Understanding User Needs for Interoperability: Defining Use Cases in eHealth

By Karima Bourquard; Anna Orlova, PhD; and Charles Parisot

In computer science, a use case-driven approach is the foundational methodology for documenting user needs.[1] This has been adopted by national and international efforts to enable health information technology (HIT) to support HIT systems interoperability and information sharing across systems. Breakthrough areas, business cases, use cases, realization scenarios, technical use cases, and storyboards are concepts used to document user needs (See Table 1 below).

These concepts are used differently by different projects, which creates confusion among HIT users and implementers about how the user needs have to be supported. To enable harmonization of various concepts, AHIMA partnered with Integrating the Healthcare Enterprise (IHE) International to form the Use Case Task Force. The task force objectives are to define these concepts and their relationships to facilitate better understanding of the standards-based technical solutions specified in the IHE interoperability standards (profiles) across users, thus facilitating the adoption of these standards in eHealth interoperability projects.

AHIMA, in collaboration with IHE, will be publishing the findings of the Use Case Task Force in a series of articles in the *Journal of AHIMA*'s Standards Strategies section. This is the first article in this series that provides definitions for the use case concepts. Future topics will discuss the hierarchy between concepts and examples of assembling the artifacts (individual standards, integration profiles, use cases, and business cases) within this hierarchy to address specific interoperability needs from user perspectives, including healthcare organizations, public health agencies, research institutions, academia, and others.

Defining User Needs for Information Sharing

In the United States between 2005 and 2009, the American Health Information Community (AHIC) developed 152 national breakthrough areas (business cases) which had been further used to build interoperability specifications by the Healthcare Information Technology Standards Panel (HITSP)[2] (see Table 1). In the European Union (EU) Antilope, project (2013-2015),[3,4] which was focused on dissemination and adoption of the eHealth European Interoperability Framework, eight interoperability business cases were identified (see Table 1). The EU VALUeHEALTH project on "establishing the value and business model for sustainable eHealth services in Europe" started in 2015.[5] The cross-border business cases for interoperability were further expanded to include country-specific health service business cases. In the EU eStandards project,[6] additional European use cases were identified together with several realization scenarios (see Table 1).[7]

The AHIMA Patient Registration Use Case that is under development by the AHIMA Standards Task Force includes 17 realization scenarios, such as registering walk-in patients in the emergency department, clinician-initiated patient registration for unconscious patients, registration for admission, registration for outpatient visit, registration for testing, and others.

The realization scenarios can be further linked to specific IHE interoperability standards that specify technical solutions (i.e., transactions and information exchange content). The latter, in turn, are based on the technical use cases. The technical solution usually includes multiple individual standards—a set of standards—that have to work in an interoperable way. For example, in IHE profiles several individual Health Level Seven (HL7) standards may be assembled.[8] Each individual standard is built upon its own use case, or "storyboards" in HL7 standards.

IHE's Use Case-Driven Processes

IHE has been developing interoperability standards (integration and content profiles) in various domains including patient care coordination, dentistry, eye care, radiology, laboratory, pharmacy and quality, research and public health. IHE profiles are

deployed in national, regional, and international projects all over the world. IHE developed a use case-driven process[9] that supports the development and maintenance of the profiles and brings together users and HIT vendors in:

- Defining healthcare needs for information sharing
- Identifying the appropriate HIT interoperability solutions to address these needs
- Selecting standards for these solutions in the integration and content profiles
- Testing the profiles at IHE Connectathons around the world to ensure that selected standards are interoperable in products that implemented these profiles

Coming to Terms

Breakthrough areas, business cases, use cases, realization scenarios, technical use cases, and storyboards are all aimed to ensure that user needs for HIT solutions are met. These concepts represent different levels of granularity in modeling the relationship between user problem and correspondent technical solution. They are developed by and for different audiences. User needs (problems) are described in business cases and use cases by users. Technical solutions are presented in the technical use cases and storyboards developed by IT specialists/vendors. To address this complexity and confusion, the IHE Use Case Task Force developed the following definitions.

Table 1: Examples of Business Cases, Use Cases, and Realization Scenarios by Project

US AHIC/HITSP[10]	**EU Antilope Project[11]**	**EU eStandards Project[12]**
Breakthrough (Business Cases)	**Business Cases**	**Use Cases/Realization Scenarios**
EHR laboratory result reporting	Laboratory	Request and results sharing laboratory workflow
Biosurveillance	Referral and discharge reporting	Referral from primary to secondary care
Emergency response	Patient summary	Exchange of patient summaries across border Exchange of patient summaries across Atlantic
Consultation and transfer of care	Multi-disciplinary consultations	Healthcare provider directory
Medical home	Participatory healthcare (chronic diseases)	Workflow care plan management
Remote monitoring	Telemonitoring	Mobile services to empower patients with heart failure
Quality	Radiology	Request and results sharing workflow for radiology
Medication management	Medication	ePrescribing and eDispensing on national/regional scale
Maternal and child health	Neonatal care management	Neonatal care plan management at the local or regional scale
Immunization	Immunization	Immunization information sharing at the local, regional, or national levels
Consumer empowerment		
Patient–provider secure messaging		
Public health case reporting		
Newborn screening		
Clinical research		

Business Case

A "business case" is an overall description of a need for information sharing within and across healthcare organizations using HIT, often linked to the health objectives. It is written by users in a natural language and may include several interoperability use cases.

Developed by: Users.

Target audience: Decision makers.

Examples include:

- Radiology is a domain where HIT is used to support:

    1. Receiving a test order from a referring physician's electronic health record (EHR) system
    2. Scheduling a test visit for the patient interconnecting with a personal health record (PHR)
    3. Managing the workflow and data flow for a particular procedure and modality (fluorography, mammography, etc.) in the picture archiving and communication system (PACS)
    4. Reporting test results from PACS to ordering physician's EHR system
    5. Quality assessment and reporting to governmental agency's information system
    6. Managing the operation of the department (equipment, supplies, personnel, facility).

- Immunization is a domain where HIT is used to support:

    1. Receiving immunization order from referring physician's EHR system
    2. Scheduling test visit for the patient interconnecting with a PHR
    3. Administer immunization
    4. Reporting immunization information in the ordering physician's EHR system
    5. Quality assessment and reporting to local, regional, or national public health agency's Immunization Information System (IIS)
    6. Managing vaccine supplies by communicating with vaccine supplies information systems

Interoperability Use Case

An "interoperability use case" is a description of a specific example of HIT used for information sharing within the business case. Several interoperability use cases may derive from the business case. It includes depiction of business actors (humans) and technical actors (systems), scope, and workflows of tasks performed by healthcare professionals and associated data flows. It is written in a natural language and may include several realization scenarios.

Developed by: Users.

Target audience: Healthcare professionals.

The following are the interoperability use case examples:

- In Radiology—1,2,4,5 above; items 3 and 6 do not include interoperability with other systems.
- In Immunization—1,2,4,5,6 above; item 3 does not include interoperability with other systems.

Realization Scenario

A "realization scenario" is a description of a subset of workflow steps and data requirements within the interoperability use case from the business actors' perspectives as well as specific transactions of technical actors (systems) to support workflow steps and data requirements. Examples of transactions include send-receive data, data query, and other. It is written in a natural language and may include several technical use cases for the selected transaction. It is described in Volume 1 of the IHE profile.

Developed by: Users and IT specialists.

Target audience: Project managers, system architects, and implementers.

The realization scenarios for interoperability use cases 1,2,4,5 (Radiology) and 1,2,4,5,6 (Immunization) include the following transactions for send-and-receive information through secure channels via:

a) Point-to-point (message-based) communication

b) Health information exchange (document-based)

c) Mobile application at the edge

Technical Use Cases

"Technical use cases" are a description of a need for a specific transaction between technical actors (systems, IHE actors) that supports the realization scenario. They are written in technical language and may include several implementation options enabled by individual standards selected for the transaction. They are described in Volume 2 of the IHE profile.

Developed by: IT specialists.

Target audience: Systems architects and implementers.

For interoperability use cases 1,2,4,5 (Radiology) and 1,2,4,5,6 (Immunization) under the realization scenario (b: send-receive information via health information exchange (document-based)), the technical transaction is described by the technical use cases that are specified in the following IHE profiles:

- Cross document sharing (XDS)
- Manage provider directory
- Notification of document availability (NOFA)
- Acknowledgement of receipt
- Consistent time (CT)
- Secure communication (ATNA), and other

For more information about the AHIMA-IHE collaboration, please contact Anna Orlova, PhD, at anna.orlova@ahima.org.

Notes

[1] Bruegge, Bernd and Allen H. Dutoit. *Object Oriented Software Engineering* (Third Edition). Upper Saddle River, NJ: Pearson Prentice Hall, 2008. pp. 1-172.

[2] Health Information Technology Standards Panel (HITSP). http://www.hitsp.org. [5/17/2017 update - website available through the Internet Archive Wayback Machine]

[3] European Union Antilope Project. Home page.

[4] Integrating the Healthcare Enterprise (IHE) Europe. "Use Case Repository."

[5] VALUeHEALTH. European Union Research and Development Project. Home page.

[6] eStandards. "eHealth Standards and Profiles in Action for Europe and Beyond."

[7] Ibid.

[8] Health Level Seven (HL7). Home page.

[9] International Organization of Standardization (ISO). “Technical Report (TR) 28380 - Health Informatics – Integrating the Healthcare Enterprise (IHE) global standards adoption-Part 1: Process. Part 2: Integration and content profiles. Part 3: Deployment.” 2014.

[10] American Health Information Community (AHIC) and Healthcare Information Technology Standards Panel (HITSP). http://www.hitsp.org.

[11] European Union Antilope Project. Home page.

[12] eStandards. Home page.

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