A Web Portal based Framework for the Integration of Business Processes to Support the Networked Virtual University

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Abstract

This paper describes an approach aiming to provide a seamless integration of business processes and quality assurance systems across the Networked Virtual University. The approach adopted in this work is discussed and the proposed architecture based on a web portal based framework is described. An evaluation of the approach is provided through a simple case study showing the integration of heterogeneous quality assurance processes within the NTU. The limitations and challenges of this approach are presented and discussed in the context of ongoing work on this project.

1. Introduction – The Networked Virtual University

The rapid expansion of e-learning worldwide and the emergence of Web technologies to support semantic and business process integration across enterprises enabled the creation of a Networked Virtual University (NVU). The NVU provides a virtual web-centred integrated presence of a coalition of Higher Education Institutions aiming to provide a seamless and coherent e-learning service across geographic and education system boundaries.

Higher Education Institutions (HEIs) are always seeking better ways to support individual learning needs by embedding e-learning via the Internet into their strategic planning. They also want to move many administration functions online to save money and improve performance. Often a university seeking to expand the number of students and improve teaching quality is restricted by the money available to invest in the necessary additional administration and resources. Coalitions are therefore considered for economic reasons in addition to the others mentioned earlier. The concept of the Networked Virtual University emerges as a result backed by the rapid development of the Internet technologies. Networked means there are more than one HEI collaborating to face the new challenges. Virtual means that learning/teaching and related functions are made available through the Internet as well as through other online media.

This paper describes the work done to provide the web based integration of business processes and educational Quality Assurance (QA) systems across the NVU. The challenge is to use a web portal based technology to build flexible and extendible “bridges” across diverse educational methods and materials as well as across dissimilar quality assurance methods and standards and across diverse business models and processes. The admin overhead of a NVU can be prohibitive unless its web presence can automate most processes and map effectively to the native local semantic structures and processes of individual partners.

Initial work conducted within the EU funded mENU (model for a European Networked University) project, involving 11 partner Universities across Europe, showed that a generic
meta-data based framework can be used to integrate the semantic differences across the diverse educational systems of the education material and delivery providers [Bacon et al 2005]. The mENU project also showed the great challenge of integrating diverse educational styles and methods and business models and processes. The project showed how an interdisciplinary approach involving collaboration between education and business experts, higher education practitioners and computer scientists is necessary to provide usable and flexible models and frameworks to allow the efficient integration and operation of a NVU.

The approach adopted in this research is based on the effective modelling of the key characteristics of the educational and business culture and of the processes and practices in each of the partner institutions. This is used as a basis for the design of the semantic integration within NVU. The interdisciplinary approach proposed centres around the use of web technologies to allow the automation of the integration and operation of processes within the NVU.

2. The proposed approach and Architecture

Early work within the mENU project showed that the main barrier to the effective integration of business processes within the NVU is related to the significant differences in standards, processes and culture between the various stakeholders. The differences are related to different semantic views related to:

- incompatible National standards – QA procedures
- Varying institutional business cultures
- different Communities of Practice (administrators, educators, systems managers/developers, learners)

![Figure 1 Architecture of the agent enabled portal](image)

The approach taken in this research was to provide a semantic integration framework to overcome the interdisciplinary challenges met in the effort to enable the presence of a NVU on the web. The key element of this approach was the proposal for an innovative architectural design for a Web Portal Framework based on the Web Services for Remote Portlet (WSRP) standard [Ma et al 2007],[OASIS 2003]. Figure 1 shows the architecture and components of a transparent Business Process Management System supporting the NVU.
The agents translate provider specific semantic translations to provide a transparent view to the provider services for the learner. Figure 2 shows the component architecture of the design and the mapping of the views (two way) via the interface mapper (IFM).

![Component Architecture Diagram]

**Figure 2 The component architecture of the design and the two way mappings via the IFM**

This architecture supports intelligent agents responsible for the transformation and mapping of semantic elements across NVU partner systems. In order to provide a reusable and extendible mechanism for the system, a portal framework has been proposed and tested on a number of simple cases. The portal framework used in this research is shown in figure 3 below.

### 3. The Portal Framework

A portal framework provides the infrastructure and tools for building portal sites regardless of their types. A typical portal framework combines a number of different tools. Essentially it contains the tools for aggregation, organization and presentation of information through a Web browser. The user interface to a portal is a portal page, containing some number of portlets that users can arrange into columns and rows, minimize or maximize, or arrange to suit their individual workplace. Each portlet is a window into an application. A portal framework can define a default appearance for the portlets, and is responsible for intercepting and routing URL requests into specific portlets and for supporting navigation between or within portlets. A portlet can be seen as a user-facing Web service. In addition a portal framework provides the infrastructure for handling common services across portlets.

Advanced capabilities including business intelligence, categorization, collaboration, content management, integration, knowledge management, search, security, reporting, wireless access and workflow are increasingly added [Hollar 2004]. A framework may provide these capabilities natively or through third-party, plug-in products. The boundary between the advanced capabilities and the basic framework has become increasingly blurred in recent years. Figure 3 below shows the portal framework used in this.

The architecture uses WS-BPEL [OASIS 2006] to achieve an orchestration of the workflows included in the integrated business process.
4. An evaluation of the architecture and system

In order to evaluate the approach and related architecture and framework, a typical NVU case study was considered. This is the set of processes involved in the setting and moderation of an exam paper. This involves the setter who sets the paper, the moderator who moderates the paper, the drafter who approves a paper and the external examiner and exams administrator. All these roles can operate across various systems, in different institutions and countries operating under different business and quality assurance processes. The set of workflows needs to be orchestrated and translated seamlessly across business process and cultural boundaries to achieve the overall goals of the exam setting process for the NVU.

The case study was tested on a NVU portal system created at Greenwich using WS-BPEL [Oasis 2006] standards to provide semantic and business process integration through web service choreography and orchestration. The portlet-based architecture of the system shown above was used and Business Process Execution Language (BPEL) and portlet technologies were used to integrate business processes across partner institutions. An evaluation of the exercise showed that the architecture is capable to support a business process of this complexity across partner institutions. However, the evaluation showed some weaknesses in...
the human interfaces of the process. This pointed to the relative weakness of BPEL in supporting human-centric business processes. Additionally, the effort of building this demonstrator, showed the challenges of interdisciplinary work necessary for the effective and flexible design and development of a NVU portal system. The fact that a number of diverse communities of practice (such as administrators, educators) are involved even in a relatively straightforward business process such as the exam moderation process presents an additional dimension of complexity that complicates further the efficient and flexible design of such systems. Although effective system to system interfaces are easily designed and maintained, the system to people interfaces are more difficult to be designed and operated effectively. Extensions to BPEL, such as BPEL4P (BPEL for People) have been proposed to deal with the shortcoming of BPEL in this respect [IBM 2005].

Figure 5 The exam moderation process activities and workflows

Conclusions

The architecture and web portal based framework for the integration of workflows across incompatible business processes and culture, national standards and practices and quality assurance processes and standards has been presented. An evaluation of the approach and architecture, based on a simple exam moderation process has been conducted showing the suitability of the approach for seamless systems integration within the NVU, but it was shown to be less effective in workflows involving direct human interaction. Further work is under way concentrating on the BPEL extension BPEL4P to address this.

References:


