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# Chapter 3- Requirements

This chapter provides a detailed description of the functional and non-functional requirements for WEAVE. Use case diagrams show how the system is expected to be used.

## 3.1 Background

This project builds on an existing system- IWE- for facilitating the use of worked examples in educational context. This system is described in Chapter 2. The evaluation on IWE clearly shows that such software would be a valuable asset contributing to the learning process of students. Due to the overly complicated procedure required to deploy IWE in schools while it is in the form of a Java standalone application, the need to turn it into a more easily deployable online version arose. Since it is crucial that students use this application in the schools and authors of such examples would rather use it on their personal machines, the focus of this project is the student interface. In addition, interviews with highly motivated teachers, who are part of PLAN C project (reference), have identified the need for one more interface to be used at schools. In order to improve their teaching practice, these teachers would benefit from feedback on how students in their classes use these worked examples. Information that would be valuable for them includes: identification of which students interacted with which examples; aggregated information on answers selected for multiple choice questions and the students that selected each answer; information about the average time spent at each step of an example as per the whole class; information about the time spent at each step of an example as per an individual student of a class; summary data of the total time spent at an example and the last step reached by each student in the class.

In order to build upon IWE, this project aims to achieve four goals:

G1- build a web-based viewing system that is interoperable with the author interface of IWE, i.e. ensure no changes to the way worked examples are created should be needed in order to add these examples to the new system

G2- provide an interface for teachers that will help them gain more information on how the worked examples are used by their own pupils

G3- replicate as closely as possible the student interface of IWE

G4- add features to the student interface to store personalised usage data as opposed to anonymous one

## 3.2 Functional requirements

The functional requirements for G1, G2, G3 and G4 are described in sections 3.2.1, 3.2.2, 3.2.3 and 3.2.4 respectively. Each requirement is classified according to the *MoSCoW* classification method (reference). The categories considered are:

- **must-have**- requirements that are crucial for the achievement of the goal of this project and must be implemented

- **should-have**- requirements that are considered to be important but not necessarily crucial for achieving the goal of this project and should be implemented

- **could have**- requirements that have been identified as features that would add further value to the prototype but are thought of as stand-out ones rather than ones contributing to the correct functioning of the prototype and may not be implemented due to constraints

The **would-like** category coming from the **W** in MoSCoW is not part of the classification methods used for this project due to the fact that all the requirements fit comfortably in the other categories.

3.2.1 Interoperability with the existing author interface

The existing system uses XML files to store all aspects of the worked examples that are created. These aspects include… . The web-based system will need to read in worked examples from these data files.

Feedback from students and teachers will inevitably lead to changes being required in some of the worked examples. The existing authoring tool supports editing of worked examples, and it is expected that this tool will still be used to make such changes. The web-based tool will then need to read in these worked examples.

<You could explain whether your update model is destructive or version oriented, and why you've chosen this. Just now, in the old system, it is destructive – we don't keep a log of all changes. Is this the right decision? Might a teacher want to keep going with an old version – it may be a bit surprising for a WE to change under his/her feet…? I imagine you'll go with destructive update!! As long as you explain why, that's fine.>

The prototype:

* **must** be able to parse an XML file containing the fragmented problem specifications of the worked examples and their solutions.
* **must** be able to parse an XML document containing information about individual steps of the worked examples (e.g. which fragments of a document must be shown/hidden/highlighted, the explanation associated with a step and a question if one was provided).
* **must** be able to parse an XML document containing information about the layout of worked examples (e.g. number of panels for the example, their order and problem solutions associated with each panel).
* **must** be able to parse an XML document containing information about the styling associated with each example (e.g. font style, font size, etc.).
* **must** be able to support easy addition into the web-based system of new worked examples created using the old authoring tool.
* **must** be able to support easy modification of existing worked examples.

3.2.2 Teacher interface requirements

Need to discuss issues around security. Why is a password required? Why named groups, students etc? Why printable lists of students? What did you get from Peter that helped guide your design here? You need to give the reader a clear sense as to WHY you have all these MUSTs. Not enough simply to state them. You have groups as MUST and number of students as SHOULD. Why? What does just groups give? What do both give? The number of students alone is not enough for him/her to identify individual students. You need to explain the whole mode of use that you agreed in consultation with Peter. The system creates anonymous very short ids for pupils. Why anonymous? Why very short? Why have the printed paper?

All of this discussion, on how you arrived at this solution, is essential precursor to stating the requirements. I don't think you need use cases and all that, but you must write down the process that led to these requirements.

The teacher:

* **must** be able to register with a username and password.
* **must** be able to login/logout of the system.
* **must** be able to create groups for their students
  + **must** be able to specify the name of the group.
  + **should** be able to specify the number of students for the group.
  + **could** be able to specify the academic year this group belongs to.
* **should** be able to update existing groups by adding more students to them.
* **should** be able to view a printable list showing the student ids for a group.
* **should** be able to view information on the average time spent by all students at each step.
* **should** be able to view information on the number of times an answer for a question has been chosen.
* **could** be able to view information on the average time spent by a particular student at each step.
* **could** be able to view information on the list of students that chose a particular answer to a question.
* **could** be able to view information on the total time a student spent on an example.
* **could** be able to view information on the last step a student reached on an example .
* **could** be able to delete existing group.

3.2.3 Replication of the IWE student interface

At least a sentence here explaining that this is a direct translation of work already done – hence no detailed discussion. Did we change anything on the basis of Yulun's thesis? I don't think so!! Refer back to goal G3.

The prototype:

* **must** enable the student to select a worked example from a list of existing examples.
* **must** support multiple panels for the different parts of the problem solution.
* **must** contain a dedicated area for the explanation.
* **must** support showing/hiding/highlighting of fragments.
* **must** support the option to ask students questions.
* **must** enable the student to go back and forwards through steps.
* **should** record time spent at a step.
* **should** record answers to questions
* **should** enable the student to reset the example there are working on.
* **should** highlight the newly introduced fragments at each step.
* **could** provide a means for drawing the student’s attention to the newly introduced fragments.

3.2.4 Additional features needed for the student interface

You can link into the major Goals above – here you are satisfying goals G2 and G4 – supporting identifiable information for the teacher and anonymous information for WE authors and for CS education researchers.

Note that your requirements below are ambiguous as to who will be able to see this information. For example "connect usage info stored for a student to their teacher". Is this just for the teacher? Or for the author as well? Or is that they teacher gets to see personalised info (eg, which pupil), while the author may know that a particular teacher (known only by id, not by name) taught this group of pupils (again, known only by anonymous id, not by name).

All I'm saying is that the personal / anonymous thing is a major part of your contribution, so you want to write about it very clearly.

The prototype:

* **must** allow the student to use the system without any identifying information.
* **should** be able to connect the usage information stored for a student to their teacher.
* **should** be able to connect the usage information stored for a student to their teacher and the current academic year.
* **should** be able to connect the usage information stored for a student to their teacher, the current academic year and a group they were allocated to.
* **should** connect the usage information stored for a student to their teacher, the current academic year, a group they were allocated to and a student id.

# 3.3 Non-functional requirements:

You can expand on these. For example. What will it take to ensure that the prototype will be easy to use? You can refer to the thesis, where a thorough usability analysis was performed, to show that the actual viewing mechanism itself was quite acceptable to students. So, as long as you replicate that, you are half way there. Then, you just need to ensure that the web-based framework around the edges is easy to use as well.

* The prototype **must** be easy to use.
* The worked examples **must** fit the entire screen. EXPLAIN? I think what you mean is "In order for pupils to be able to study the worked examples effectively, and also due to the small workstation screen sizes found in schools, the space committed in the viewer window to the worked examples themselves (and not admin details) should be maximised." Hmm – hard sentence to write – but you get the idea….?
* The size of the area showing the worked examples **must** not exceed the size of the screen. Why? Personally, I don't like to scroll a lot. Can you find some research to back this up?
* A modification to a worked example **must** not affect students doing the same example. Needs further discussion. What is in your mind when you write this?
* Concurrent storage of information for multiple students connected to the same teacher **must** be supported. Again, what scenario are you considering here? This is too concise – I don't really know what problem you are concerned about.
* The student interface **should** include a tutorial on how to use the system. Why? Can't you make it obvious how to use the system? Or is it because this is really rather unlike any other system they may have used?
* The teacher interface **should** provide information on how to use each feature.
* The panels showing the problem content **should** be resizable. Why?
* The explanation area **should** be resizable. Why?
* Shortcuts for easier transition between steps **could** be added. Why?