

4 Version 2 explained

This chapter documents the modelling conventions used in Version 2 of the NHIM, and explains its main components. It also explains some of the rationale behind specific changes to existing entities from Version 1 and the inclusion of new entities.

4.1 Presentation conventions for Version 2

4.1.1 Entities

Entities are the things about which we need to know information or hold data. Entities may be people, places, objects, events or concepts.

The 'rules' for entities, as used by the NHIM, are:

- An entity is represented by a soft box (i.e. rounded corners), with the name in capital letters.
- An entity name is located inside the box, justified towards the upper left-hand corner of the box.
- An entity name refers to a single instance, i.e. the entity would use the singular PERSON, not PEOPLE.
- An entity name must be supported by a definition.

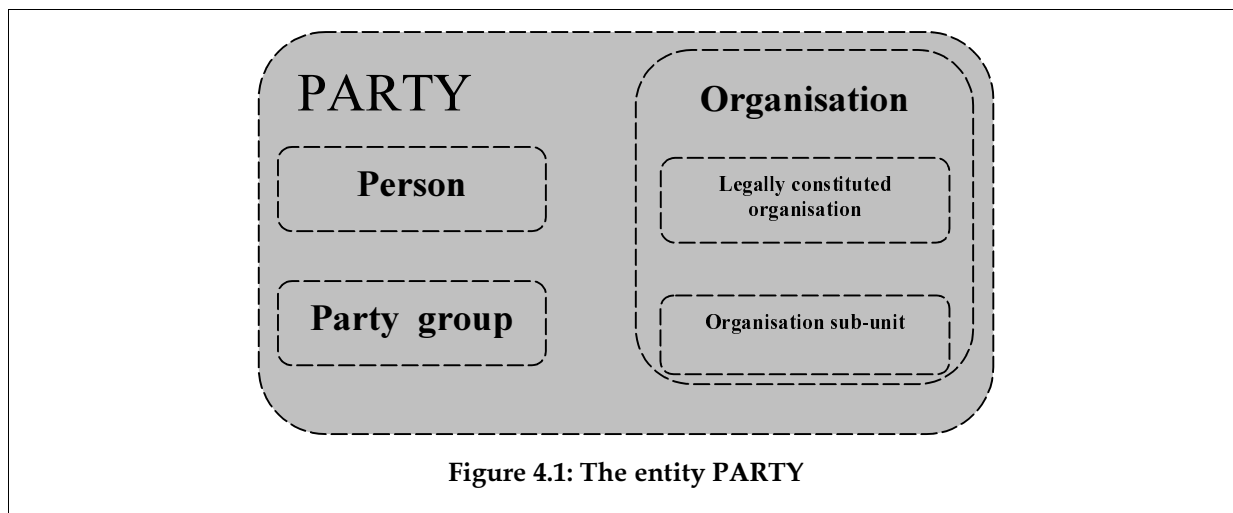
Entity definitions provide much of the richness and utility of the NHIM and it is important for the reader to consider more than just the names allocated to particular entities. Although information modelling provides a concise representation of information, an entity name can be open to interpretation and possible conflict. In defining an entity, it is often useful to include practical examples of what is or is not covered by the particular entity.

4.1.2 Entity supertypes and subtypes

In constructing a model of a major system or sector, the practical information modeller treads a thin line between complexity and generalisation. Models with too many entities may be too complex for an audience to understand and genuinely appreciate the underlying information structures they represent. Conversely, models that treat structures at too high a level of generalisation may fail to capture the essential components of a dynamic information structure.

High-level entities may be usefully presented as a composite structure that includes a unique model within its logical boundaries. These composite entities are known as 'supertypes' and may present a subordinate or nested structure comprising several entities or 'subtypes'. The process of clustering entities together as subordinate structures of a single supertype is known as 'generalisation'. The refinement of an entity to incorporate a subordinate structure is known as 'specialisation'.

For example, in Version 2, the entity PARTY is subdivided into three mutually exclusive subtypes: PERSON, PARTY GROUP and ORGANISATION (see Figure 4.1).



The smaller boxes in Figure 4.1 are entity subtypes, and the complete entity is an entity supertype. Note that the entity ORGANISATION is concurrently a subtype entity of PARTY and a supertype comprising two distinct subtypes (or specialisations). Nesting entities with supertype-subtype associations enables the modeller to present some complex structures with minimal visual complexity.

The ‘rules’ for entity subtypes and supertypes, as used by the NHIM, are as follows:

- Entities may be specialised into two or more entity subtypes.
- Entity subtypes should be mutually exclusive.
- Entity subtypes inherit the rules of their parent supertype.

Although the NHIM does not present attribute-level detail, it is useful for contextual modelling purposes to record that supertypes and subtypes may each have attributes.

4.1.3 Attributes

Attributes, often called data elements, describe an entity. They are the things that we want to know about an entity. As a conceptual model, the NHIM does not present attributes. Doing so would make the depiction of the NHIM complex and unreadable.

A valuable reference source for attributes that can populate the entities of the NHIM is Australia’s National Health Data Dictionary (NHDD), presently in its eleventh edition. The NHDD presents a range of nationally agreed data definitions in a format that is specifically mapped to the entities in Version 2 of the NHIM.

4.1.4 Dotted boxes — further work required

One of the difficulties of developing a high-level model of health in Australia is that there is no high-level consensus on a number of areas depicted in the NHIM. Research is currently being undertaken to define some of these areas; for others there is ongoing debate.

One of the easy ways for the NHIM to accommodate this is to avoid the use of subtypes and use only high-level entities with very general names. The Model has adopted a new notation to represent entities and their subtypes that may ‘need more work’ or ‘await national agreement’. These entities are represented on the NHIM as entities with ‘dotted’ box borders.

4.2 An overview of Version 2 of the NHIM

4.2.1 The macro-architecture

Although person-oriented, the NHIM has no prescribed centre; rather, it allows the reader to use any of the entity supertypes as the logical centre of the NHIM depending on the reader's interests at the time.

For some audiences, size and placement of the various entities and supertypes in the NHIM infer a degree of emphasis or importance and can affect acceptance and interpretation of the NHIM. This should not be the case and the NHIM Version 2 attempts to de-emphasise this as far as possible.

Notwithstanding this latter observation, the entity supertypes of the NHIM can, however, be loosely organised into four categories, as represented in Figure 4.2.

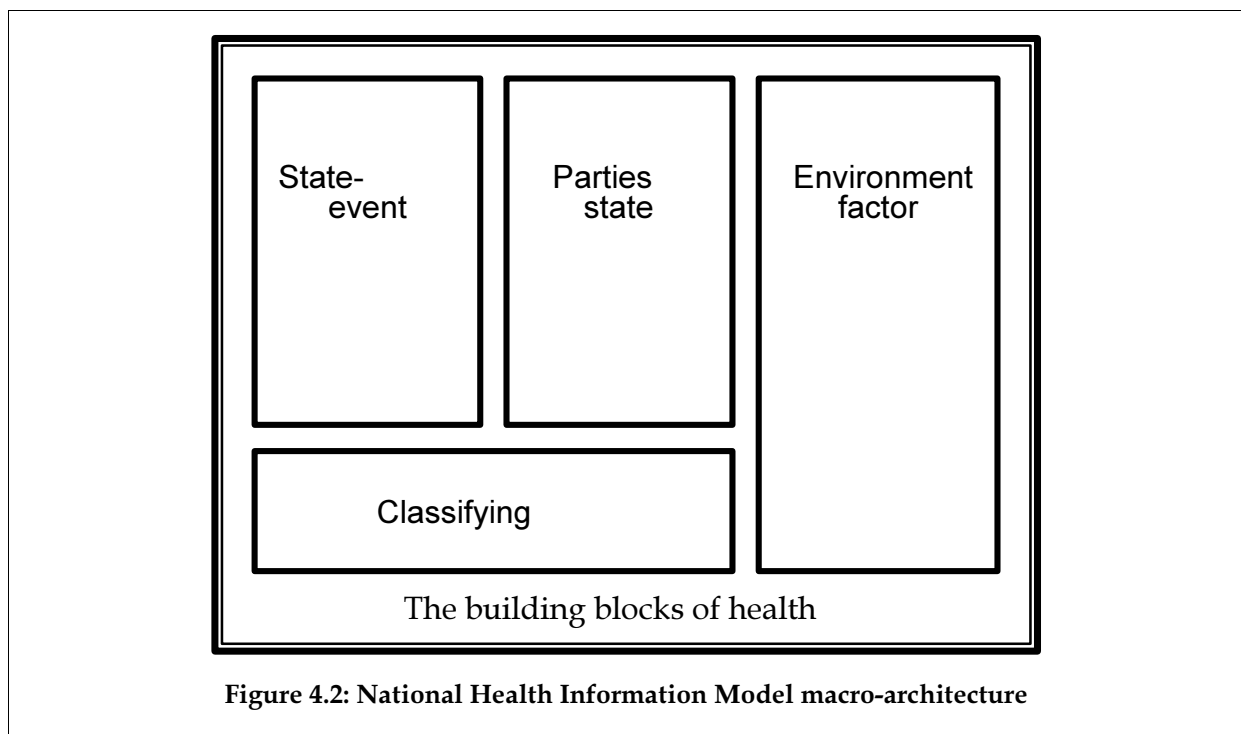


Figure 4.2: National Health Information Model macro-architecture

The macro-architecture categories of the NHIM are:

- *Parties and states* – the people or parties active in the health sector, the roles they play and their particular observable, recordable, definable or measurable characteristics
- *State-changing events* – things or 'events' that happen within the health sector and/or involve the parties of interest, and the distinguishing characteristics of those events. Events may vary from imprecise 'life events' such as the onset of puberty to complex service delivery events in institutional healthcare settings
- *Environmental factors* – the administrative, physical and social environments within which we live and within which the health sector operates
- *Classifying systems* – systems that might be used to classify, encode or assess health factors, states or events. Such systems may include value domains, coding systems and performance indicators.

4.2.2 The NHIM in action

If enterprise models are worth constructing, they must be put to good use in practice. A well-constructed robust model will be used in different ways. This diversity builds familiarity and stakeholder ownership, and ultimately challenges and reinforces the integrity of the model. Successful modelling initiatives result from the collaboration, commitment and sacrifice of many contributing parties and jurisdictions.

So how might the NHIM be used?

4.2.2.1 An aid to consensus

The health sector is full of complex language, terminology and jargon that often complicates effective communication, both with other sectors and within the health sector itself. Sector-specific language stands as a significant barrier to the rationalisation of data and information in most health jurisdictions and sectors. Some of the problem does indeed reflect the unique terminology of a specific sector and activity. All too often, the differences will be cosmetic or semantic (e.g. do we deal with 'patients' or with 'clients'?); they are, however, very real to their proponents. Irrespective of origin, semantic differences in terminology within the health sector present political and administrative difficulties to those charged with data development and/or standardisation exercises.

An enterprise model can diminish the adverse effects of semantic barriers in health. A model can support several separate expressions of logically similar constructs as subtypes or attributes of a single entity; PATIENT and CLIENT could reasonably be considered as unique subtypes of a ROLE for a PARTY in the health sector. Alternatively, sector-specific language and semantic variations on a particular theme might be covered by the use of aliases within a single attribute definition, a strategy that more appropriately accommodates our semantic example of *patient* and *client*. It is often useful to achieve consensus on logical structure in the first instance and an information model is an invaluable tool for assisting this process.

4.2.2.2 Business planning

An enterprise information model provides a novel perspective of a business. It can stimulate original thinking about the objectives and organisation of a business, and can be useful as an aid to planning. It can be used to structure thoughts and plans or to support the development of policy, thus enabling planners to analyse and assess the impact of a policy initiative on information.

Using an industry-wide conceptual model as the basis for constructing a jurisdiction-specific contextual model usefully challenges the integrity of the business rules that characterise the particular jurisdiction. Such a contextual model will clearly outline the business imperatives of the jurisdiction, and provides an ideal starting point for discussions with vendors of health systems and application developers.

4.2.2.3 Data development and management

An enterprise model can be used to highlight available data resources and those areas in which data development might be most productively undertaken. Appropriately populated with attributes and data definitions, and linked to an inventory of data collections, information models highlight areas of overlap in existing data and indicate where attention to data rationalisation might pay significant corporate dividends. The NHIM is routinely

used in this manner by Australia's National Health Data Committee, the data development arm of Australia's well-established national health information infrastructure.

Many agencies lack an easily accessible, properly indexed inventory of available data resources, a shortfall that can limit the use of those resources. The resultant problems can include duplication of data and data collection effort, the use of inappropriate substandard sources for data and, ultimately, poor decision making. Where catalogues, registers and inventories of data exist, they often rely on alphabetic indexes and key words for cross-reference capability, and hence are semantically vulnerable. These problems can be particularly apparent when data are sourced across jurisdictional or sectoral boundaries.

4.2.2.4 Application development

It is self-evident that the health sector comprises a broad range of interdependent specialist sectors. Application and information systems development activities within health agencies often reflect the views, strengths and weaknesses of particular individuals from single sector environments. Without an overall information framework within which to work, data may not be consistently represented across an agency. This often leads to inefficient application/system design, increases the costs of data handling and management for the organisations involved and seriously limits agency-wide capacity for data exchange.

The acquisition of large health information systems often targets off-the-shelf systems or packages, rather than in-house development activity. It is important to remember that as well as buying an application system the buyer is importing an information model to the business environment, a model that will not necessarily reflect the wider industry and/or jurisdiction within which the agency operates. Agencies will often need to, and should be able to, influence a vendor's underlying information model but will often face the commercial reality of a developer with a mature product to sell and a reluctance (or even inability) to change.

Commitment to a national health information model, together with supporting products such as a national data dictionary, should enable agencies to indicate to vendors the preferred underlying information architecture for the system required without unreasonably affecting commercial considerations. Commercial realities are such that industry-wide commitment to an agreed model will be the key to this capability.

4.2.2.5 An example of the NHIM in action

The NHIM can be used to describe many things, including how the health system might respond to particular circumstances. Consider the case of an individual person involved in a motor vehicle accident and how those circumstances might be mapped to the NHIM.

- The person we are following maps to the entity PARTY and the subtype PERSON.
- The person may be identified and characterised by a range of characteristics that map to the entity PARTY CHARACTERISTICS. These characteristics will include such things as the name of the person and state of wellbeing at a given point in time.
- The motor vehicle accident is an 'event' – a CRISIS EVENT within the entity supertype EVENT.
- The accident will have occurred at a particular place, and that place may be described in accordance with the factors relevant to the entity LOCATION. The place may be a specific ADDRESS (32 Smith Street) or it may be described as a SETTING (e.g. the metropolitan area or the country).

- The accident may have altered the person's STATE OF HEALTH AND WELLBEING resulting in the person being admitted to hospital (a HEALTH AND WELFARE SERVICE EVENT).
- The admission will have been authorised by an attending physician (another PARTY with identifiable PARTY CHARACTERISTICS, but this time a PARTY IN A ROLE of 'Service Provider'.

And so on.

Of course, in practice, each jurisdiction will have its own expectations of what data items might be necessary to document adequately each of these occurrences. The range of items is likely to extend well beyond the material included in the National Health Data Dictionary.

Although this process is, of itself, valuable, it gains significant additional value when the outputs from a number of similar exercises are compiled using the entities or entity supertypes from the NHIM, e.g. when specialists from a number of areas decide to consider how they describe PARTY CHARACTERISTICS that refer to their clients or patients. In this situation, the NHIM may be used to provide a framework for considering and classifying data.

4.3 Summary

Experience gained over the course of developing one version of a national health information model and a draft of a second has shown that not all models that are built are actually used in practice. If a model is to be used, it must be relevant to the sector to which it refers and sympathetic to the needs of data providers and users.

We believe that the NHIM passes scrutiny on both these criteria. Some of the functions it might perform include:

- *Providing a tool for building consensus* – an effective model overcoming the obstacles of sector-specific jargon and semantic differences
- *Assisting business planning* – models provide novel perspectives that can be used for policy analysis and to structure further development
- *Providing a logical framework* – models assist the data development process and provide a framework for the management of information resources
- *Influencing application development* – models illustrate fundamental information structures and can enhance communication with systems developers and vendors.

Although models can improve information resource use and management in many ways, they are not substitutes for sound data development practice and management. Equally, there is no single best model for health or indeed any business activity. The best conceptual models continue to be challenged and supported by contextual level models while accommodating the technical and semantic diversity that generates them.