*open*EHR & clinical modelling

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openEHR.org

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What is *open*EHR?

- **Set of specifications** for an **EHR architecture**:
  - Highly stable reference model for health computing platform
  - Clinical content specification:
    - General purpose archetypes
    - Specific purpose templates
  - Approach - EHR ≡ all about data; IT IS NOT AN APPLICATION
- **Open source** software implementations
- Registered online community –
  - >1000 members from 75 countries
    - Technical
    - Clinical
    - Implementation

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Who is *open*EHR?

- The *open*EHR Foundation is a **not-for-profit** company
- Founding members :
  - University College London (CHIME), UK and
  - Ocean Informatics, Australia.
- >15 years of research and international implementations
- Ongoing development and enhancement
- www.*open*EHR.org

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Types of interoperability

Level 1: Non-electronic data.
Examples include paper, mail, and phone call.

Level 2: Machine transportable data.
Examples include fax, email, and unindexed documents.

Level 3: Machine organisable data
ie structured messages, unstructured content
Examples include indexed (labeled) documents, images, and objects.

Level 4: Machine interpretable data
(structured messages, standardised content)
Examples include the automated transfer from an external lab of coded results into a provider's EHR. Data can be transmitted (or accessed without transmission) by HIT systems without need for further semantic interpretation or translation.

Walker et al, 2005

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What is *open*EHR for?

SEMANTIC INTEROPERABILITY
→Shared EHRs

= specification for secure, shareable health information

Designed for:

- robust clinical record keeping;
- clinical business processes;
- medico-legal compliance; and
- supports distributed workflow

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Purpose-built EHR specification

COMPLEX RECORD; LEGAL

- *Management of dynamic content
- Distributed versioning/merging of records
- Audit trails
- Strong history and event model
- State model
- Archetype-driven semantic querying
- Configurable security

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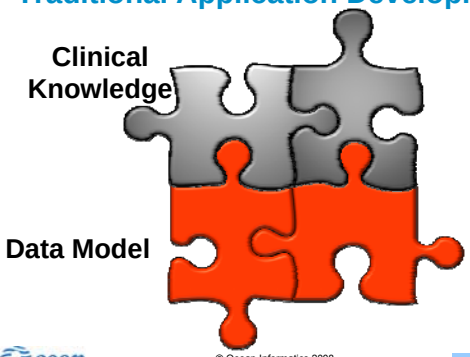
Traditional Application Development



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Nature of Health Domain

Huge amount of information

- SNOMED medical termset → 357,000 concepts and >1 million relationships

Dynamic

- Rate of change is high;
- Common knowledge today is 'out-of-date' tomorrow

Open-ended & evolving

- *In breadth* – new information discovered, or re-evaluated
- *In depth* - finer-grained detail
- *In complexity* - new relationships

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Information complexity: timing

Dose frequency	Examples
every time period	…every 4 hours
n times per time period	…three times per day
n per time period	…2 per day …6 per week
every time period range	…every 4-6 hours, …2-3 times per day
Maximum interval	…not less than every 8 hours
Maximum per time period	…to a maximum of 4 times per day

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Information complexity: timing

Time specific	Examples
Morning and/or lunch and/or evening	…take after breakfast and lunch
Specific times of day	06:00, 12:00, 20:00
Dose duration	
Time period	…via a syringe driver over 4 hours

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Information complexity: timing

Event related	Examples
After/Before event	…after meals …before lying down …after each loose stool …after each nappy change
n time period before/after event	…3 days before travel
Duration *n* time period before/after event	…on days 5-10 after menstruation begins

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Information complexity: timing

Treatment duration	Examples
Date/time to date/time	1-7 January 2005
Now and then repeat after *n* time period/s	…stat, repeat in 14 days
n time period/s	…for 5 days
n doses	…Take every 2 hours for 5 doses

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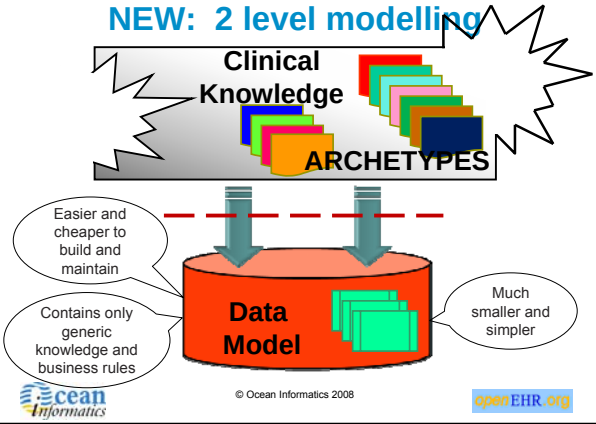
Information complexity: timing

Triggers/Outcomes	Examples
If condition is true	…if pulse is greater than 80 …until bleeding stops
Start event	…Start 3 days before travel
Finish event	…Apply daily until day 21 of menstrual cycle

NEW: 2 level modelling



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Archetypes

- Dictionary definition - a model or prototype
  - ***open*EHR archetypes are models of clinical concepts**

= Keystone of *open*EHR architecture

- Model a range of concepts:
  - Simple and straightforward concepts
    - 'blood pressure'
    - 'weight'
  - Complex compound concepts such as
    - 'medication order'
    - 'family history'

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Archetypes put the clinician in the driver's seat!

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Archetypes 2

Can be standalone – one person/one purpose

BUT

Archetypes are most useful when

- **Shared**
- **Re-used**

} Central Archetype Repository – revisions; versions; release sets

Potential for a **SINGLE, SEMANTIC MODEL** of clinical content

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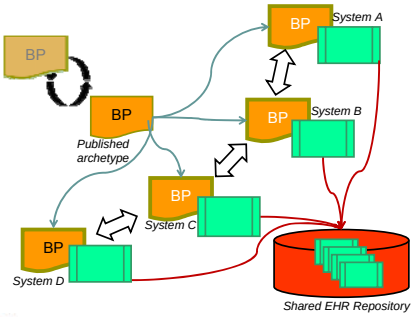
Single Semantic Model



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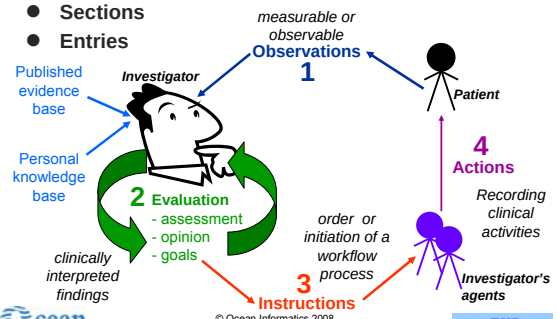
Types of Archetypes

- Compositions
- Sections
- Entries



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Designing an archetype

Clinician involvement required → Maximum Data Set

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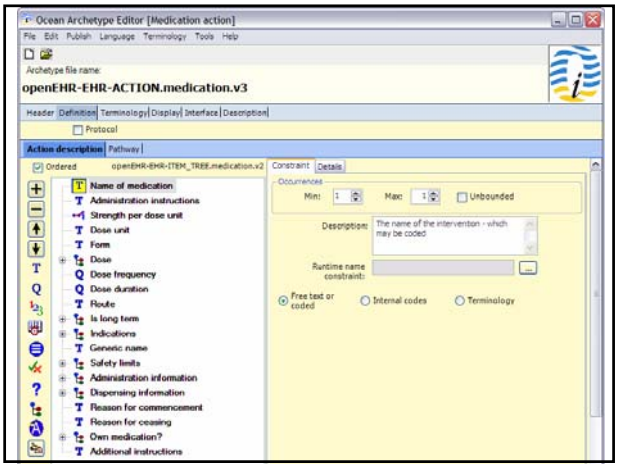
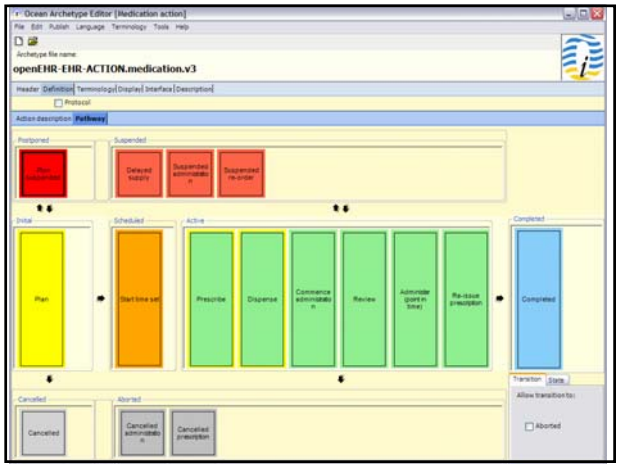
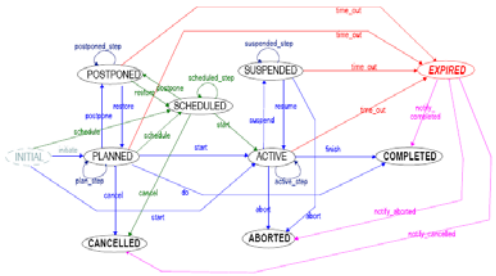




Action State Model



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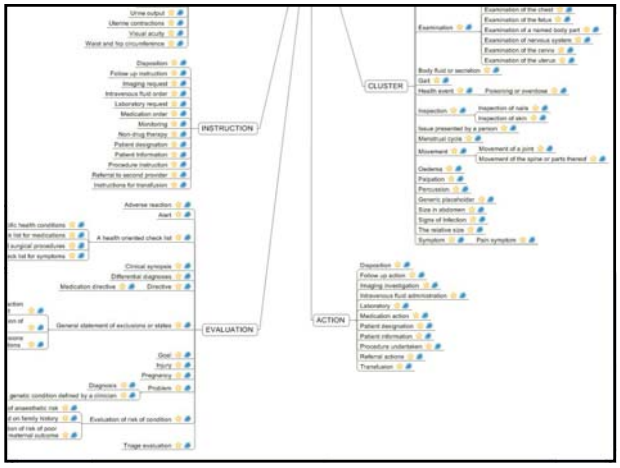

Templates

Templates are formal specifications defining a particular aggregation of archetypes

- Context, purpose, clinical domain or location.
- Constrain the component archetypes to make them 'fit for purpose', including
  - assigning default values,
  - addition of mandatory items, and
  - specifying terminology subsets for real-time usage.

In practice…

→ combining archetypes

→ screen forms, reports, or messages.

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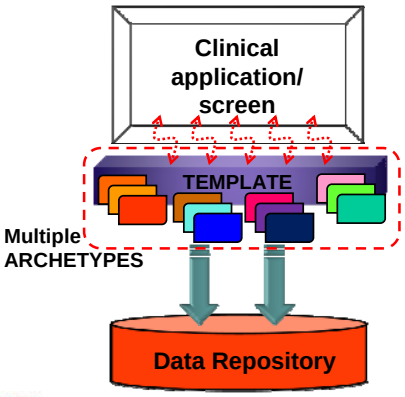

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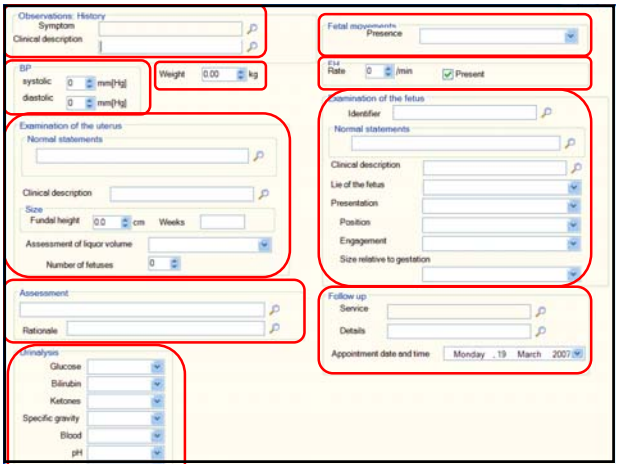

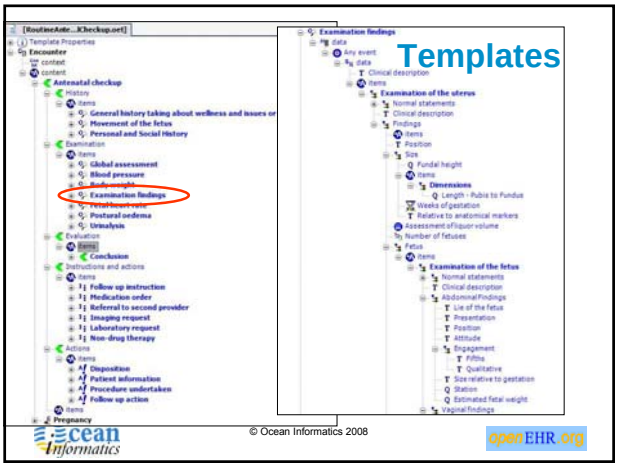

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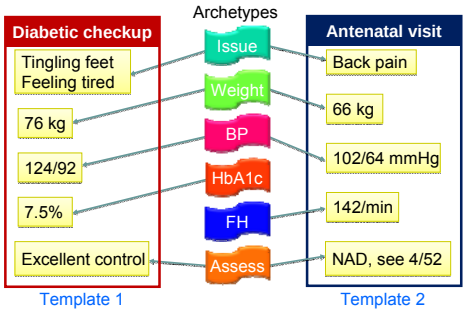
Archetypes Re-use



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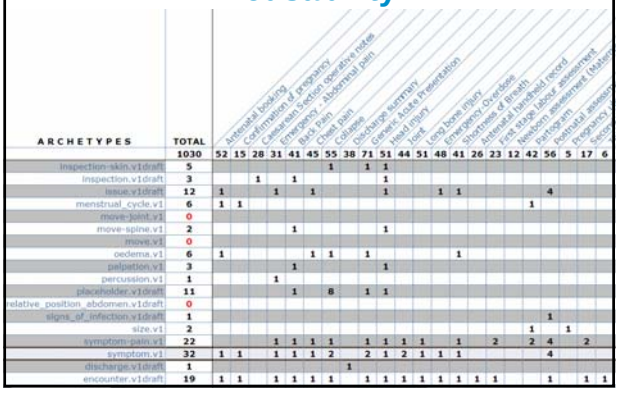
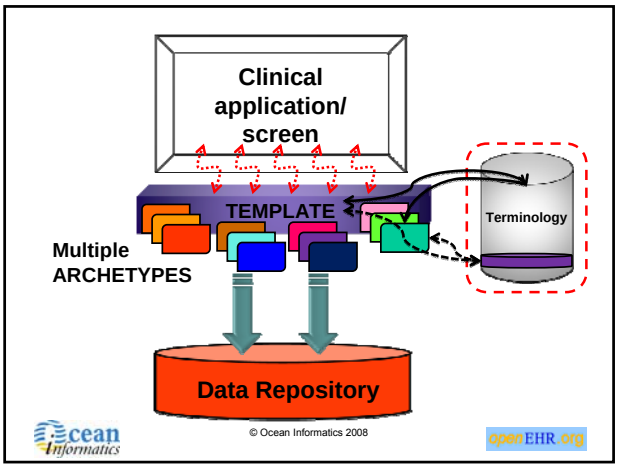
Reusability





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Multilingual Archetypes

Each archetype is translated once

No language of primacy

- English
- Japanese?
- German
- Dutch
- Spanish
- Portugese
- Danish
- Swedish
- Turkish
- Farsi

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~~Longitudinal~~ Health Records

LIFELONG

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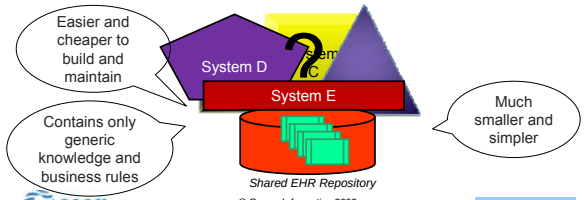

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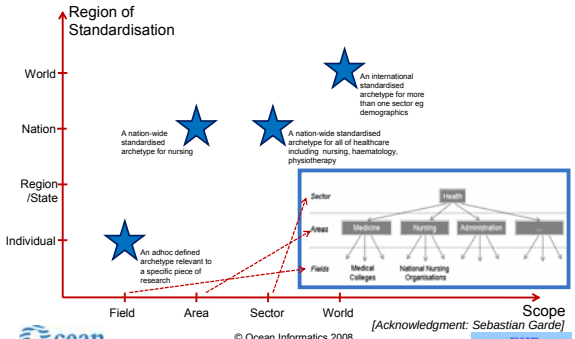
Interoperability



[Acknowledgment: Sebastian Garde]

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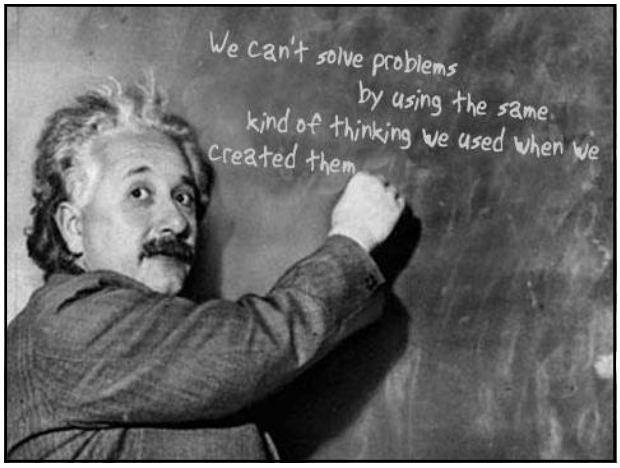
Model governance

REPOSITORY

- Manage Archetype and Template lifecycle
  - Creation → Clinical Review → Publication
- Version management
- Terminology subsets
- Release sets
- Community engagement

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