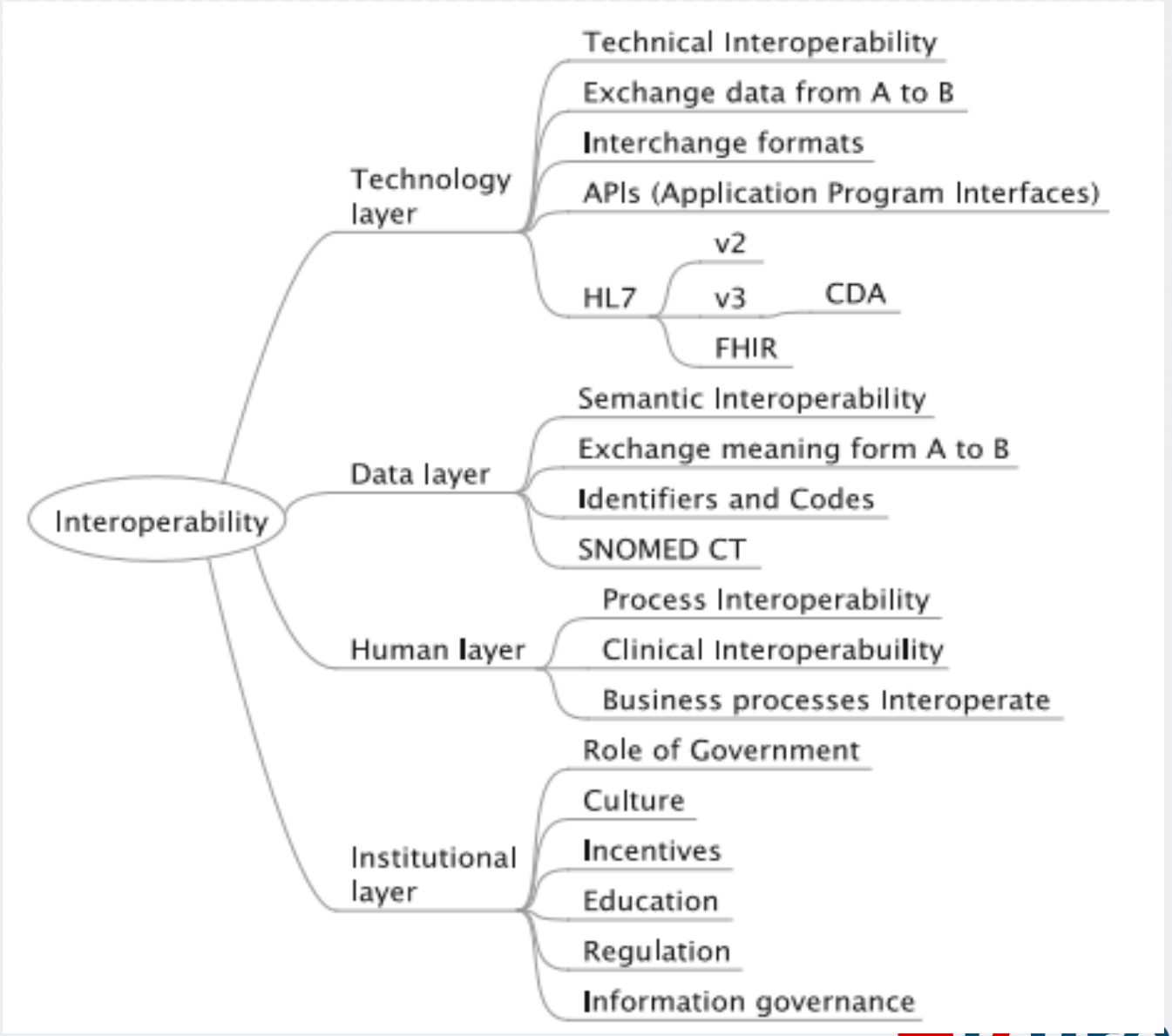
Interoperability

Layers and Types

Layers of Interoperability

- There are four main layers for interoperability
  - Technology
  - Data
  - Human
  - Institutional



Types of Interoperability

- **Technical Interoperability**: also named, channel or connection/communication interoperability
- **Information Interoperability**: also named, (Syntactic) Semantic interoperability
- **Process Interoperability**: also named, organisational or service interoperability

Technical Interoperability

- A **basic type** of interoperability
- Also known as connection interoperability
- Refers to the ability of exchanging data and information in terms of signals, at infrastructure levels
  - In other words, the ability to transfer data from A to B
  - Provides methods to establish physical and logical connections between two or more systems

Technical Interoperability

- **Domain** independent: independent of information or to what domain the information belongs to.
- Does not care about the meaning of what is exchanged
- Sending and receiving computers do not understand the message exchanged between them
- e.g., emails, or SMS: they can be used only to transfer data, irrespective of the domains.

Information Interoperability

- Refers to the ability of different systems to
  - Interchange data
  - Share information
  - Share knowledge

to deliver new services

Information Interoperability

- **Information interoperability** has many forms
  - Morphological interoperability: also named structural interoperability
  - Syntactic interoperability
  - Semantic interoperability

Information Interoperability

- **Morphological (Structural) interoperability**
  - Structural interoperability
  - Validates that the same data has the same (or understandable structure and) format

e.g. HTML document structure

<html>

…

</html>

```
<html>
  <head>
    <title>Title</title>
  </head>
  <body>
    <h1>Main Heading</h1>
    <p>Paragraph</p>
    <h2>Sub Heading</h2>
    <p>Paragraph</p>
  </body>
</html>
```

Information Interoperability

- **Syntactic interoperability**
  - *Information* interoperability - the interoperability between systems that agreed on exchanging information, with the agreed upon syntax of the transferred information.
  - **Guarantees** that a message **was delivered**
  - **Does not guarantee** that the receiver receives (or comprehend) the message
  - e.g. message syntax is consistent

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Information Interoperability

- **Semantic interoperability**
  - *Knowledge* level interoperability
  - Ability of different information systems to exchange information on the basis of *pre-established meanings* of terms and expressions
  - The basis for achieving interoperability in healthcare

E.g. Actionable message: a message can be understood and an action can be taken/invoked.

<Message: “Call Adel”, Coding System: “English”>

<Message: “4548-4”, Coding System: “LOINC”>

Information Interoperability

- **Semantic interoperability**
  - **Guarantees** message recipient (or comprehension)
  - Uses *semantic mediation* to combine data from heterogeneous sources
  - *Semantic mediation*: converts clinical messages from their standard/common format into another local format or vice versa

Process Interoperability

- Refers to the ability of different systems to
  - Exchange *clinical processes* and *workflows* between clinical systems associated with clinical data

- A critical feature in health care is *clinical process* interoperability
- "Clinical process interoperability is the ability for two or more clinicians in different care teams [or organisations] to transfer patients [and/or their data] and provide seamless care to the patient"
- To achieve clinical process interoperability, transfer of workflow and standards supported by clinical systems is needed.