

Taming Semantic Disconnects in the educational information landscape

Kennisnet uses TopBraid EVN™ to facilitate semantic mapping across key educational information standards

“*Today, organizations in every industry, including education, are challenged to achieve critical information integration across data silos. Use of standards makes it easier for us to share data within the context of a specific process. However, individual data standards are typically narrowly focused and do not facilitate a “360 degree integrated view” of diverse information. TopBraid EVN is helping us to address this challenge by enabling Kennisnet to make significant progress toward our goals – where all kinds of systems are integrated and all information needed for delivering education tailored to an individual student is available to everyone.*”

— **Jeroen Hamers, standardisation expert, Kennisnet/Edustandaard**

PRODUCTS USED

TopBraid Enterprise Vocabulary Net (TopBraid EVN) is a flexible, web-based system for managing semantic information models. It enables business stakeholders to collaborate on defining and linking enterprise vocabularies, taxonomies, thesauri, and ontologies used for information integration, navigation, and search. EVN is also available as the Vocabulary Management package within the broader TopBraid Enterprise Data Governance solution.

relatively homogeneous yet adaptable set of concepts and concept schemes.

- EVN’s easy, customizable interface provides the capabilities that users need to keep track of all changes and background information required for proper governance.
- Customizable reports enable efficient maintenance of the ever-growing web of interrelated concepts and matching resources.
- Using TopQuadrant’s SPARQL Web Pages (SWP) and SPARQL Inferencing Notation (SPIN) technologies, Kennisnet, is able to create tailored viewers for various stakeholders that show relations between standards, e.g., by displaying related concepts and definitions side by side.

BENEFITS

- By using EVN, Kennisnet is now able to transform and map a number of so-called semantic sources (XSDs, VDEXs, CSVs etc. and also non-machine readable sources), thus creating a

Background on Kennisnet

Kennisnet is the public organization for Education & ICT in the Netherlands. Kennisnet provides a national ICT-infrastructure, advises the educational sector councils and shares knowledge with the primary education, secondary education and vocational education and training. Kennisnet enables the educational sector to realize their ambitions with ICT and fosters innovations in the way information is exchanged, shared and used.

Challenges

In 2014 in SION, Netherlands, a special Dutch government task force established that educational institutions and other education-related organizations in the Netherlands should work towards a common information management approach. These organizations, however, use a variety of standards for the information they produce and receive, including:

- Learning results (described using standards such as UWLR¹, QTI², SCORM³ and others)
- Learning material (e.g., learning goals, learning levels, and subjects described using metadata standards like NL LOM⁴)
- Student files that are exchanged when a student switches schools (described, depending on the schools involved, using different application profiles of OSO⁵)

See Figure 1 for illustration of some of these example standards in action and their description. Note that there are more than these five standards in use.

Overlap frequently occurs in these information specifications. For example, the information element “level” (as in, the level of a course or training, or level of proficiency attained by a student) occurs under different names in all the above specifications — sometimes meaning exactly the same, sometimes meaning the same but with a different scaling metric implied, and sometimes meaning something slightly (or completely) different.

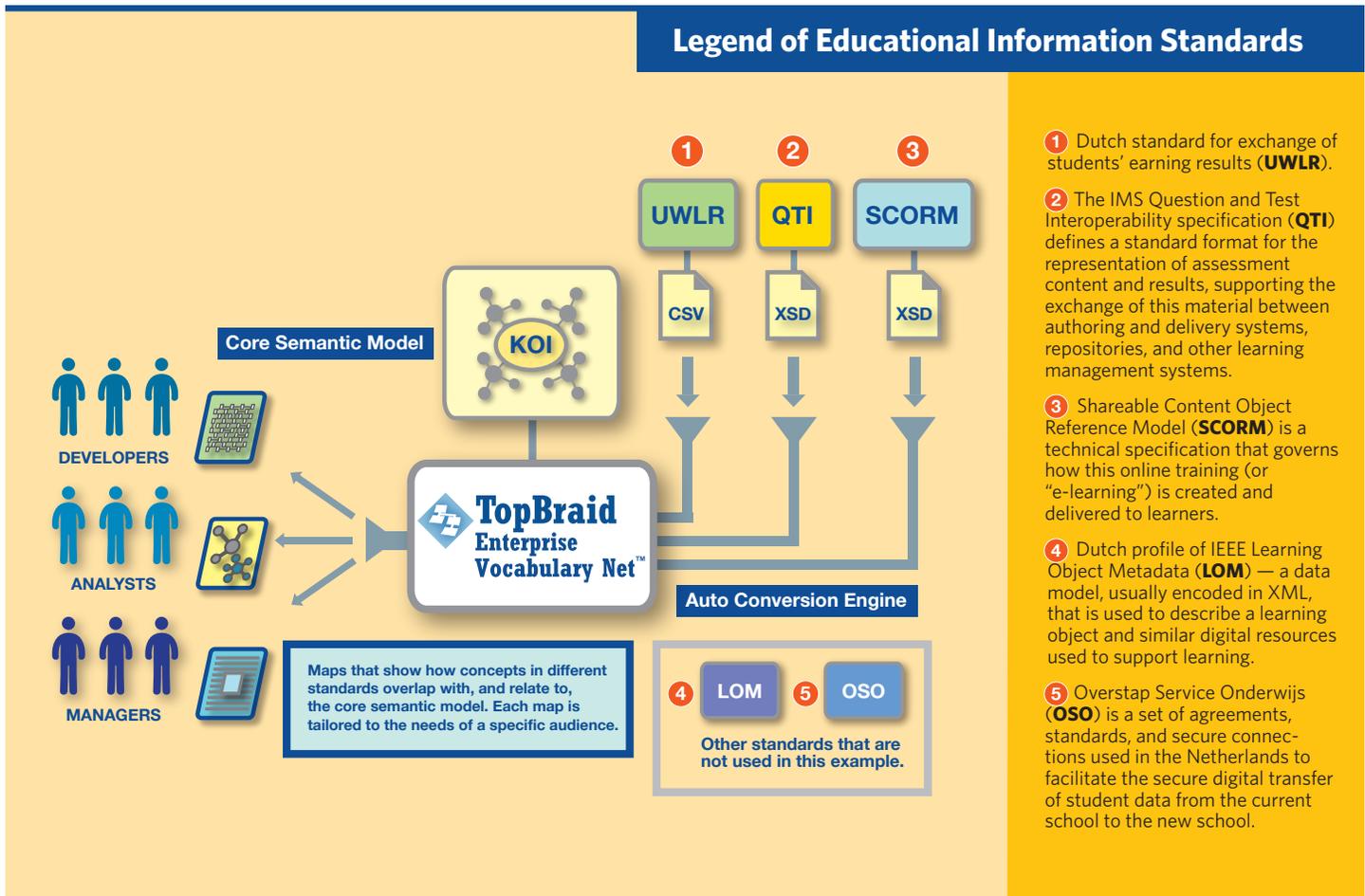


About TopQuadrant

TopQuadrant helps organizations succeed in data governance. We provide agile solutions for managing information, regardless of its structure, origin, or location. Our products use standards-based graph technologies — because connections are important. Making information easy to connect enables unparalleled flexibility for organizing, governing, and using it, in today’s dynamic data environments.

TopQuadrant customers include government agencies and Fortune 1000 companies in many industries including financial services, pharma, energy, and digital media.

Legend of Educational Information Standards



- ① Dutch standard for exchange of students' earning results (**UWLR**).
- ② The IMS Question and Test Interoperability specification (**QTI**) defines a standard format for the representation of assessment content and results, supporting the exchange of this material between authoring and delivery systems, repositories, and other learning management systems.
- ③ Shareable Content Object Reference Model (**SCORM**) is a technical specification that governs how this online training (or "e-learning") is created and delivered to learners.
- ④ Dutch profile of IEEE Learning Object Metadata (**LOM**) — a data model, usually encoded in XML, that is used to describe a learning object and similar digital resources used to support learning.
- ⑤ Overstap Service Onderwijs (**OSO**) is a set of agreements, standards, and secure connections used in the Netherlands to facilitate the secure digital transfer of student data from the current school to the new school.

Figure 1: TopBraid EVN prospective standards

Increasingly, organizations need to provide a combined overview of the education information. For instance, combining learning goals in a curriculum with the average progress that a group of students has made in a specific period. This means that information models defined by different standards need to come together. However, due to the problems described earlier (in the Challenges section), bringing information together proves to be very difficult.

Solution

After a few test cases, it became clear that aligning information semantics that had been described using different standards, would require a combination of tools, methods and experts. Kennisnet decided to use TopBraid EVN to maintain business vocabularies that explain all the concepts in the relevant standards and provide tools for the users to decide how to bring information together.

In 2016, Kennisnet developed and deployed a knowledge base that explains and aligns concepts in a multitude of standards used to create and share education-related information. To accomplish this, XSDs and other technical artifacts from the relevant standards were imported into TopBraid EVN to create vocabularies of business concepts. The business concepts were enriched by adding information about what they mean (i.e., definitions, descriptions) and by adding relations to other concepts — either in the same or in a different standard. The individual elements from each standard were linked to the business concepts.

Specialized browsers of the knowledge base visualize relations so that users needing to compare two standards can easily get an overview of concepts that are unique to each standard and

concepts that occur in both. And for the latter category, see if they mean the same thing in each case or not.

Kennisnet also offered the core semantic-model (KOI), as part of the reference architecture for education (ROSA), to Edustandard for continuing governance. Edustandard is a standardization board that brings together all parties in the field of education to make agreements. These agreements include finding digital learning material through established concepts, or transferring student data from one system to another.

Kennisnet provides additional support to help all involved organizations in their combined effort to create what they have come to call a semantic landscape for education.

Results

The ability to create customized viewers on data structures of different shapes and sizes is enabling Kennisnet to support semantic discussions about the use and possible further development of information standards used in educational software. The introduction of the customized viewers created so far has increased the awareness of overlap and differences between the semantics of separately developed standards. This awareness is boosting the demand for even more insight on semantic relations between concepts used in educational context. Information about students, for instance, is currently exchanged using at least six different specifications for several different processes. One of these specifications specifically addresses privacy issues. By relating the concepts used in the different specifications, we saw the opportunity for easily creating a shortcut for the privacy discussions -- which we are working on. Going forward, we anticipate creating such shortcut mappings as they are needed for the other specifications.