

Knowledge Transfer

Models of Use to Models of Meaning

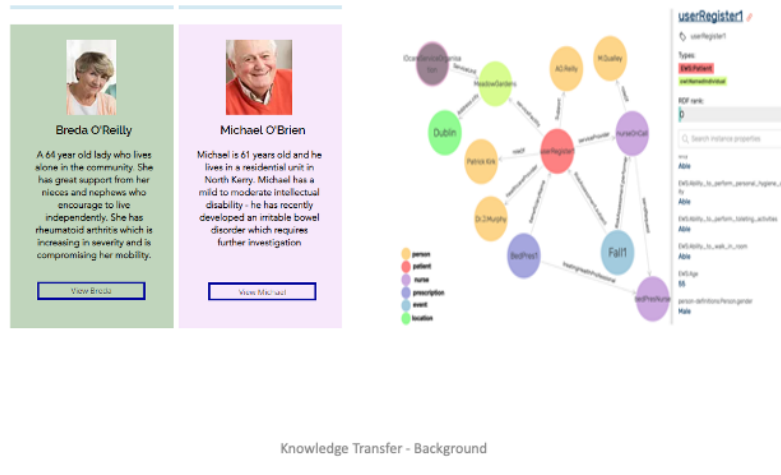
Pamela Hussey



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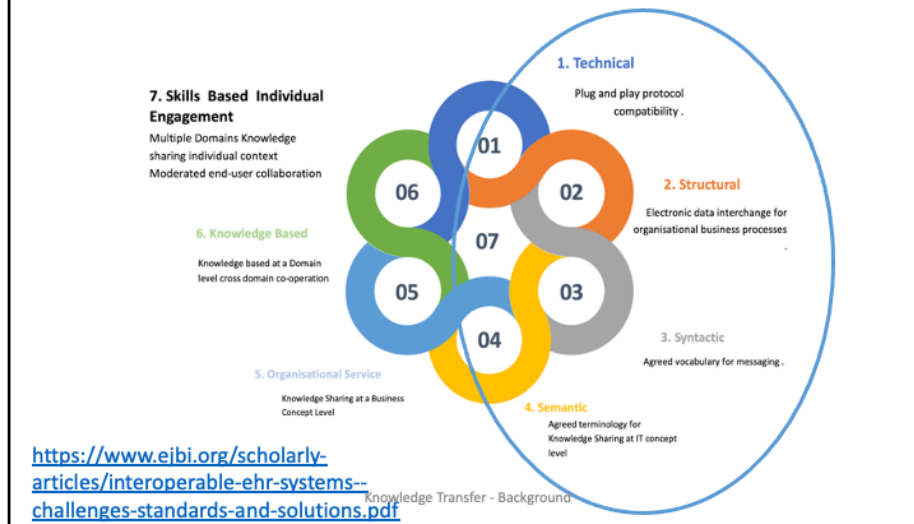
This presentation is provided as an introductory resource to Knowledge Transfer and is created to link with the practice section of this sandpit resource. As a presentation it offers a high level summary of the material which is presented in detail using the Common Semantic Data Model Project in the various sections of the sandpit resource.

From Citizen Centric to GraphDB



In the Citizen Section we provide some links to scenarios that can be used by viewers to create Use Case templates for describing a use case and an interoperability realisation scenario. A full list of the material provided by the Antilope Project published in 2015 is <https://www.antilope-project.eu/resources/>. In this sandpit we provide additional material to showcase how the CeIC CSDM team are creating GraphDB to demonstrate ontology development in the Irish context. Our partner services in this project are St Michaels House Intellectual Disability Services.

Steps 1-4 Blobel's Work Explained



Extensive work has been completed on interoperability over a number of years by Bernd Blobel et al see <https://www.amia.org/about-amia/leadership/acmi-fellow/bernd-blobel-phd-facmi> . The diagram above provides an adapted figure which references Blobel et al's work . This particular paper is interesting as it details a structure which can be used to detail the seven various components required to address the complexity of interoperability. In the sand pit we focus our attention only on steps 1-4 which link with activities relating to technical , structural, syntactic and semantic levels of interoperability.

The Journey Citizen Scenario-Digital

- Translating Models of Use to Models of Meaning
- Examples provided by Dr Subhashis Das in <https://sites.google.com/dcu.ie/csdm/>
- Goal: To create a health record which is capable of passing from machine to machine and be understood in terms of language (semantic) and structure (syntactic) an iterative and rigorous process of mapping and alignment must be completed.

This starts with three core processes

1. Defining the problem requirements (creating a use case)
2. Defining the information (what is common core and context specific data)
3. Defining the overall structure in which the information will be held schema.

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From the outset it is important to understand that the existing Models of Use currently deployed are often not sustainable for long term use or in line with policy requirements for Electronic Health Record use. Paper records or small scale bespoke systems that have been created locally and considered instrumental for local health care provision, are more often not well aligned with national requirements. Specifically they often fall short on reporting or supporting for new models of shared care delivery. Quality of data as defined in the HIQA guidance portal <https://www.hiqa.ie/reports-and-publications/health-information> details well what quality data is and how it can support services and policy such as the Slaintecare Implementation Plan currently in flight in Ireland. Also translating Model of Use in there current state results in a missed opportunity to focus on service improvement for example taking existing paper based practices and converting them into scanned pdf documents in a system does not deliver value for the citizen in the long term where data is not properly structured and coded the net result is prevailing heterogeneous databanks. So in this resource we offer some examples of how to instigate a system which offers a more sustainable alternative in line with global policy requirements and which offers a better return on investment and overall value for citizens.

Defining Problem Requirements

- There are many ways to approach this process, however most individuals develop a Use Case which identifies the core functional requirements.
- An important deliverable is a detailed use case or project report which outlines what information is to be collected who will have access to this information and how it will be viewed. *Input – Process- Output*
- Creating diagrams to detail the processes involved is important in order to describe the system components. For example what are the concepts associated entities and attributes and what is the relationship between the entities created within the system.
- The rules associated with the system also have to be identified as this impacts on how the relationships in the system will operate.

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Defining initial problem requirements with domain experts and which an interoperable and sustainable system can address are detailed above. Key to this process includes detailed clinical process models which provide key information on who, what, and how information collected will be used. Once the initial detailed process maps have been created and agreed with domain experts for any future system, the rules associated with permissions and conformance are then developed. These rules are applied with input from domain experts and are designed in accordance with patient safety and an associated data management plan.

Defining Information Involves

- A series of iterative steps to define the required information, translate it into data, and consider the core functional requirements that the system will perform.
- Moving from Information used in Models of Use to Defined Concepts in a Model of Meaning see [Practice Section Resources](#).
- Progressing to detailing the defined data types with the rules associated with the data use called entities values and properties
- Key processes focus on the relationships between the data types and the explicit conformance details for example designing hierarchy of the data. e.g Must Should linking to conformance
- Role is a good example: Can a person can be a healthcare professional and a service user? How will the system manage this role requires creating an individual with two roles an individual can have one is health care professional the other a service user.

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Defining the information and associated processes is detailed in the Practice Section resources. Essentially any information to be used in future system development lifecycles will be aligned and mapped to a suite of information models which involve organising and structuring the information into hierarchies of data types and loading the data into pre defined tools. For example OWL is a W3C Web Ontology Language which can be used as one of the tools to structure the information for use on the World Wide Web.

Good Example ISO 13940 System of Concepts for Continuity of Care



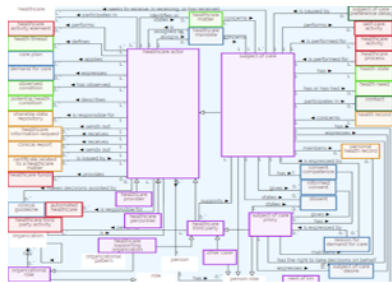
A visualisation of a model conforming to International Standard EN ISO 13940:2015 Ref Nicholas Outbridge and Torbjørn Nystadnes published Oct 2019.

<https://contsys.org/page/default>

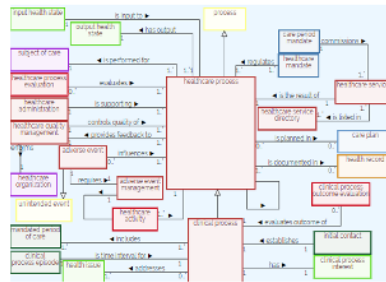
For an example where information is clustered using health informatics standards we link here with an ISO standard published in 2015. this standard is currently under review by ISO as is the normal convention with standards every five years. Commonly known as Contsys this standard provides a visualisation model demonstrating Systems of Concepts for Continuity of Care. The link attached <https://contsys.org/page/default> provides some clear detailed information for you to review on the visualisation of a system of concepts for continuity of care.

Excerpts of UML Concepts Role & Process ISO13940:2015

Role



Process



<https://contsys.org/page/default> Published by Nicholas Outbridge and Torbjørn Nystadnes Oct 2019

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Here we provide two screen shots of this visualisation demonstrating the relationships between concepts for Role and Health Care Process. This work was completed by a task force in the EU CEN Standards Community Group chaired by Nicolas Outbridge and the UML diagrams were created by Torbjorn Nystadnes.

Example of Ontology Based Applications

- A step by step summary review is provided by Dr Subhashis Das to explain how this knowledge transfer process happens from translating any informal model to an ontological graph.
- The Schema is often referred to as the blueprint of the system design.
- In step three of the resource listed here Contsys is used as an example of the schema we have adopted in the EliteS project for Common Semantic Data Model <https://sites.google.com/dcu.ie/csdm/>.

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Moving on from the standard Contsys the CSDM project provides a summary overview under the Practice section of this Sandpit Resource illustrating the various steps required to create a Model of Meaning from a Model of Use.

Further Related Reading

- Robertson, D., Giunchiglia, F., Pavis, S., Turra, E., Bella, G., Elliot, E., Morris, A., Atkinson, M., McAllister, G., Manataki, A., Papapanagiotou, P., & Parsons, M. (2016). Healthcare data safe havens: Towards a logical architecture and experiment automation. *The Journal of Engineering*, 2016(11), 431–440. <https://doi.org/10.1049/joe.2016.0170>
- Blobel, B. (2018). Interoperable EHR Systems—Challenges, Standards and Solutions. *European Journal for Biomedical Informatics*, 14(2). <https://doi.org/10.24105/ejbi.2018.14.2.3>
- Das S , Hussey P. Development of an Interoperable-Integrated Care Service Architecture for Intellectual Disability Services: an Irish Case Study *In* *Frontiers of Data and Knowledge Management for convergence of ICT, Healthcare, and Telecommunication Services*, Paul, S., Paiva, S., Fu, B. (Eds.), Springer, 2021 In Print

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Here are some additional resource papers which outline the complex and detailed processes required to deliver on sustainable interoperable systems. The third of these written by Subhashis and I which provides additional material on the CSDM project is in press but accepted for publication as a chapter in *Frontiers of Data and Knowledge Management for convergence of ICT, Healthcare, and Telecommunication Services*.