Object Oriented Approach for developing of a Tutorial System Work Security and Health in SMEs

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This paper presents the authors' research for developing a tutorial system which enables the delivery of proper training to specialized personnel in Small and Middle Enterprises (SMEs), in order to eliminate or reduce the health and safety risks of these enterprises to an acceptable level, according to the European Union directives. During the analysis phase, the requirements of the tutorial system were described using UML use case diagrams, the activity flow was modeled with an activity diagram, and the relevant classes were identified and described in a class diagram.
Keywords: *Tutorial system, training, the health and safety risks, UML.*

Introduction

Proper risk prevention requires proper training. This study aims to accomplish a tutorial system, which is able to deliver proper training of specialized personnel in SMEs, in order to eliminate or reduce the risks of these enterprises to an acceptable level, according to the European Union directives.

The design of the tutorial system involves two different aspects:

▪ one aspect referring to the *educational design* in the field of work security and health, focusing on SME specifics, in order to provide the source of knowledge needed to achieve the objectives;

▪ another aspect concerning the *technical design* of the tutorial system.

Solution for analyzing the tutorial system requirements

Further we present the object-oriented approach, for which we have chosen the leading standard language in object-oriented modeling, UML (Unified Modeling Language). Using the UML concepts and diagrams, we captured the basic system requirements and divide the system into components.

The training system will function both online and stand-alone and presumes the development of a web-based applications where the user will enter using a username and a password. Depending on his role, a user can be a student, a course manager or an administrator and will have different rights within the system.

First, two major components of the system have been identified: Training and Testing and, for each of them, system requirements have been described in natural language. Some of most important system requirements are depicted below, according to the system components and to the two main user roles: Student and Course Manager.

Training Component/ Student role

• An enterprise that uses the tutorial system will be able to create a finite number of user accounts. When a new class starts, each student must provide identification details, such as name or institution, and then the administrator assigns him a username and a password. Subsequently, he can use this login information to enter the application anytime.

• After logging, a student have the following possibilities: to select, from a list of SME categories, the type of SME he is working in; for each type of chosen SME, a student can study the main risk factors that correspond with the specific SME type; to manage the training time by himself, in order to finish a course in a certain period of time;

Training Component/ Course Manager role

• The course manager is the user that has the right to create and update the learning content of the training system.

• The course manager must update the legal

information regarding the SME, the main risk factors and the methods for risk prevention in several possible situations.

Testing Component/ Student role

• After studying the legislation regarding risk factors, a student can choose to test his knowledge in this field.

• For each risk factor specific to a SME, a set of tests is defined: partial tests, final tests and case studies.

• Once a test was selected, the student can see the test details and can choose to take the test. After solving it, a test is automatically evaluated and the result is instantly displayed on the screen. A student can take each test three times and the last result is the one that counts.

Testing Component/ Course Manager role

• The course manager must populate the testing component with tests for each risk factor.

• For the partial and final tests, he must add questions, possible answers for each question and specify the correct answer and its score.

• For case studies, the course manager must specify a description of the case study, possible causes that generated that situation, possible measures to take and interrelated causes, measures and effects.

Figure 1 and Figure 2 depicts the use case diagrams for Student and respectively for Course Manager.
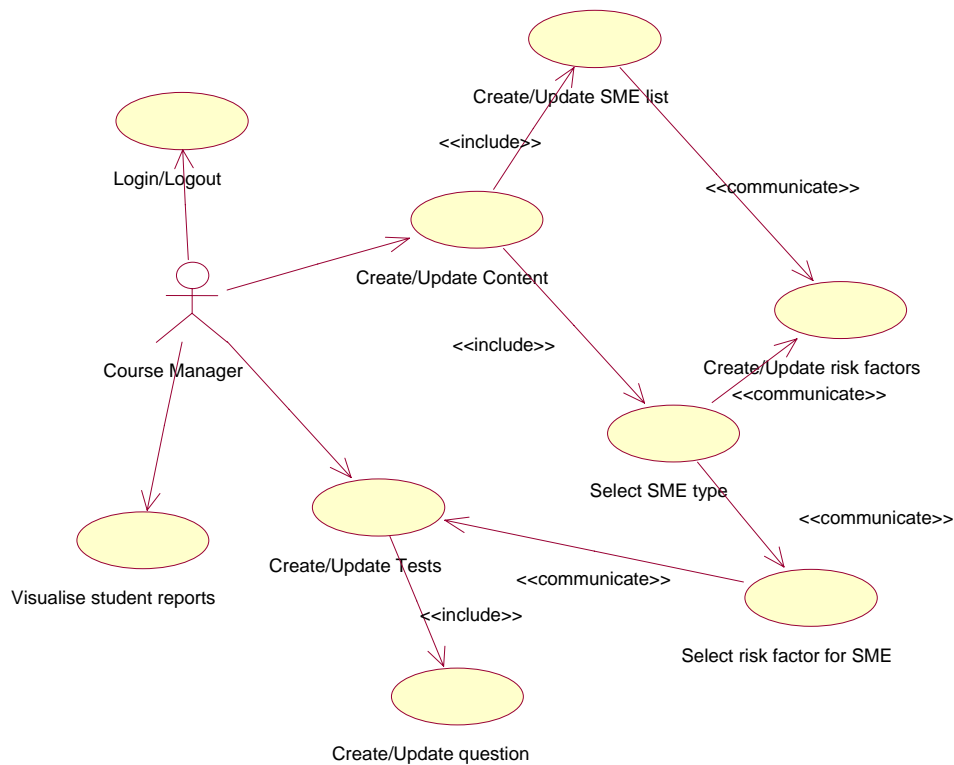

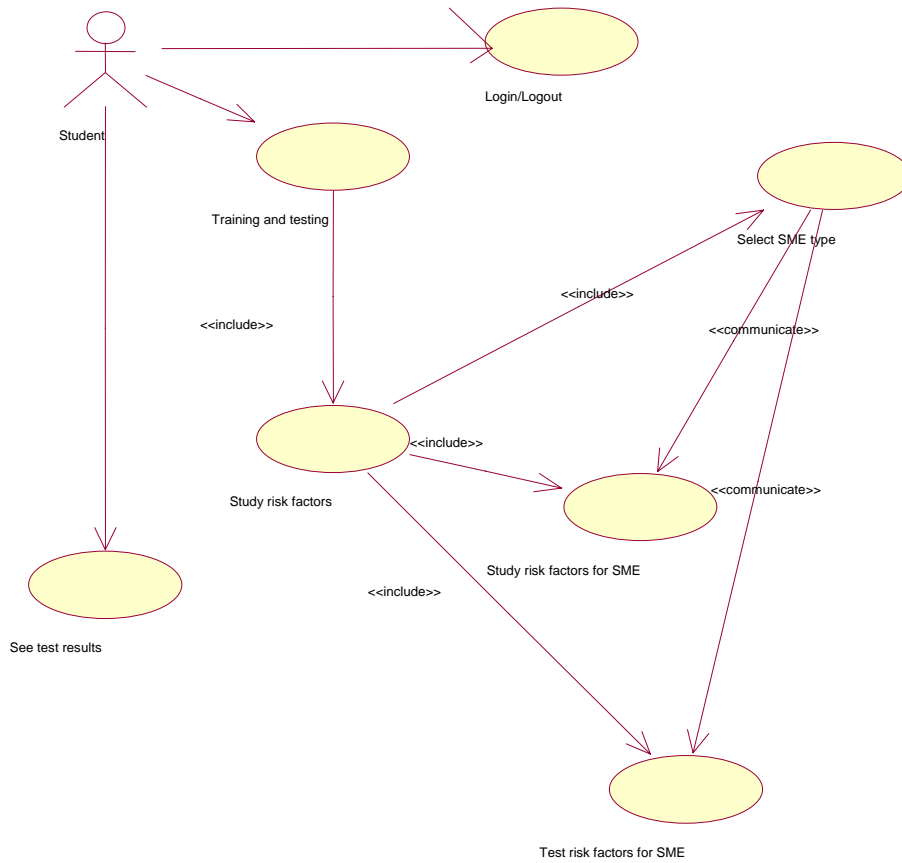Figure 1. Use case diagram for the Course Manager role

Figure 2. Use case diagram for the Student role

In order to depict the flow of activities for the users, as well as the system in its functioning, an activity diagram is used for modeling; the activity diagram of the training and testing system is shown in Figure 3.
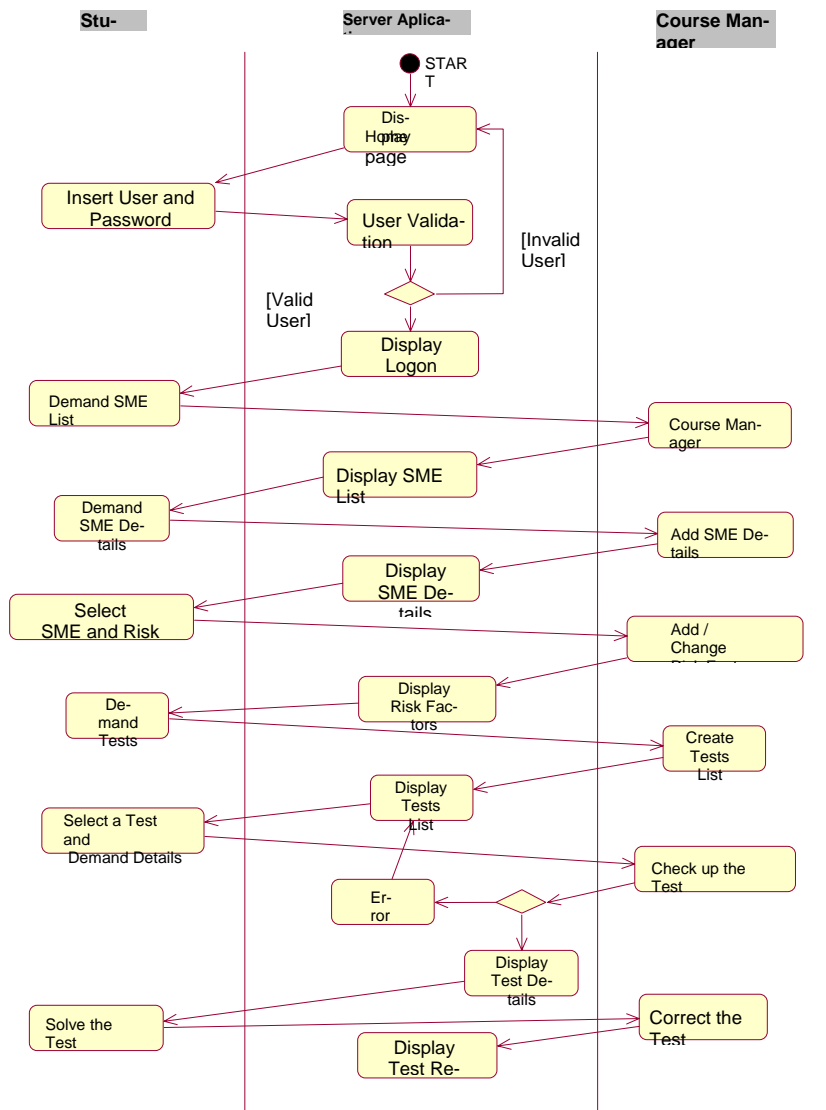
Figure 3. Activity diagram for Training and Testing

We have identified a first list of classes that represent the static view of the system. These classes, which are an abstraction of the objects that will collaborate in realizing the system requirements, include: Student, Course-Manager, Account, SMEList , SMEInfo, RiskFactor, Test, Question, TestResults.
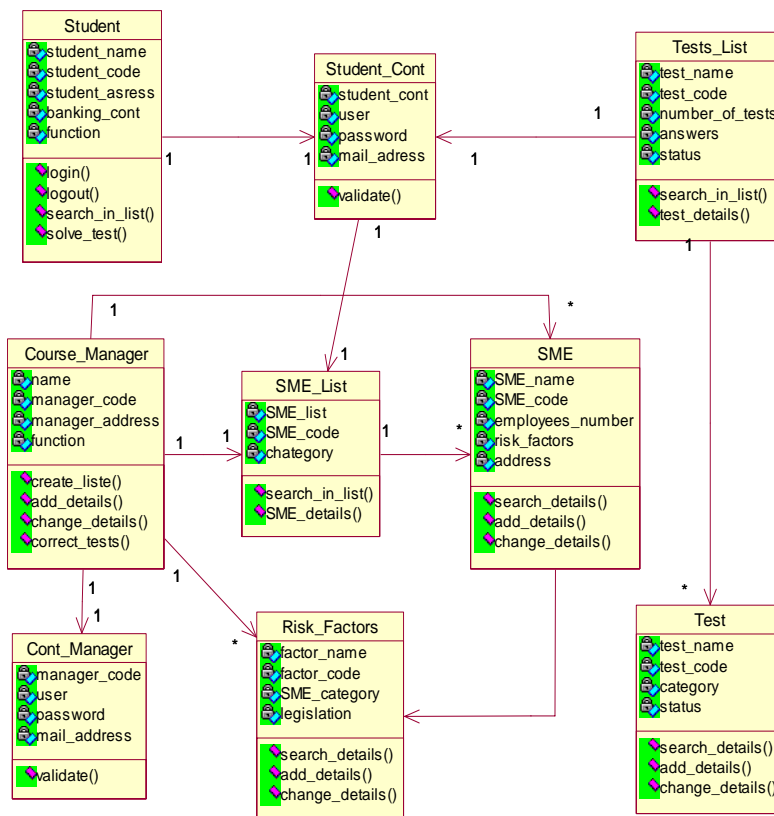
Figure 4. Class diagram

Each class will be described in more detail through its attributes and operations. As the development will go further, the list of classes will be refined by adding, removing or by identifying specialization/generalization relationships between classes.

Conclusions

The reasons for choosing an object oriented approach and the Unified Modeling Language is that it allows interactive settings for the system and further update of the educational content and test information. In fact, by following the object oriented approach we create a framework for training and testing that can be customized according to users needs. The possibility to update the content is very important in the conditions of frequent changes in the Romanian and European legislation for work safety and health.

For this purpose, the description of system requirements and a logical structuring in subsystems was realized through the elaboration of an analysis model based on the UML diagrams.

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