

Service Oriented Architecture of Assessment Model

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Abstract

This paper presents the service-oriented architecture for tools that supports assessment activities in learning process and learning outcomes, suitable for lifelong competence development. To address this more general objective the following goal was established: to develop a new integral assessment service-oriented architecture that includes modern assessment approaches along with the classical tests. In the first part of the paper was described the assessment process which was divided into the following stages: Assessment design, Item construction, Assessment construction, Assessment run and Response rating. Then it was presented some more general architecture of the assessment process conform to the SOA specification and provide the functional and non-functional requirements as a base for developing of that architecture.

Keywords

SOA, assessment model, functional and non-functional requirements, assessment services

INTRODUCTION

A Service Oriented Architecture (SOA) is a software model in which the concept of a 'service' is an abstraction of a function used by an application.

Thousands of enterprises worldwide have adopted the principles of Service Oriented Architecture. SOA provides an architectural approach that brings the flexibility and agility required by today's global business environment [1, 5].

SOA addresses the business demand for applications to be responsive to business needs and to adapt to dynamic business environments. In SOA, services may be defined as Web services to provide a standards-based approach to interoperability.

The paper focuses on the build aspect of the service-oriented architecture of the TENCompetence Assessment Model. To achieve that goal, it is necessary to describe requirements drive downstream design and development to transform as-

essment processes into composite applications that automate and integrate the business. The solution is designed to ensure that they are flexible and can be adapted as needs change.

The solution complies following general non-functional requirements:

- TENCompetence framework - the solution uses data and programming languages that allow integration of platform with existing infrastructure of TENCompetence framework (java, xml).
- Architecture of Assessment Model - the system must be providing extensible architecture in order to achieve high adaptation for current needs and to give opportunity to extend it for future needs [2].
- Services Based Architecture - the solution must be providing services architecture, for better flexibility and easy improvements.
- Interface to be user friendly and to have appropriate coloring scheme, with no contrasts colors (except for the error and warning messages).
- Repository - the solution must be support repository with Unit of Assessment xml templates, and to give tools for easy access to them.
- Standards-based - wherever possible and practical, the tools and service should conform to IMS QTI standards and specifications.

ASSESSMENT MODEL

The TENCompetence Assessment Model aims to cover the life-cycle of the assessment process. That model gives the possibility to implement various assessment techniques which allow de-

velopment and design of assessments that are specific to competence development [3].

The model is built on several sub-models, each matching a different stage in the assessment process (fig. 1). According to the Assessment model there are five main packages which describe all the functionalities of the assessment process.

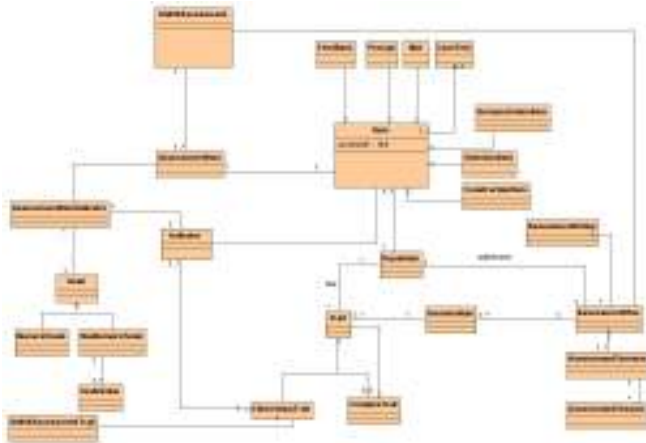


Figure 1. TENCompetence Assessment Model

The Assessment Design stage defines Assessment Plan which is a complex object containing different factors and guidelines from the pedagogical model of the assessment. The Assessment Plan focuses on specific traits of the individual person(s) or group(s) which are assigned to it, by using the decision rule as well as specific assessment policy which has to be followed.

In core of the second packages (Item Construction) stays the Item which could be of different type: construction, selection and demonstration. For the proper description of the functionality of the Item, the following components are used: Prompt, Case text, Hint and Feedback.

In the Assessment Construction package the output is the Unit of Assessment which consists of one or more Items according to the Assessment Plan. It defines the type and value of the Scale which specifies how the candidate's response has to be translated into a score.

The Assessment Run package is the process where the candidate undertakes an assessment and his/her answers are recorded in the ItemRes-

ponse for every single Item. There are two main objects: AssessmentTake and ItemResponse.

In the Response Processing package the main object is Assessor. It is responsible for two major steps: to transform the candidate's response, represent as Item Response in the model, into a rubric score using the defined transformation rules and to calculate the Assessment Indicator Score for each candidate.

RESEARCH METHODOLOGY

Our research approach is based on following methodology: (described on Figure 2):

- Overview of problem(s) in assessment area (stage 1),
- first we have a design model, described in 'Assessment model' section, (stage 2)
- Developing of prototype software tools (stage 3)
- Tool evaluation and analysis (stage 4)
- Based on results – developing service-oriented architecture (stage 5).

In current paper more or less we concentrate our work on the last bullet – stage 5, which comes as result from stages 1-4.

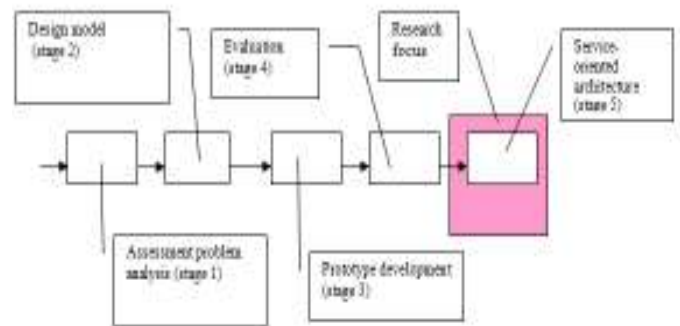


Figure 2 Methodology steps in assessment SOA development

In this paper we are focusing on developing SOA for assessments.

SERVICE ORIENTED ARCHITECTURE OF ASSESSEMENT MODEL

When transforming the architecture to a SOA, an important step is the definition of services.

Figure 3 shows the SOA of Assessment Model. The following overview provides a brief look at capabilities, how they fit into an SOA approach, and the technologies that support them.

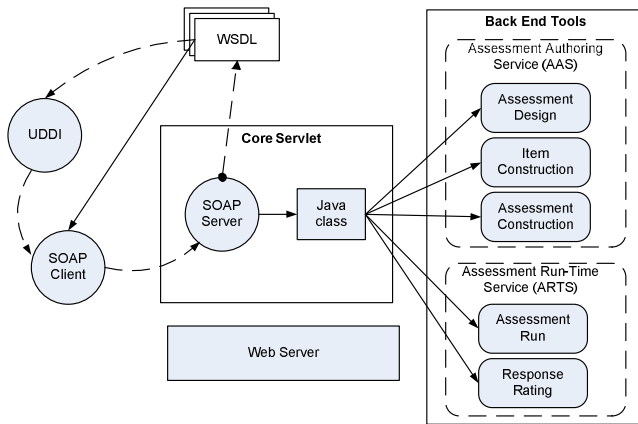


Figure 3. SOA of Assessment Model

Assessment Design Service (ADS)

This service will be responsible for creation and editing of Assessment Plan. The main object is the Assessment Plan. It is defined in terms of units of assessment and their assessment types, as specified from the assessment scenario, determining their sequence and time dependencies. The Assessment policy prescribes which assessment types (methods) can be used and on which conditions. The Trait is an abstract object used to measure different personal characteristics. Identifying the most appropriate people to rate the performance of the individual is a key part of the process. Ideally the recipient will have full involvement in identifying who they think is in the best position to comment on their performance. In context of the Assessment Model all participants in the process are called Population, and the assessed competence or performance level - Traits. It is also important to consider briefings with all participants on the objectives of the process and some basic tips for completing the questionnaire, called Assessment Policy, for example highlighting the importance of marking observed behavior.

Assessment Construction Service (ACS)

The central object in this stage is called Unit of Assessment. Each Unit of Assessment corresponds to particular Type of assessment and in-

cludes one or more Items. It defines the type and value of the Scale which specify how the candidate's response has to be translated into a score. There are two types of scales: numeric and non-numeric scale. Unit Of Assessment will be load and stored into local file system; special repository or specific data base in XML format easy to accessed and re-used.

Item Construction Service (ICS)

The main object is called Item and will be load and stored into local file system or special repository; specific data base in XML format easy to accessed and re-used. It is used to measure particular competence using specific indicators.

Assessment Run-Time Service (ART)

The run-time service will be responsible for the assessment run and grading, resulting in providing rates and evaluation reports.

FUNCTIONAL REQUIREMENTS OF THE SYSTEM

According the defined above services all of them have different function requirements. We defined the follow ones for each of the services:

Assessment Design Service (ADS)

The ADS must expose certain capabilities to support the assessment design process:

- To support activities related with creation and support of digital repository with assessment materials like Assessment Scenario and Assessment Plan.
- To supply a tool for creating, editing and deleting of Assessment Plan.
- To supply a tool for creating, editing and deleting of Assessment Scenario.
- To search assessment plan and assessment scenario.
- Define Traits: elementary and complex.
- To allow XML for data exchange.

Assessment Construction Service (ACS)

The ACS must expose certain capabilities to support the assessment construction process:

- To support activities related with creation and support of digital repository with assessment materials like Unit of Assessment.
- To search Unit of Assessment.
- To supply a tool for creating, editing and deleting of Unit of Assessment.
- To supply a tool for creating, editing and deleting of Scale.
- Add or remove Items.
- To allow XML for data exchange.

Item Construction Service (ICS)

The ICS must expose certain capabilities to support the item construction process:

- To support activities related with creation and support of digital repository with assessment materials like Items.
- To search Items.
- To supply a tool for creating, editing and deleting of Items.
- To define Hint, Feedback, Prompt, Case Text.
- To select the set of possible responses according to the chosen Response-type.
- To allow XML for data exchange.

Assessment Run-Time Service (ARTS)

- To allow defining of the parameters for Unit of Assessment and their type like for self-learning, self-control, peer assessment, 360 degree feedback, etc.
- Sub-system must register results from the some of the Unit of Assessment.
- Activities, related for filling the items, must provide opportunity to set type of the answers (like yes/no, 1/0, many-from-many, matching, graphics, etc.)
- System shall provide capability for development of Unit of Assessment based on a database of items.
- They will access exams (self-assessment, partial assessment and full assessment).

This includes possibilities of learner to:

- List all their Unit of Assessments.
- View information about Unit of Assessment and schedule.
- Evaluate planned Unit of Assessment.
- Possibilities to view runtime (during evaluation) information about evaluation process, such as estimated time, planned time, page information, assessment information (Assessment Session).
- Auto evaluation and auto feedback for some type of items.

CONCLUSIONS

The paper describes services defined in the design of SOA for assessment model, according to the non-functional and functional requirements which are defined. All functions of Assessment Model are modeled as services, which includes purely business functions and system service functions. The other main item is that all services are independent. They operate as “black boxes” and perform their function merely that they return the expected results.

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