Feedback from Research and Teaching Functions of Higher Education

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In the continuous process of expansion, higher education tend to interpret these challenges differently and tries to offer several master degree programs for level of degrees and life long learning. This paper show a model for a feedback from research and teaching functions, based on several master degrees programs and students' opinions about level of master degrees educations and job perspective. Our proposal is focused on Jakarta Struts Framework since this solution offers more flexibility, portability and interoperability in other applications. This framework validate knowledge management proposal for academia.
Keywords: Education Programme, Struts Framework, Knowledge Management Framework.

1 Introduction

The issue of diversification of higher education will continue to be among the major issues in future debates about the development of higher education systems. Ulrich Teichler formulated six causes frequently named for this:

1. "Higher education aims to respond to the growing diversity of students in terms of motives, talents and job perspectives.
2. The growing importance of life-long learning calls for reconsideration of the role of higher education. Institutions of higher education tend to interpret these challenges differently, and this is likely to persist.
3. The growing pressure for relevance of teaching and research is differently interpreted and absorbed by individual higher education institutions and programs.
4. The tensions between the research and teaching functions of higher education continue to grow and are likely to lead to diverse modes of accommodation.
5. Changing steering policies of national governments and growing managerial responsibilities of the individual higher education institutions call more strongly than in the past for choices on the part of individual institutions as far as their individual profiles are concerned [1].
6. The rapidly spreading belief that higher education institutions to an increasing degree have to consider themselves as actors on a globalising higher education market reinforces the issue named above."

Higher education might diversify structurally according to different dimensions:

− types of institutions and programmes,
− levels of degrees,
− substantive profiles of institutions and programmes of the same type (horizontal diversification), and − ranks of reputation and quality of the institutions and programmes of the same type (vertical diversification) [2].

Based on this causes of diversifications, we intiate a research study in Babe-Bolyai University, Faculty of Economics and Business Administration (FSEGA), based on several master degrees programs and students' opinions about level of master degrees educations and job perspective. Our study has 4 year (2003-2007) and is focused on on-line questionnaires which are changed in every year, according to master degrees programs, graduate curricula and job perspective. For this reason we must change several questions, and category of answers according to newest demands and challenge.

For instance, we organize this applications based on PHP Triad and MySQL database management system, but in this paper we present another version based on Stut Framework with Validator focused on ActionForm.

Major problem in our research work was diversity of items from degree curricula from an year to other and also diversity of master

degrees programs. Every program has a general framework to admission and particular percentage of diploma mark, admission test, depending on type of it. Because a globalizations tendencies a degree student can follow several master degrees programs, or can be in graduate program of a FSEGA 's specialization and also in one of master degrees programs.

For these reasons our form must be flexible, in order to offer proper questions and dropdown lists with all of master degrees programs or with courses from graduate curricula. As we intended to do, all dates stored in database will be a mart for OLAP in other research programs, and will be analyze in DDS for improving degree curricula, or courses' items or for change master degree programs according to students' demands, market tendencies and research directions.

Our proposal is based on Jakarta Struts Framework because this solution offers more flexibility, portability and interoperability in other applications.

2. Using Struts Validator in questionaries

2.1. Flexible forms using Struts Validator

Because of major changes depending on Bologna implemented directives, we organize two different questionnaires one type for ending graduate students, and second for master degree student. In this manner we obtain both information Framework Struts are able to validate entering data from ActionForm, according to validation rules from every ActionForm class. Every valid property is linked with validation rules and if the error exists, it must be handle by a new ActionError object and added to ActionErrors collection.

This functional solution has some implementation problems, first of them are related to redundancy problems in application and second is related to maintenance. Through validation rules we put the code in ActionForm. Every valid compulsory field like finish degree data, master degree program, number of degree, etc are shown in several places of complex applications. Those applications are several HTML or JSP pages full of entering data from the users, and all of those dates must be valid. Maintenance problem is linked with changes frequency of validation rules or improving validation conditions from ActionForm, and in this case we must recompile source code.

Validator Framework belong to Jakarta Commons and is included in Struts distribution. It depends on few package for proper functionality, most popular is Jakarta ORO package, made by Apache Software Foundation. Latest versions of Validator Framework depends on other package - Regexp, included in Jakarta project. Struts project contains other packages: Commons BeansUtils, commons Logging, Commons Collections si Digester for develop applications, started with 1.1 version [6].

Except Validator Framework we put validation rules out of ActionForm and solve a declarative configuration using XML files. In this case ActionForms has not validation rules and in this case, can be more easy to develop and maintain application. Because of extensibility Validator offer us standard validation routine and can be able to extend with own routines.

Commons-validator.jar and jakarta-oro.jar must be in WEB-INF/lib directory. Validation rules are declared as external sources of application. We focused on both configuration files of Validator framework: validator-rules.xml and validation.xml for making a flexible questionaries.

2.2. Setting validator-rules.xml

This file has a global standard validation rules set independent of Struts aplications. It must be changed according to specified application rules. A unique rule is described in <validator> element :

Example :

```
<validator
name="required"
class-
name="org.apache.struts.util.StrutsValidator"
method="validateRequired"
methodParams="java.lang.Object,
org.apache.commons.validator.ValidatorActi
on,
```

```
org.apache.commons.validator.Field,
org.apache.struts.action.ActionErrors,
javax.servlet.http.HttpServletRequest"
msg="errors.required">
</validator>
```

Name attribute assign a name to validation rule and it is useful to call the rule in other linked rules. Validation logic is defined in class name and method attribute. In our example validateRequired() from StrutsValidator class invokes for required rule and msg attribute is a key from message file (resource bundle). Validator Framework will use this key for localize a message if an error occurs. Error message is personalized, according with application demands, and key value are change in validation-rules.xml file.
For linked rules we use <validator> element with *depends* attribute in order to specifying other validation rules which are execute before current rule. For instance in this example before execute *minlenght* rule, first we call *required* rule:

```
<validator
name="minlength"
class-
name="org.apache.struts.util.StrutsValidator"
method="validateMinLength"
methodParams="java.lang.Object,
org.apache.commons.validator.ValidatorActi
on,
org.apache.commons.validator.Field,
org.apache.struts.action.ActionErrors,
javax.servlet.http.HttpServletRequest"
depends="required"
msg="errors.minlength">
</validator>
```

For depending questions we make a complex rule depends on several linked rules: depends="required, integer" because this mechanism are working like lazy evaluation. If a rule from depends attribute is falling, the rest of them are not calling. In minLength rule, if validateMinLength methd is not calling if required are fauling.
Frameworkul Validator has general feature with basic rules which are used almost in applications and org.apache.commons.Validator.
GenericValidator is implementing generic rules as a set of public methos (isBlankOrNull, isByte, isCreditCard, isDouble, isEmail, isFloat , isInRange, isInt, isLong, isShort, matchRegexp, maxLength, minLength).

2.3. Bilding flexible form with validation.xml

This file contain relationship between validation rules from validation-rules file and particular ActionForm as a characteristic of declarative configuraration. With this extern file ActionForm has proper associations of validation logic. Most important element is <form-validation> with *global* (for contants definition) and *formset* with constant and form elements and Internationalization attribute (language and country) [7].
For particular definition of ActionForm we use <form> element with *name* attibute corresponding with name attribute of form-beans section of struts-config.xml file. Every *field* attibute is corresponding with specific property of ActionForm.
Example:

```
<form name="opinieForm">
<field
property="opinieAnlicenta"
depends="required,isAnlicenta">
<arg0 key="opinie.Anlicenta "/>
</field>
.....
```

After we configure both validation files we put in WEB-INF directory and use *plugIn* mechanism for integrating Validator framework in Struts aplication.

```
<plug-in                                  class-
Name="org.apache.struts.validator.Validator
PlugIn">
    <set-property property="pathnames"
        value="/WEB-INF/validator-
rules.xml,/WEB-INF/validator.xml"/>
  </plug-in>
```

From the beginning of application Struts framework will call init()method of ValidatorPlugIn class and this method will load in memory Validator resources from XML file.

Before calling init(), pathnames value will pass to ValidatorPlugIn instance for loading proper Validator resources.

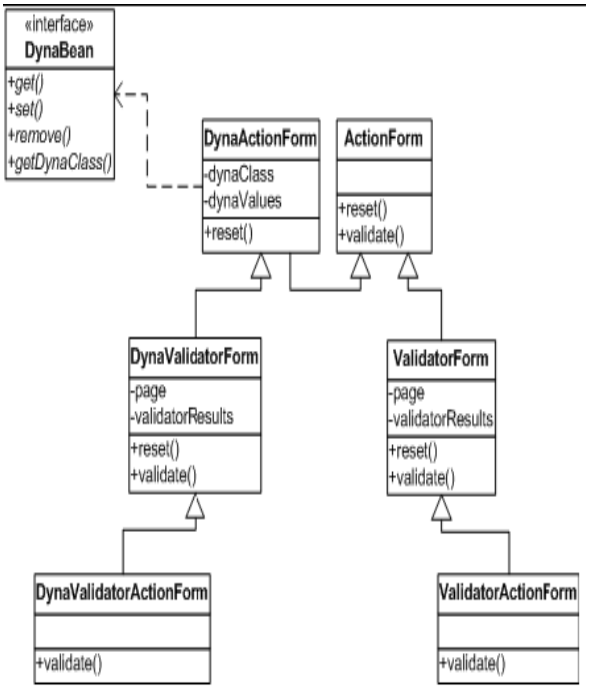

Fig.1. Dinamic validation in form
Source: http://struts.application-servers.com/doc

In our case we create an own ActionForm class linked with Validator framework, and this class is using dynamic form. Validator configuration in struts-config.xml is same if we use standard or dynamic form [8].

<form-bean name="opinieForm" type="opinie.form.OpinieForm"/>

- fisierul OpinieForm.java

public class OpinieForm extends ValidatorForm{..}

This implementation was made on www.bizcar.ro/c and used by students as a feedback to teaching and researching process.

3. Direct feedback from research and teaching functions

First of all, we try to present our framework proposal in academic management, and then follow three feedback loops to check and validate our model. We use engineering representation with several feedback's loop depending on several management processes, provided by three entities: *Learning Engine*, *Production Engine* and *Research Engine*. Learning Engine has the aim to manage knowledge utilization, by giving students possibilities to use, apply, absorb the stored knowledge. Knowledge acquisition and generation are made in faculty and researchers' teams in the *Research Engine* . This *engine* is monitoring progress and evaluating results and provide guidance for *Development Programs,* depending on a set goals for the organization. *Research Projects and Programs* has a role to increase intellectual capital and generate a high value of knowledge. In the *Production engine*, stored knowledge is using to produce and codify knowledge as part of knowledge generation and knowledge storage. This engine has a feedback from Research Engine, as a supervisor of managing knowledge.

We have three different feedbacks, depending on external influences in every loop. First we have *Direct and indirect feedback on the learning outcome* given by *Development Programs,* and *Indirect feedback.* Development Programs are depending on *management strategy* from university and major goals from Consortium Universities or partnership with other universities from globalization perspective. *Indirect feedback* depends on interaction with social, economical environment. Second loop link Research Engine to *external demands* (international programs, national strategy, educational priorities) to the Production Engine, as a slave engine coordinate by increased knowledge storage from *Project goals and directives*. Third loop has major role to knowledge quality, by measuring intellectual capital as a quantification of fundamental and applied results from *Research projects and Programs*.

Learning Engine (LE) coordinates and makes guidance for undergraduate and graduate students, and is main user of knowledge created by others engine. Production Engine(PE) has concerned to graduate students or post graduate students and Research Engine (RE) bring together faculties, postgraduate student, doctoral candidate and other researcher.

For LE and PE we have several particular

situations in "Babeş Bolyai" University (BBU):

- undergraduate students in two different universities;
- undergraduate students in one faculty (BBU) and graduate students in other university;
- post graduate students in one university and graduate students in other faculty/ university (BBU);
- post graduate students in BBU and graduate students in other faculty/ university (BBU);
- undergraduate students in one specialization, and graduate students in other specialization, in same faculty (BBU);
- graduate students in one specialization, and post graduate students in other in same faculty (BBU);

For this reason we will meet same actor (student) in LE and PE in same time. Learning is a continuous and cyclical process that provides participants at different levels in the organization either with the necessary information or the means to obtain it.

RE has membership from different departments from same faculty/ different faculties, or different faculties from same universities/different universities, research centers, different postgraduate students and researchers.

Their role in the research engine is [9]:

- select research areas to explore;
- identify theories and hypotheses to formalize the exploration;
- operationalize these theories and hypotheses in development projects;
- establish guidelines and provide direction for learning and development;
- assess the validity of the hypotheses and theories;
- ensure the quality of the final product.

Actors from production engine can be able to:

- research the content areas of the required knowledge module;
- acquire the technical skills required for its development;
- confirm the final requirements for the knowledge module;
- design and develop the module;
- assure its quality.[10],

Learning engine describes how stored knowledge can be employed as a teaching tool. The courses are designed for undergraduate students but could be targeted to employees in any organization. An application and teaching offer the material and simultaneously allows the students to practice each skill. The graded assignments are structured so that the students cannot just passively follow the tutorials, but instead must actively apply and than verifying them. [11]

Our goal is testing the validity of framework proposal based on statistics dates and direct feedback from graduate and post graduate students during 1991-2007. This study was focused on Business Information Systems Department, Faculty of Economic Science and Business Administration (BIS-FSEGA). Major reason was the interrelated specialization of graduate students and Master Programme (Business Information Systems in Information Society BIS-IS) which was started in 1996 and never split in two or more direction.

Directions	Values		
	Min	Max	Actual
Teaching engine (undergraduate students)	60 (1991)	104 (2006)	84 (2007)
Production Engine			
Graduate students	12 (1998)	35 (2007)	35 (2007)
Teachers	8 (1991)	22 (2007)	22 (2007)
Phd. Candidate	2 (1994)	9 (2004)	5 (2007)
Research Engine			
Graduate students	2 (1994)	8 (2006)	5 (2007)
Teachers	9 (1996)	18 (2007)	19 (2007)
Phd. Candidate	6 (1994)	16 (2006)	21 (2007)
Post graduate students	3 (1998)	5 (2006)	7 (2007)

Table 1. Actors' Statistics in Teaching/ Production and Research Engines

If we analyze dates from Table 1 maximum values are located between 2004-2006 only Phd. Candidate and teacher are increasing,

but if we detail in deep this information me can conclude several links between those engine and research programs from BIS-FSEGA during 1994-2007.

Teaching Engine	Production Engine	Research Engine	Status now	
			Research programme	Role
From 74 udergraduate Students 9 was involved in research programme (1994)	18 post graduate students in BIS_IS (1996), 6 was involved in research programme (1994)	22 Phd. candidate doctoral stages (1994-2006)	16 member of different research teams	16 Phd. in BIS, 1 Professor, 2 Assoc. Prof. , 9 Lecturer, 4 Researchers
From 86 udergraduate Students 6 was involved in research programme (2004)	15 post graduate students in BIS_IS (2004), 8 was involved in research programme (2004)	23 Phd. candidate (2004-2007)	12 member of different research teams 7 Doctoral grants from 2004-2007	Phd. candidate
From 84 student 9 involved in research programme (2007)	34 graduate students	23 Phd. candidate	11 Grants (CEEX, CNCSIS, PN II)	Director (9), Coordinator (2), 17 members

Table 2. Teaching and Research Process Evolution in BIS-FSEGA

Even we have not a significant increase of undergraduate students nowadays, we can link production process to research process, according to students results and curricula changes in every teaching stage. If we analyze statistics information we conclude that 30,43 is the percentage of PhD candidate which obtained doctoral grants, 2 of them has now own grants (FP7, CEEX) and coordinate a research team. More than 10 teachers are PhD in BIS, 66,66% of lecturer are graduate in BIS and all of them was post graduate in BIS-IS. Further, from 34 graduate students included in master programme BIS-IS, 7 was in research programs, 8 was involved in student contests.

The migration of our graduate students from BIS follows two directions: Marketing or Finance and Banking, depends on them jobs, but 100% are employed or involved in doctoral stages. In this year was an exception a migration to Mathematics and Information Department, same university.

3. Conclusion

If we consider a simple students' questionnaires our solution could be too sophisticated, but if we analyse how many changes was made in master degree programs last 5 years and how different curricula has a Bologna Programme students now, we must handle a flexible and dynamic solution to answer at different challenges and to offer good datamarts for other decision support systems and knowledge management applications. Our goal was to check the model and to identify weakness and straightness of DSS and KM used in teaching and researching process.

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