



Introducing *openEHR*

© 2003-2007 The *openEHR* Foundation

The *openEHR* Foundation is an independent, non-profit community, facilitating the sharing of health records by consumers and clinicians via open-source, standards-based implementations.

**Founding
Chairman** David Ingram, Professor of Health Informatics,
CHIME, University College London

**Founding
Members** Dr P Schloeffel, Dr S Heard, Dr D Kalra, D Lloyd, T Beale

email: info@openEHR.org **web:** <http://www.openEHR.org>

Overview of *openEHR*

The Foundation

The *openEHR* Foundation is a not-for-profit company, limited by guarantee. Its founding shareholders are University College London, UK and Ocean Informatics Pty Ltd, Australia. It is regulated under the UK Companies Acts 1985 and 1989. The aims and management of the Foundation, exercised through its Board of Directors, are described on the [openEHR website](#). The Board is responsible for the governance of the Foundation, including strategic direction, financial management, legal regulation, and intellectual property (IP) management. The Board determines the roles, structures, and procedures of the Foundation and ensures that these function correctly. The major work of technical and clinical oversight and supervision of *openEHR* product developments is delegated to the Architectural Review Board (ARB) and Clinical Review Board (CRB).

Aims

The *openEHR* Foundation is dedicated to the development of an open, interoperable health computing platform, of which a major component is clinically effective and interoperable electronic health care records (EHRs). It does this by researching clinical requirements, and creating specifications and implementations. The specifications take the form of modular information models, service models and clinical information models. The platform supports the following requirements:

- ability to record any **clinical information**, including complex time-based lab results, imaging, diagnoses, care plans, evaluations, patient education material, and stateful, workflow-based instructions and intervention information;
- **archetype- and template-enabling** of all clinical systems, empowering clinical professionals to define the content, semantics and user interfaces of systems independently from the software;
- proper **integration with terminology** systems, including with: SNOMED-CT¹ so that reliable inferencing and decision support based on EHR data will be possible; LOINC², so that traceability and sharing of laboratory data is possible; and ICDx³ and ICPC⁴ classifications, enabling reliable reimbursement, management, and public health studies;
- ability to integrate *openEHR* with **messaging** systems, particularly HL7 version 2 and EDI-FACT, via the use of “legacy archetypes” and systematic mapping definitions;
- ability to integrate with existing **hospital information systems** and other databases, also via the use of legacy archetypes;
- **integration with applications** via a published API;
- **distributed versioning** and merging of EHR, demographic and other information;
- to make the architecture **componentised, adaptive and future-proof**, so that it may be a reliable basis for managing 100 year+ health records.

The Foundation publishes the specifications for the architecture openly. It also publishes “implementation technology specification” expressions, such as XML and database schemas corresponding to

1. A major ontological terminology effort by the College of American Pathologists; see <http://www.snomed.org>

2. A code system for laboratory observations. See <http://www.regenstrief.org/loinc/>.

3. WHO International Classification of Diseases. See <http://www.who.int/classifications/icd/en/>.

4. Primary care classification. See <http://www.globalfamilydoctor.com/>.

the models. From these artifacts it creates open source implementations which are validated in clinical environments, used for further research, and ultimately deployed in actual clinical environments.

The other major activity of the *openEHR* Foundation is the development of evidence-based clinical information and workflow models, known as *archetypes*. These are developed collaboratively by domain experts, and published openly in an online, intelligent repository, and are directly consumable by systems based on the *openEHR* archetype principle.

Modus Operandi

The *openEHR* Foundation works in an open manner, based on active relationships with domain experts and users, with national and international standards bodies, including ISO, CEN, and HL7, with software and system developers, and with educational institutions and researchers. The technical work is carried out within a scientific framework i.e. the use of an experimental methodology to validate and refine hypotheses. It is performed in an engineering mode, i.e. with a dedicated team undertaking an iterative process of requirements capture, design, implementation and testing. All of its deliverables are version-controlled and formally change-managed.

Unlike closed commercial developments, *openEHR* conducts its development in the open, with direct community involvement in specification, software implementation and evaluation, so that users can see and trust the foundations and structures of the software they are using.

Membership

Membership of *openEHR* implies a commitment towards realising the vision of high quality, interoperable EHRs, and a willingness to share ideas and experience. Membership is free, and is available simply by registration on the *openEHR.org* website.

openEHR Activities

The *openEHR* Foundation works in two broad activity areas: the “technical” and the “clinical”. The technical area is where engineering work is done, including specifications, implementations, testing and conformance. The clinical area is where healthcare domain professionals and organisations engage with *openEHR*, including on the development and deployment of ontologies, archetypes, templates, guidelines, and clinical education and training. These two areas of activity in *openEHR* are visible in the “two-level modelling” approach of *openEHR*, through which a rigorous yet flexible development framework enables reliable sharing of clinical meaning in addition to guaranteed data interoperability.

Management

Within each of the two *openEHR* activity areas, work is performed by project groups (PGs) each comprising a team of developers responsible for the work done on a project. Change management on some of these projects is overseen by a review board. In the technical area, the Architectural Review Board (ARB) performs this function. Its membership comprises some eight members of *openEHR*, appointed by the Foundation Board, all with long-term experience in an area of health informatics. The current membership of the ARB is posted on the *openEHR* website [ARB page](#). The role of the ARB is to review and make decisions on change requests (CRs) for *reference* projects (defined below). It operates using simple majority voting.

In the clinical area, the Clinical Review Board (CRB) performs a corresponding change management function. The CRB, likewise, comprises an international group of experienced clinical professional

members of *openEHR*. Issues affecting both areas are managed through consultation between the board.

The management structure of *openEHR* is illustrated in FIGURE 1. Projects whose change is managed by the ARB or CRB are shown joined to the relevant board of review; others are not..

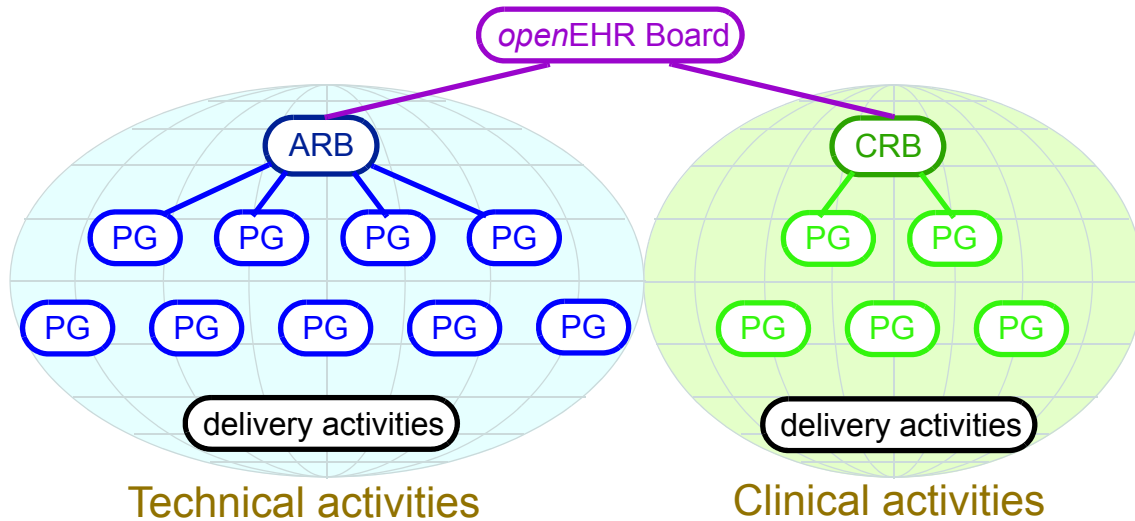


FIGURE 1 Management Structure of *openEHR*

What is an “*openEHR* Project”?

An *openEHR* project is defined as any project that:

- is based on *openEHR* in one of the following ways:
 - contributes to *openEHR* specifications or
 - aims to build something that satisfies *openEHR* conformance criteria of nominated *openEHR* specifications;
- agrees to use the relevant Technical or Clinical Change Management plan (CM Plan) and;
- agrees to the IP framework defined by *openEHR* for its products and services;
- is registered as an *openEHR* project with the *openEHR* Foundation.

Common aspects of *openEHR* change management in both activity areas include:

- the use of version and change management toolset/environment;
- the use of Problem Reports (PR) and Change Requests (CR), and the lifecycle and process for handling them;
- the use of defined operating procedures including for the distribution and publication of artefacts (also described in the CM plans).

Similarly, *openEHR* projects agree to respect the following intellectual property rights.

- All project documents must use the *openEHR* public licence (document form).
- Project source code must use the *openEHR* open source licence.
- The project must respect and preserve the structure of the **org.openehr** namespace, which is managed by the ARB.
- Irrevocability: organisations contributing to projects cannot retrospectively revoke the right of the *openEHR* Foundation and community to continue to use software or other artefacts

which they have developed within the *openEHR* environment (since this would contravene the terms of the license). They may of course use any such developed works as a basis for other developments. This condition ensures that neither the community (which may have come to rely on a component) nor the original developing organisation (which may have spent significant time and money on the development) lose access to the work; if the interests cease to coincide, the development is simply “forked”, and only one line remains within the *openEHR* framework.

Copyright of donated IP may optionally be transferred to the *openEHR* Foundation, converted to joint copyright with the *openEHR* Foundation, or may remain with the originating organisation or author.

Projects agreeing to this framework can take advantage of the facilities provided by the *openEHR* Foundation, including version management, build servers and a distribution server. It particularly enables smaller projects to proceed where otherwise they might not have sufficient material resources.

This approach to development is offered as a collaboration environment by *openEHR*, and is not a requirement of developing *openEHR*-compliant products. Development organisations are welcome to develop *openEHR*-based products in any way they see fit. It is expected that many projects will be executed by companies, universities and others, according to their own needs and priorities, including fully commercial and closed source projects.

What is an “*openEHR* Product”?

Regardless of the manner in which its development proceeds, a component, executable, or other artefact (such as a information model schema) can only be represented or promoted as an “*openEHR* product”, and can only use service marks containing terms such as “*openEHR*”, “*openEHR*-compliant”, “*openEHR* 1.x compliant” and so on, if it has been shown to be conformant to the appropriate *openEHR* specification(s), through a testing procedure defined and certified by the Foundation, against a specified set of test cases, test data or other appropriate test material. The name “*openEHR*” is registered internationally as a trademark, and its use with respect to products and services requires permission of the *openEHR* Foundation. In practical terms this means that users of *openEHR*-certified end products (particularly those for clinical information management) can rely on claims by the developer to be “*openEHR* compliant”. It aims to prevent non-conformant (potentially faulty) software or other products being promoted under the banner of *openEHR*. The test cases and criteria are developed by the community and reviewed by the ARB and/or CRB.

The following figure illustrates the relationship among *openEHR* projects, products, and non-*openEHR* work.

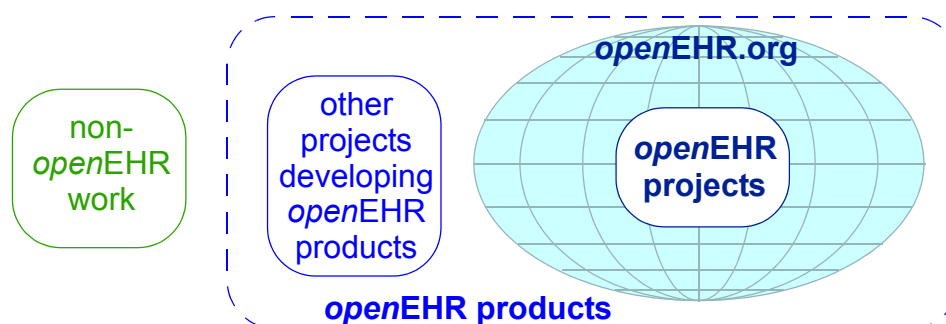


FIGURE 2 Relationship between Projects and Products

Intellectual Property

The *openEHR* Foundation has created a framework to enable the *openEHR* community to build a repository of intellectual property (IP), for common use. Since the IP includes specifications, software, knowledge bases (e.g. clinical vocabularies) and educational materials, which will find use in clinical and related environments, as well as use in research and education, some legal protection is also required. This is to ensure continuing quality and open access to the IP. The measures adopted by the *openEHR* Foundation are typical of those used by standards development organisations (due to the fact that *openEHR* publishes specification documents), and other open source development organisations: copyright, source code licensing, trade- and service-mark protection, and control of the *openEHR* namespace.

Copyright: Recognition of Authorship

openEHR copyright exists on four kinds of deliverables: documents, software source (including schemas, interfaces), executable software, and knowledge products, such as terminologies. Legally, copyright law guarantees that the original author of the original version of a given artefact is always recognised. However, it does not, on its own, offer much legal protection of such IP, due to the fact that such artefacts keep changing over time, unlike artistic works, which are generally published once only in their finished form (and for which copyright law was mainly developed). For this reason, the *openEHR* Foundation does not demand that the output of all *openEHR* projects be copyrighted to the Foundation - the copyright may be retained by the original developer, or a joint copyright may be adopted. However, all reference specifications, ITSs and reference implementation project deliverables must be solely or jointly copyrighted to the *openEHR* Foundation. Deliverables of non-reference implementation projects may retain the copyright of the original developing organisation.

Source Licenses: Protection for Developers

Because specification documents, software and related artefacts are by their nature constantly changing, the conditions of use, copying, modification and sale are specified explicitly in licenses, rather than relying on potentially unreliable copyright law (which in any case varies across jurisdictions). Two types of license are used - one for documents, and one for software and related materials. The *openEHR* licenses are available from the Foundation website [license page](#). These licenses are designed to guarantee fair, open and continued availability of all *openEHR* products to the *openEHR* community. They provide the main protection for developers of materials that their work will not be taken out of circulation, or otherwise appropriated by private individuals or bodies.

Trademark & Service-marks: Protection for Users

Controlled use of the “*openEHR*” trademark and related service-marks is the main protection for users of *openEHR* products, ensuring that, for any product claiming to be compliant, conformant or otherwise based on *openEHR*, this is in fact the case, and that the exact meaning of the claimed conformance/compliance can be investigated (e.g. by accessing and inspecting the relevant test cases or other materials from the *openEHR* website). The “*openEHR*” trademark and any related service-mark may only be used with permission of the *openEHR* Foundation.

End-use Licenses: Rights of Users

End-use licenses govern the conditions of use of end products - artefacts that can be deployed in a runtime environment. The *openEHR* Foundation itself employs only a minimal end-use license for its reference implementations, which essentially says that the relevant artefact can not be modified while being presented as its original. This simply ensures that a published component is not altered at the binary level and passed off as the original (or at least that where this happens, it is clearly in violation

of the conditions of use). More complex end use licenses (often called “EULAs” - end use license agreements) may be used by commercial organisations to control the use of their products; such licenses are not the business of the *openEHR* Foundation.

The *openEHR.org* Domain and *org.openehr* Namespace

The *openEHR* Foundation owns the *openEHR.org* internet domain, all related variants and sub-domains, and by extension, the *org.openehr* namespace. Population of the namespace (for example with Java libraries and XML-schemas) is managed on behalf of the Foundation by the *openEHR* ARB, for the benefit of the community. The principal aim is to ensure that the namespace is clearly defined. Only *openEHR* reference deliverables may be defined in the *org.openehr* namespace.

Technical Activities

FIGURE 3 illustrates the areas technical activity of *openEHR*, including specification and implementation projects, and delivery/deployment activities.

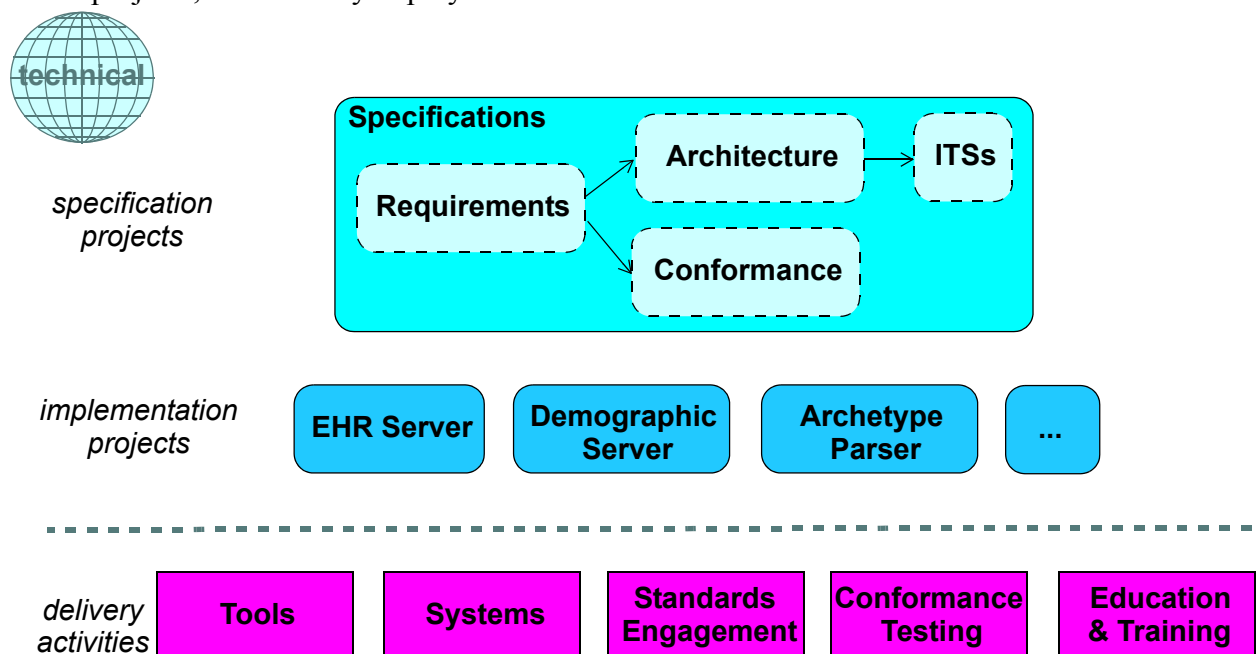


FIGURE 3 *openEHR* Technical Activities

Requirements Project

openEHR undertakes the collation of requirements for the design, implementation and deployment of interoperable EHRs a) to support the seamless sharing and continuity of health care and b) to enable EHR systems to interface with medical knowledge, evidence of best practice and other systems needed to deliver safe, secure and effective health services. Requirements developed by *openEHR* are contributed to relevant international standards initiatives.

Architecture Project

The *openEHR* Foundation publishes a number of formal model specifications, including: the *openEHR* Reference Model (RM), consisting of the primary information models (IMs), the archetype

model (AM) which includes the Archetype Definition Language (ADL) and Archetype Object Model (AOM), and the *openEHR* service model (SM), which defines interfaces to major software services in a health information environment.

Because these specifications are underpinned by explicit requirements and by the results of implementation and deployment of previous versions and thus constitute an evidence-based information architecture. As with requirements, *openEHR* architectural specifications are also contributed to relevant international standards initiatives.

Abstract information models are published as directly usable implementation technologies specifications (ITSSs), such as OMG IDL, XML, programming languages, and database schemas.

Implementation Projects

The *openEHR* Foundation engages in the implementation of interoperable software components, including archetype and EHR tools and components, using rigorous design and development methodologies. These reference implementations enable the validation of the published specifications, ensuring they are not simply 'paper' exercises.

Standards Activities

The *openEHR* Foundation is committed to supporting relevant government-sponsored and industry-based standards bodies as a means of encouraging the widespread and effective adoption of interoperable EHRs. Members of *openEHR* work closely with standardisation bodies, including ISO TC215, CEN TC/251, HL7 and national standards bodies.

Educational Activities

In order to promote and assist understanding and acceptance of *openEHR* methodology and models by a wide audience, the *openEHR* Foundation develops educational materials, runs workshops, and provides consultancy services internationally. It also develops materials suitable for use in clinical, healthcare, and health informatics courses.

Clinical Activities

Activities in the *openEHR* clinical activity area are illustrated in FIGURE 4.

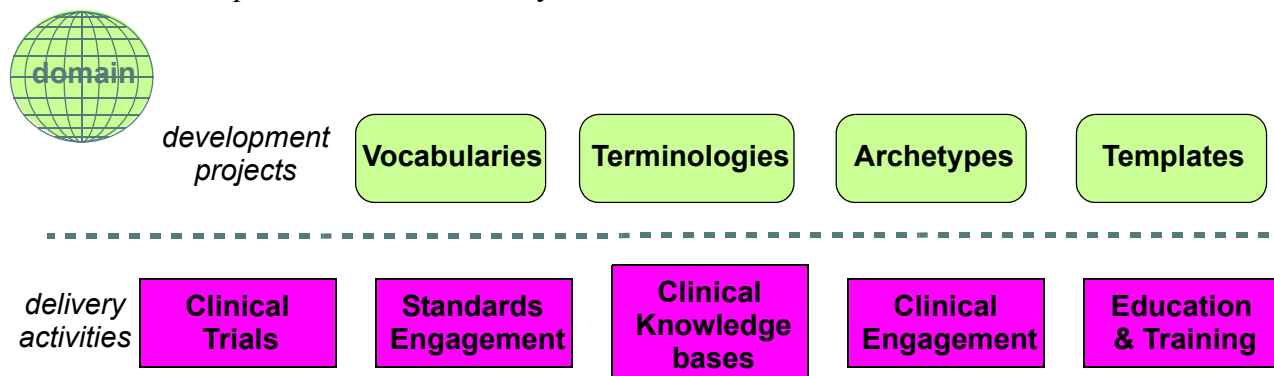


FIGURE 4 *openEHR* Clinical Activities

Vocabularies and Terminology

In the clinical activity area, *openEHR* is concerned with existing and emerging clinical ontologies and terminologies. It also develops specific *openEHR* terminologies of its own to facilitate the integration of software components and knowledge bases, through the use of archetypes and templates.

Archetypes and Templates

Archetypes are a key element of the *openEHR* methodology. They are reusable, structured models of clinical information concepts that appear in EHRs, such as 'test result', 'physical examination' and 'medication order', and are expressed in terms of constraints on the reference model. All data in *openEHR* EHRs are instances of reference model entities, configured by archetypes. Archetypes also act as mediators between data and terminology. They are language- and terminology-neutral.

Templates are (usually) locally defined models of screen forms, and ring together a selection of archetypes, terminologies, language and other details relevant to the particular local use of archetypes. For example, concepts such as 'referral' and 'prescription' are modelled as templates, which in turn use archetypes for more fine-grained concepts.

Educational Activities

The *openEHR* Foundation develops methodologies and publishes methods and materials for the formulation and use of archetypes, templates, terminologies and clinical guidelines, including those developed by *openEHR* projects. In collaboration with academic colleagues, it also develops materials suitable for use in clinical, healthcare and post-graduate health informatics courses.

Standards Activities

The *openEHR* Foundation is working with national and international standards bodies and professional organisations to establish standards for the representation, capture and sharing of clinical knowledge for use in health information environments.

The *openEHR* Methodology

The *openEHR* development methodology, designed to formally integrate technical and clinical work in a coherent manner is summarised by FIGURE 5. In the technical environment, modellers and software developers create small, generic models and specifications which are then implemented within systems. They also build tools to support users performing modelling the healthcare domain - the building of archetypes above terminologies and ontologies. At runtime, systems are driven by the definitions created by domain experts using the tools. The information processing capabilities of such systems can evolve smoothly, based mainly on ongoing tool-enabled development work of clinical experts, rather than by continual software maintenance and redeployment.

The key benefits of this approach are:

- direct, flexible and sustainable involvement of domain experts and users;
- significant reductions available in costs of development and deployment of health information systems, due to smaller, more stable software;
- the creation of a much more adaptable and durable health computing environment.

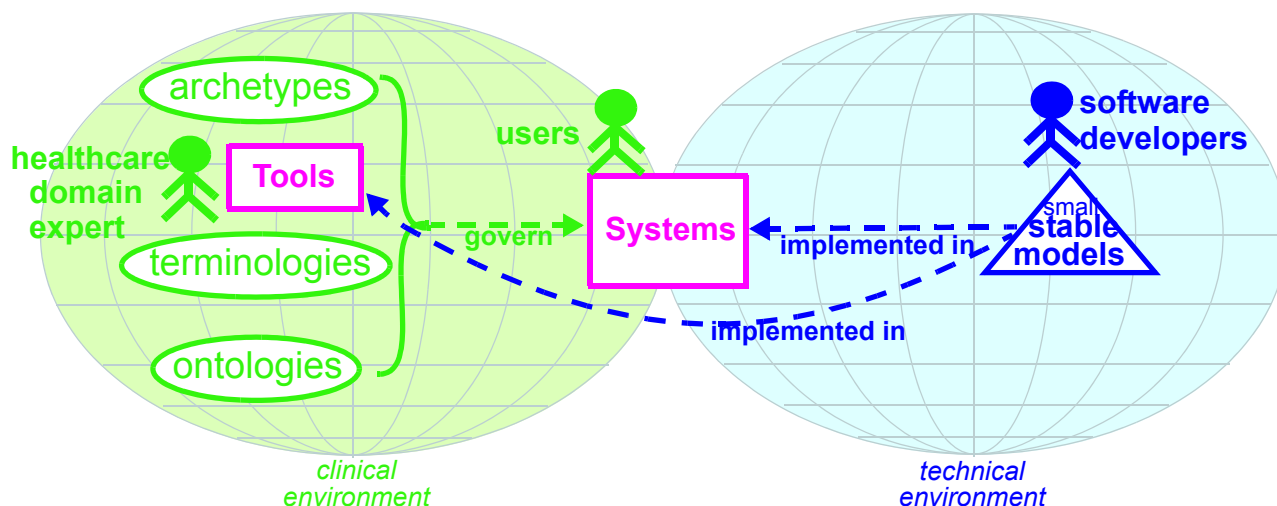


FIGURE 5 The openEHR Development Methodology

Participating in openEHR

A useful starting point for prospective participants is the [openEHR primer](#).

Membership is free, and obtained via the [membership page](#).

The Foundation maintains various [discussion lists](#):

- *openehr-announce*: one way list for major announcements;
- *openehr-technical*: dedicated to openEHR technical architecture, archetype language, service models and so on; recommended for all ICT professionals working with openEHR, and healthcare professionals interested in technical issues;
- *openehr-clinical*: dedicated to clinical modelling, archetype development, terminologies, clinical use and demonstration of openEHR; recommended for health professionals and ICT people interested in the clinical world;
- *openehr-implementers*: dedicated to implementation issues. Recommended for actual and prospective implementers.
- Each implementation project generally has its own discussion list.

Developers are encouraged to visit the [developer page](#). An equivalent starting point for health professionals is the [clinicians' page](#).

Organisations interested in supporting or contributing to openEHR should contact Dr Dipak Kalra at d.kalra@chime.ucl.ac.uk or or info@openEHR.org.

Amendment Record

Issue	Details	Who	Completed
RELEASE 1.0			
1.1	Changes to Aims and Modus Operandi.	T Beale	02 Jan 2006
1.0	Final group review.	D Ingram, D Kalra, D Lloyd	15 Mar 2005
0.9.5	David Ingram review.	D Ingram	12 Mar 2005
0.9.1	Various comments from Dipak.	D Kalra	03 Mar 2005
0.9	Initial writing. Based on CM Plan and <i>openEHR</i> planning meetings.	T Beale S Heard D Ingram D Kalra D Lloyd	12 Feb 2005