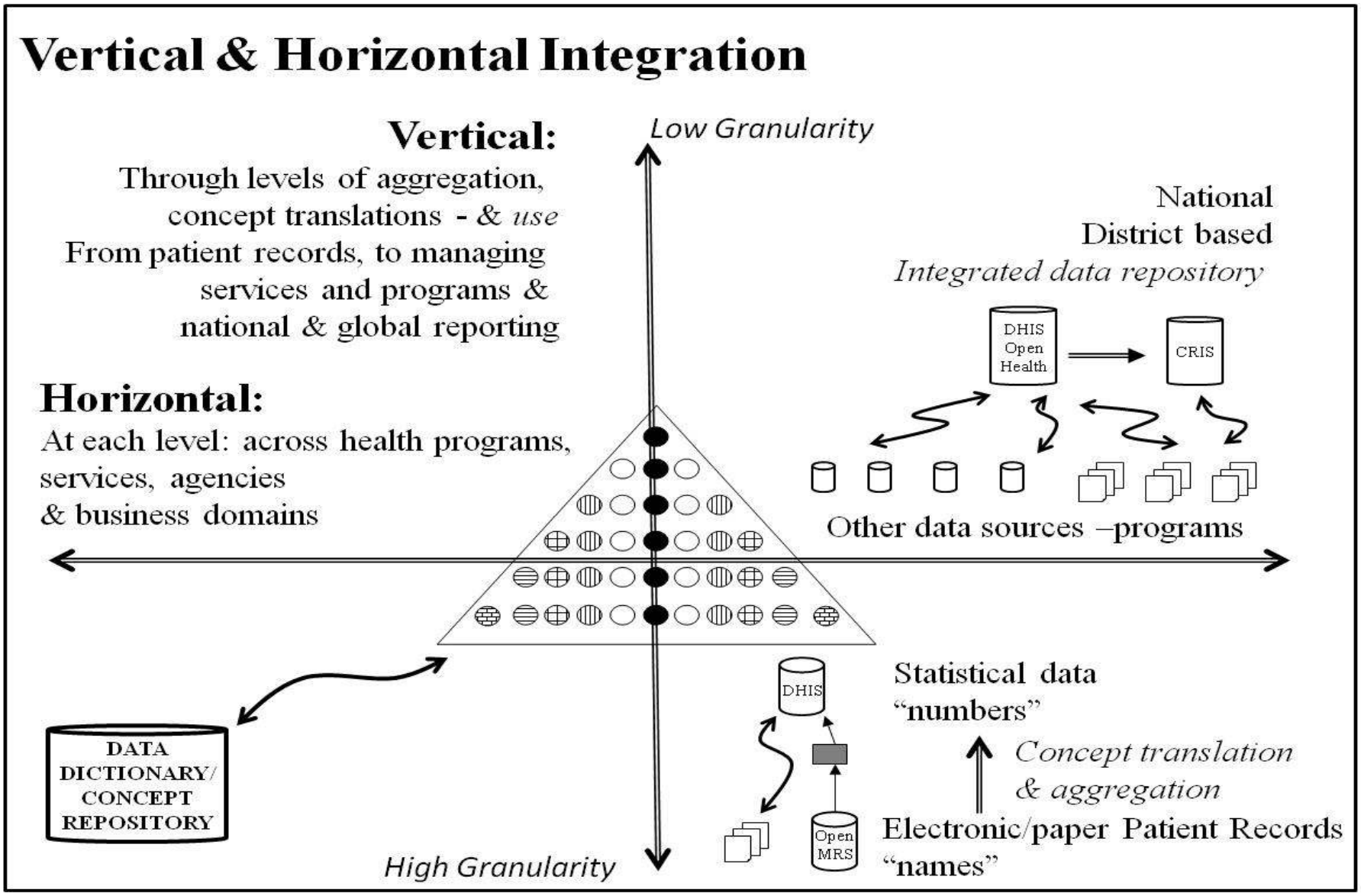
Horizontal integration
Across various domains or business areas of an enterprise. In the health sector it represents the coordination of information flows and information systems across different health programs, services and data sources

Allows all data can be accessed and analysed at “one point,” such as in a data warehouse approach. Horizontal integration can take place across different horizontal levels of the national, state, district and facility.

Each segment of vertical integration is part of a vertical flow and integration of data,

There is a dynamic relationship between vertical and horizontal integration; up, down and sideways in the hierarchy.

Horizontal and Vertical Integration



Loose and tight coupling (integration)

Refers to the degree of integration
Tight integration
If two systems use the same shared resource
Breakdown of one system leads to the same in the other

Loose integration
If there is a buffer in the design, when some resources are shared, some not
Breakdown of one system need not lead to a breakdown in the other

Example:
Tight integration – a system only allows data entry through mobile SMS
Loose integration – system allows data entry through mobile and keyboard

Tight integration – system only allows web based data entry
Loose integration – system allows web based and also offline data entry

Design Principle: Always allow for loose integration

An example

The Ministry of Health of a particular country is deploying a web based system positioning it as the “single window of truth.” The directive to all districts is to only do data entry into this web portal.

Will such an approach work?

How should the districts respond to this directive?

How could they use the concepts of integration and interoperability more judiciously?

Interoperability

Interoperability – more modern view – rather than collapsing systems into one big whole, we should rather try to make systems "interoperate," ie make them speak to each other

Interoperability is a means to achieve the end of integration

Defined: "interoperability refers to the ability of a system to use and share information or functionality of another system by adhering to common standards."

Without agreed standards shared by at least two systems, processes or other actors which are aiming at interoperability, interoperability is not possible

An example: SDMX.HD from WHO – contains two levels – syntactic (protocol for sharing) and semantic (agreement on data definitions and their meanings

Levels of interoperability

Organizational or social system level: Concerns interaction of people and organizations in order to define and decide which data and information should be shared and transferred across organizational borders, eg district and state hospitals.

Semantic level: linked to the definition, meaning and selection of the data to transfer between the systems –the data standards, eg ICD 10

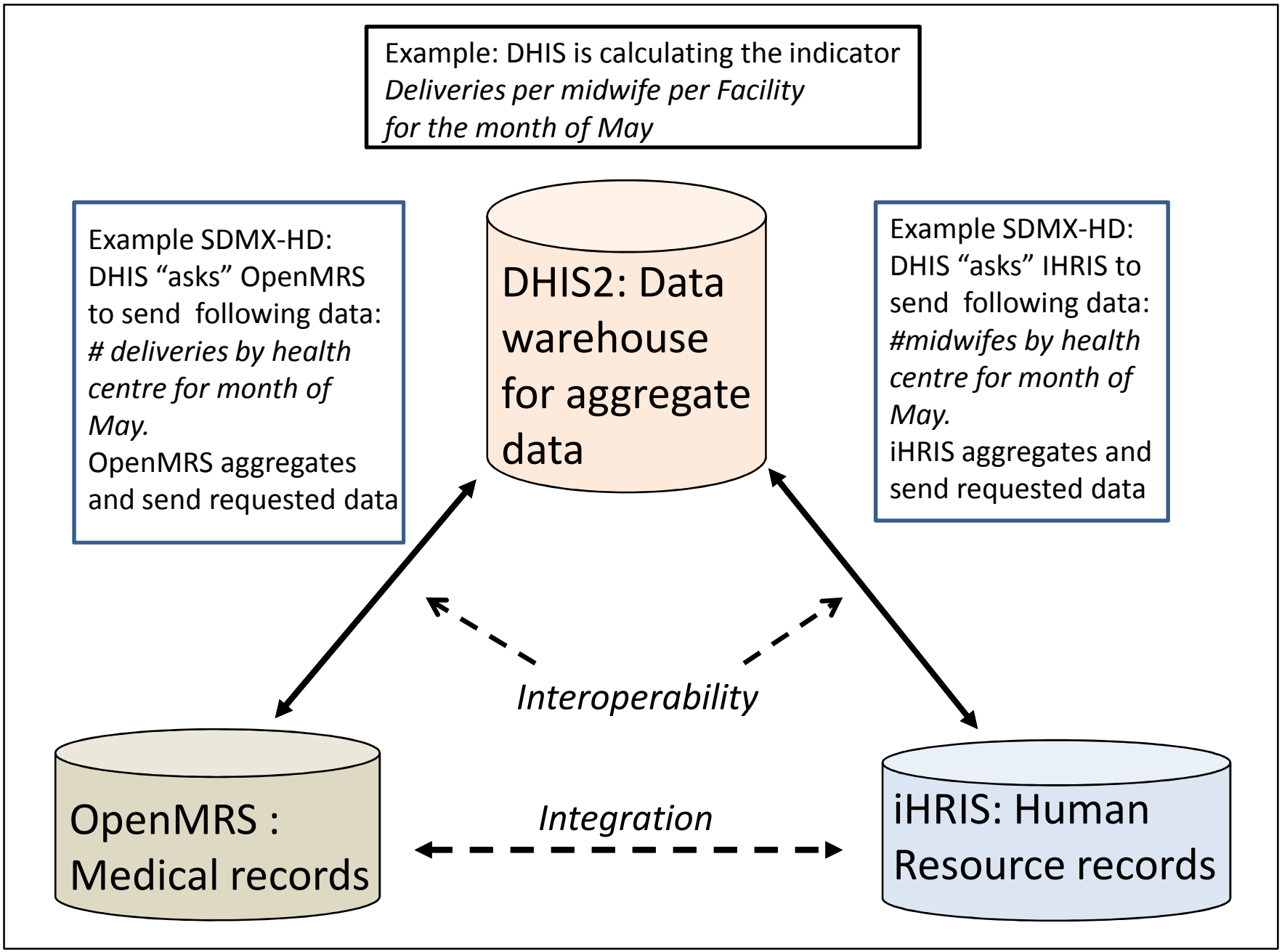
Technical or syntactic level: ability of the data warehouse or database to receive data from e.g. the medical record and human resource management system, and to exchange messages with these systems specifying which data to transfer. Handled by technical protocols for data transfer, such as SDMX-HD

Example of a cellular system

Level 1: Technical standards
he technical standards of transmission and handheld devices enable us to hear the sound of the voice from the other end, from the one you are communicating with, and vice versa.

Level 2: Semantic standards
The data and semantic standards is about the meaning of what is transferred. If in a telephone dialogue, one speaks Hindi and the other Chinese, and neither understands the other language, they will not be a conversation. Therefore, it technical standards work well, and semantic standards don't, conversation will not be effective

Level 3: Organizational standards
And finally, we will also need standards for agreed procedures of communication and data sharing at the organizational level. If, for example, two people understand each other perfectly well and are provided with a technically excellent telephone line, it doesn't help much if they don't want to talk, or have nothing to talk about.


Example: DHIS is calculating the indicator
Deliveries per midwife per Facility
for the month of May
Example SDMX-HD:
DHIS "asks" OpenMRS to send following data:
 # deliveries by health centre for month of May.
OpenMRS aggregates and send requested data
DHIS2: Data warehouse for aggregate data
Example SDMX-HD:
DHIS "asks" IHRIS to send following data:
#midwifes by health centre for month of May.
iHRIS aggregates and send requested data
Interoperability
OpenMRS : Medical records
Integration
iHRIS: Human Resource records

Interoperability in multiple settings

Environments can be multi-faceted

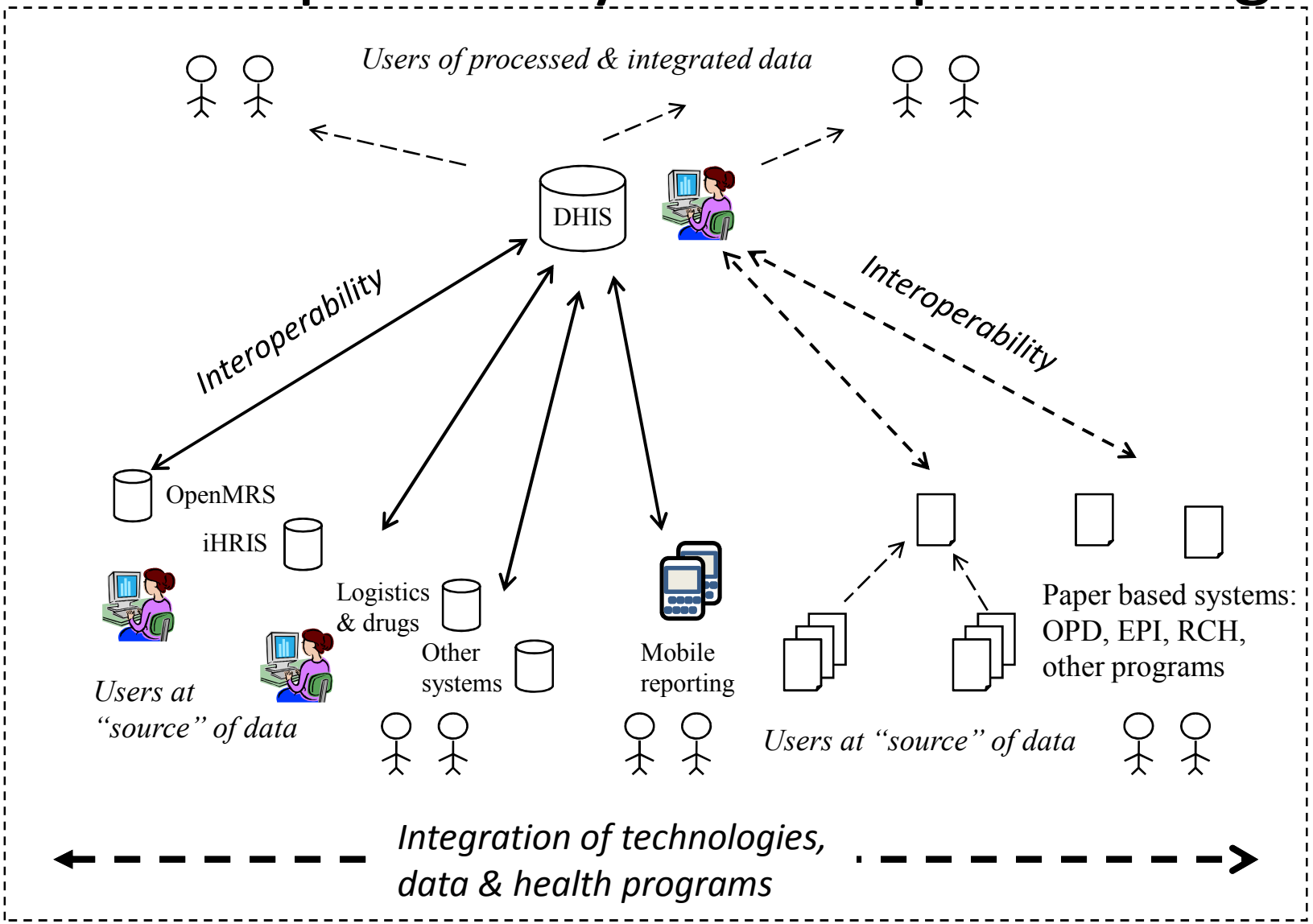
Computer or paper based, data can be reported using the Internet, USB memory sticks, as paper reports, or by mobiles

The means of data transfer, whether it uses paper or electronic format, physical transport or the Internet does not affect interoperability, not limited to exchange between computer based systems.

Data standard remains the same, regardless of the means of exchange, electronic or paper based.

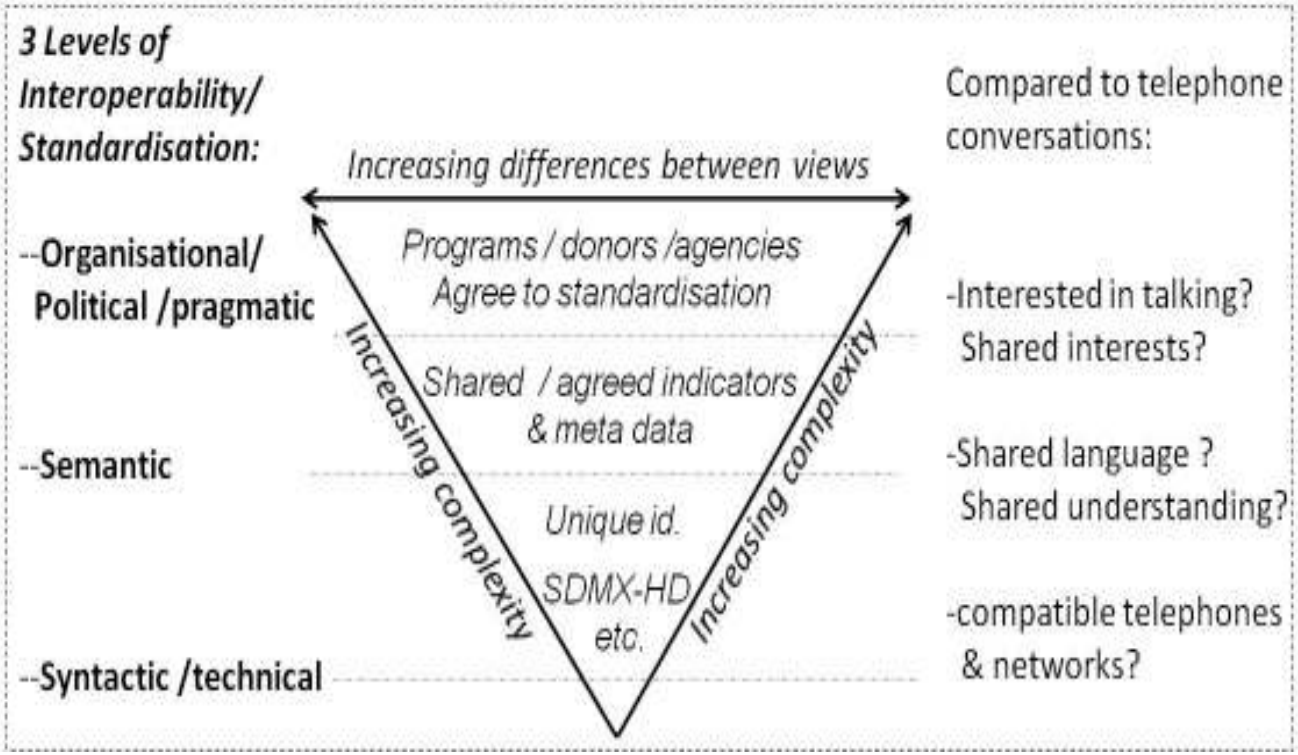
Distinguishing the technical level of data transfer from the data itself is therefore important when using the concept of interoperability

Interoperability in multiple settings



Standards is the glue

…to enable integration and interoperability…3 levels



Standards across three levels

Syntactic / technical level:
Data transfer and interoperability, for both paper, computer and combined systems. Protocols or grammar for sharing of data. Registers also represent a form of grammar.

Data-Semantic level:
Meaning and shared understanding. This is the level of standards for data and indicators, data dictionaries and metadata on e.g. procedures for calculating indicators, health facility lists, and ICD10.

Social system – organizational-political level:
Relates to who has the power to decide on standards, especially those at the semantic level. Will also include soft standards, procedures, mandates, responsibilities and job-descriptions needed to effectuate the other standards.

Negotiating across levels

Building communication across levels

The use of “boundary objects”

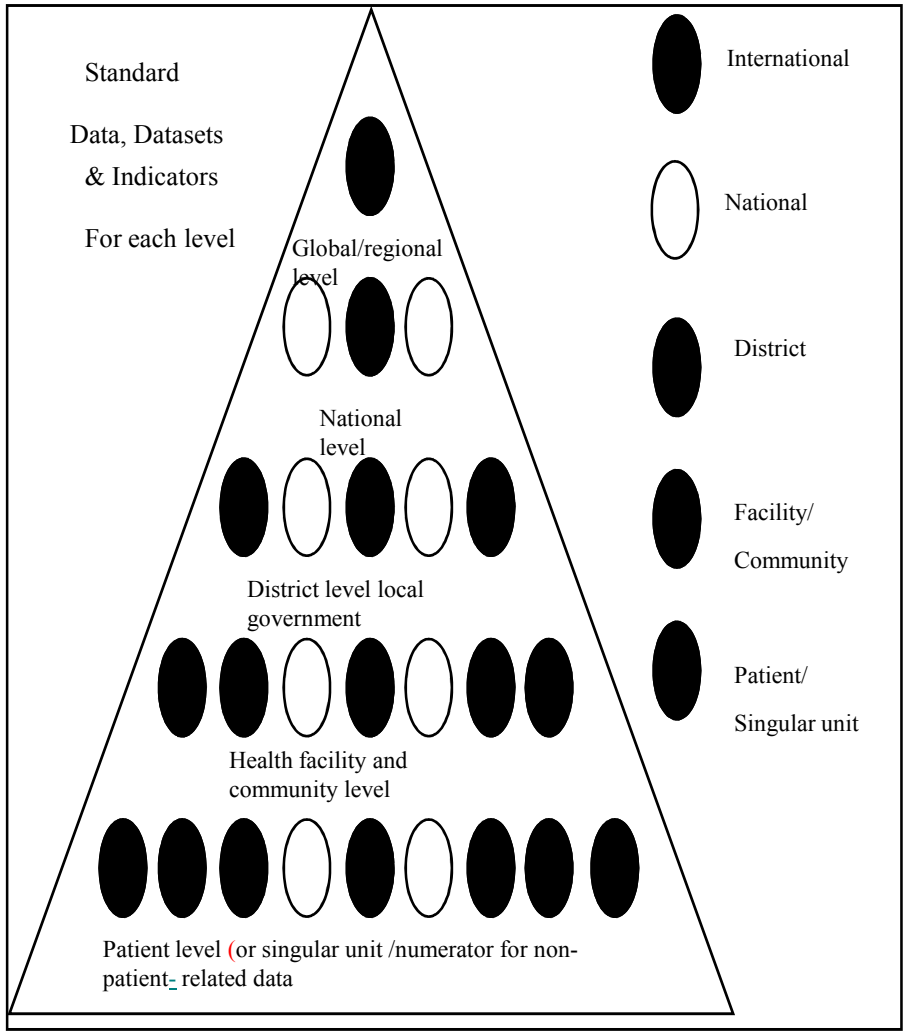
Boundary objects can be used by both sides of a boundary of differences as a means of negotiating, arriving at, communicating and maintaining shared understanding.

For example, DHIS2 can be used to mediate between two health programs working on developing shared routines for collecting and using information.

For example, showing the sharing of indicators

Boundary objects should allow cycling across levels to build shared understanding. Generally, problems at the “higher” semantic and pragmatic levels will need solutions at the levels below in order to be solved.

Standards: Hierarchy principle



- The *paradox of standardization*; provide simultaneously both the flexibility and control needed to guide standardization;
- The *paradox of integration*; rovide both coordination and independence between actors such as health programs.

Implementing standards

One size does not fit all

Standards evolve through use and by solutions that over time become “attractors,” that is, gaining momentum by attracting more and more users, and becoming more and more “global” standards.

Bureaucratic committee based standard making tend to be futile because the process is too slow while the world is changing rapidly.

Flexibility allows standards to be useful, gain momentum, grow and endure.
Flexibility has 2 dimensions:
Use-flexibility
Change-flexibility.
Eg new EU standard requiring all chargers for mobile telephones to be interchangeable in all settings. Has high use-flexibility but no change flexibility

Flexibility in standards

DHIS 2 Has high change and use flexibility

The SDMX-HD standard for interoperability is only useful for data exchange. It is easy to change and adapt to the variety of data standards needed to be transmitted, or reported, from various systems. If we compare the SDMX-HD standard for electronic reporting of data with the traditional standard for data reporting, the paper form, the difference in terms of change flexibility becomes obvious. Where the paper form is as “cast in stone” and impossible to change, the SDMX-HD standard is flexible, like a container that can be filled with a wide range of content.

Flexibility in standards:

“The third way”

“The Pragmatic balance”