



Building courses for the training in Jazz: which educational resources for the future?

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Jazz is one of the most widely used platforms in the world, made by IBM, for the development of collaborative software. The formation of a group that learns in a collaborative way needs innovative teaching resources. The book provides only a small percentage of the training activity. What else is interesting? Probably, a balanced use of visual, kinesthetic and textual resources. This work describes the experience of a Jazz-Hub project and the need to build these learning resources for the students of a Software Engineering course at the Faculty of Engineering of the University Federico II.

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1 Introduction

We do not want to build another course on RTC (Rational Team Concert) otherwise we would contribute to the Yet Another Course (YAC) philosophy. The courses we describe are born with a different approach from the one used by the IBM Academic Initiative¹ or posted on the website of Jazz-Hub^{2,3}. The reasons for their existence are at least 3: (i) the courses must be used by university students who must learn to use Rational Team Concert - RTC⁴ in a short time, (ii) the differences in the approach that is used to achieve the purpose, (iii) to become a reusable experience for all students (even from different countries) in order to carry out a project always open, in which you could reflect all changes at once within the content. Why a student should be interested reading these courses? The answer is: because these courses are simple to follow and fun to use!

Three courses were built on RTC (Cheng, 2003; Coccoli *et al.*, 2010; 2011), an experiment that has been carried out with the help of students, while the authors were the project leaders and the content designer. The project has fostered the spirit of group and cooperative work among students living in different cities and countries (i.e. Roma, Milano, Benevento, Napoli, Canton (Ohio, US), etc.) (Maresca *et al.*, 2013). In addition, how an experience like this could be an innovative resource for the student who is dealing with a professional and complex environment? The purpose was to construct courses that explain the content and provide students with other teaching aids from which to abstract the exact content. So some semantic maps were generated and linked together for easier content consultation. This activity is customizable. We preferred simple maps such as metro maps. Of course, experienced users can access more complex maps (radial pattern, hierarchical pattern, etc.), because the same courses can be viewed through different perspectives: the developer side, the user side, etc.. Each course is accompanied by a summary, related works, and a glossary of terms.

The concepts are the *lingua franca* of these courses. They are used by the students to define a path through the maps and check which of the three manuals must use to learn. They are used by teachers to teach. From the maps it is possible to extract material for lecture preparations on specific topics, lecture-concept identification, keywords or words concept search, slides preparation, audio extraction, and video demonstrations for specific topic, etc..

In the next section we talk how the documentation material is organized at the IBM site(s) while in section 3 we discuss RTC and the visual maps. In

¹ IBM academic initiative <https://www.ibm.com/developerworks/university/academicinitiative/>

² Jazz-Hub (Shildt, 2011), IBM JazzHub is an RTC cloud platform experimented by the authors as italian tester (Sdtimes, 2011)

³ IBM JazzHub, <https://jazz.net/hub/manager/>

⁴ YED, http://www.yworks.com/en/products_yed_about.html

section 4 we describe the courses and the learning aids proposed. In section 5 we report a comparative analysis between the maps and the IBM documentation. Finally we discuss the related work, conclusions and future developments respectively in section 7 and 8.

2 The IBM documentation

The RTC course construction has been addressed by IBM and has many educational resources for professionals who want to understand development of cooperative software. Among these, as part of the academic initiative of IBM^{5,6} we cite the following courses: RS841, RS835, and RS726 which have the characteristic of being dedicated to professionals. The problems in delivering courses of this type are: the time availability and the amount of material. Of course there are other types of manuals such as: the red paper and the white paper for a more specific use of the product. The IBM ® material is complex to use by the student. The first problem is due to the lack of knowledge of the English language which, when joined to the terminology, is likely to stretch the learning time because of additional research required or to block the comprehension and the proper text interpretation if translation of terms problems arise. In addition, this material often proves to be difficult because it is too technical for a beginner student. Generally these manuals and video tutorials contain procedures that require a good conceptual basis of the courses and their concepts that the student does not possess.

There is yet another problem. Much information is distributed across multiple sites and the student is forced to zap and often is lost. To worsen the scenario a search with a major search engine of a general question often leads them to bump into complex documents.

3 Presenting RTC by using visual maps

Lists or linear notes, tools that we accustomed to use when studying, are the worst way to encourage creativity for describing complex software tools like RTC. Even reading long documents is tedious and distracting. What is needed is to think in color, in small steps, take advantage of the brain being able to make associations and to move in all directions to look for connections between the concepts. We need a tool that can enable us to follow a connective, dynamic, customizable, interactive, reusable, abstract, and intuitive path. The most suitable tool for such purpose is a map. A map may take different forms depending on the needs:

- ***binary map*** to organize the concepts about the cooperative development

⁵ IBM Rational web site, <http://www-01.ibm.com/software/it/rational/>

⁶ Jazz web site, <http://jazz.net>

of the software. It allows full navigation between treated areas and thus provide a concise overview of the content.

- ***interactive map***, to take advantage of the dynamism of updates in a documentation (html, xml).
- ***tree map*** to connect the concepts hierarchically.
- ***semantic map*** to achieve the semantic relations between concepts.

The construction of the maps required the organization of the work in several stages. The first phase was the acquisition of the skills. To acquire these skills, the products such as RTC, Rational Quality Manager (RQM) and Rational Requirements Composer (RRC) were tried and tested. The second phase was devoted to the construction of the courses as discussed in the next paragraph. The third phase consisted of the construction of a common platform for the development of the courses identified through wiki. The fourth phase involved the extraction of maps from the text by using specialized tools, and the fifth was responsible for the testing of the courses and the user acceptance testing. In the next section we will discuss this part.

4 Courses and learning aids

If you want to rapidly disseminate the content of the RTC to students, you have to design specific educational resources. With these objectives in mind, we have addressed this design experience of new educational materials by involving 5 students, 2 student who prepared the thesis and one PhD student. We have built three courses to train students on RTC:

1. *Collaborative programming fundamentals. - Programming in a Collaborative Environment (using RTC)* – The course contains a guide to the installation of RTC and include all the information on where to find the material. After a general overview of the tool, this learning resource provides the main procedures for the proper configuration of RTC and the initial operations to be carried out in the collaborative environment.
2. *The fundamentals of project management - Project Management (with RTC)* - This course (course 2a) pays attention to the implementation of project management in RTC. First the concept of the project and its related tools is addressed in detail. This part emphasizes the significance of the life cycle of a project, describes the mechanisms of the collaborative areas of administration, and the management of the team members at work. In the second part, which later we decided to separate by creating an additional course (the Course 2b), presents the creation of maps and understanding, material related to the quality management within a project (with reference to RQM) and the administration of the

requirements (based on RRC).

3. *The fundamentals of project management software using agile methods - Agile Development (with RTC)* - This Course 3 was dedicated to the agile methodologies. In particular SCRUM is presented, first at the conceptual level and then at a practical level, showing how RTC contains appropriate tools for this method. The course explains the procedures for the start-up, the planning and the project management. The course terminates with a practical exercise.

One student of Software Engineering was assigned to each of the above themes. The three students were coordinated by a graduating student and by the authors. The tool used for the initial composition of the course was a wiki, as illustrated in Fig. 1.

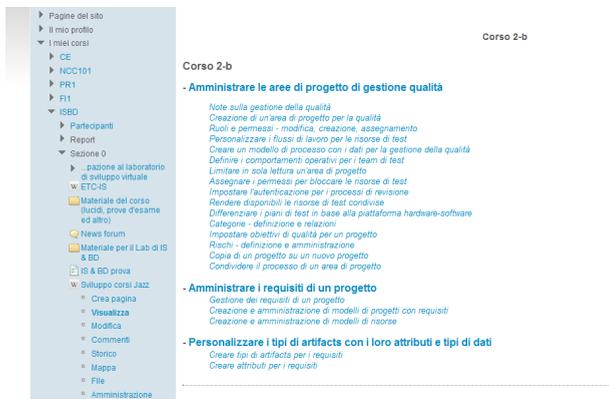


Fig. 1 - The wiki for the development of courses for Jazz-Hub

The students designed a concepts map for each course, in order to create links on the wiki. This required a level of coordination to achieve uniformity across the courses in terms of course presentation and course content. That uniformity was reflected in the construction of the maps. It was essential to find an agreement on the style and size of the font used in the text, titles and subtitles of every section. The construction of a glossary became an important requirement for the entire job. In it we collected the most important terms used in courses, we briefly explained them, and we reported also the references to the page numbers of the courses in which they were located. The words and the key concepts of this instrument are very important and strategic for the comprehension of the procedures and underlying algorithms. We observe that the students who are not able to manipulate the fundamental concepts are not able to use these complex instruments. Therefore, each course has its own glossary

and every tips that relates them to the concepts. Twenty quick demo have been developed in relation to a number of key-stages of use of the instrument that has been reports to be particularly critical for students. The glossary is available from the wiki and the student can use it to solve problems related to new terms comprehension by consulting it, an action that required non more than a few seconds. The student can also be assisted by the quick demo when it is not able to operate alone and requires additional assistance. For example if the student has trouble during the installation, there is a quick demo to help him.

However, even if the wiki is a convenient tool for the construction of related courses, it is not suitable for the presentation of its contents. Then we have defined a mapping system of the content by using an open source spider. The extraction algorithm is illustrated in (Grillo, 2012). Two students have been involved in this task. The spiders used to extract the maps from the courses on wiki were yEd, Wspider, MindManager⁷. The example in Fig. 2 which shows a radial map extracted from the courses, which shows a way to traverse the content. It is believed that this type of resource is very useful for course designers, rather than for students who must learn its content because of its complexity. If a new topic must be allocated, the designer would know where to insert it. It is worth to emphasize that the process of maps extraction can be made at any time and this ensures that any changes in the courses is reflected in the document represented by the abstract maps. Designers must not waste time searching for relations between concepts that appear automatically. The representation of the different books in different colors (and thus content) is very useful and allows you to see how the concepts are linked together from a book to another, with a crossover that debunks the concept of the book, but materializes the concept of patterns to achieve the training objective.

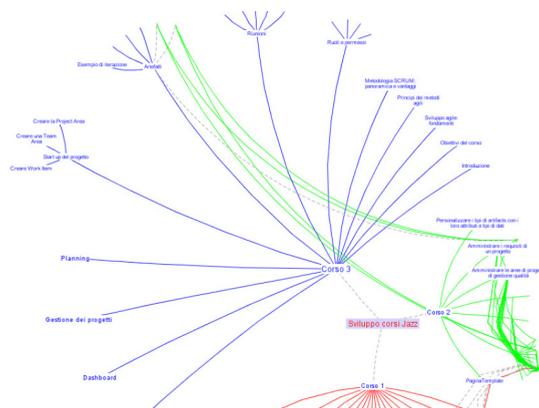


Fig. 2 - A portion of the map in a radial pattern of courses extracted with yEd

⁷ MindManager, <http://www.mindjet.com/products/mindmanager/>

This conceptual movement between the parts is not very obvious and it is also complex. An alternative, simple and fast to represent the map in a radial pattern is to use the metro map (see Fig. 3) that, more likely, is easily handled by a student. Metro maps do not need much guidance to understand how many stops must be made between the concepts to achieve and the ultimate goal. Similarly multiple maps side by side representing different contents may be used for defining customizable learning paths. The map has the dual purpose of being useful for teachers while planning a lesson. It is sufficient to draw a path that underlies the material and from this to extract the learning resources to employ in the classroom. Some of the spiders allow extracting slides from a map. The slides can then be presented during a lesson and the same thing can done even by a student who wants to review some lessons or get a brief summarize of the lecture concepts.

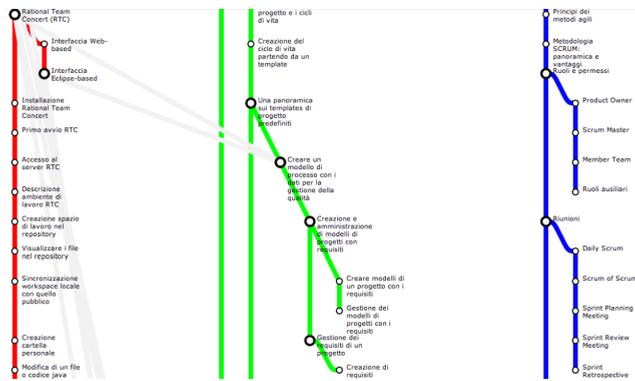


Fig. 3 Underground map of the courses Jazz-HUB

The feature that is apparent from this map (Fig. 3), in which the colors have been used to enhance the visual attractiveness of learning, is the relations between the concepts. According to the educational objectives to achieve, the student can use a tool to abstract the course, and to draw its trail between the concepts across all three content (books) if appropriate to do so. The existing relationships are so many and they are not obvious. Therefore they must be carefully sought by the student before reading the books and then making connections between the content. Remember that the content is already linked and available for use.

This way of presenting concepts can be innovative and facilitates the completeness and speed of learning.

5 Comparative analysis: IBM vs maps

This paragraph makes a qualitative assessment by comparing the approach

to the documentation offered by IBM and the use of the maps presented here. Two key aspects will be pointed out: (i) the recovery time of the information with the effort that the student must spend to find everything he needs, (ii) the learning time the student has to spend when he has the documentation together with the level of clarity of its general structure. For this task we employed a grad student. He was attentive and with a high level of computer skills, he had degree in law and was able to read English fluently. We asked him to follow the two approaches and to answer the following questions: 1) “What is RTC or the Jazz platform?”; 2) “How you plan and manage a project in RTC?”.

The student was invited, not only to answer questions by measuring the time spent to do with the two procedures, but also to keep a diary to describe the steps used. We omit here all observations the student produced, which however are available in (Grillo, *op.cit.*). The main comment the student raised about the use of the *traditional approach* is that although the documentation appears to be complete, it is difficult to learn because of the enormous amount of unknown, undefined terms or for which he ignores the significance. The visual approach of the maps places the student in touch with the concepts which are directly related to the current content. These concepts then are connected to other concepts by creating chained list of links between related items. In addition, the terminology is well illustrated by the glossary, also the label *Platform Jazz* indexes immediately to its content, since there is a indexing words between concept and content within the wiki. The various maps allow a global view of all the links to that topic and this gives dynamism to the study. The concept is treated from simple to complex, allowing the student to become familiar with the topic in a gradual manner.

For *information retrieval time* we define the amount of time that the student takes from the beginning of his search to get the text relevant to the topic accessible. While the *search time* on official sites can vary greatly (and depends on the student’s abilities) from a few minutes to an hour, by using maps the identification of the concepts is immediate thanks to the presence of visual aids and various interconnections with other maps and the glossary. The experience shows that students take about ten seconds to access the necessary material. Another aspect of the comparative analysis of the two approaches concerns the time the student spends to understand the concepts.

First we estimated the learning curve through the procedure proposed by the IBM site. Despite the help of video tutorials, on average, it took ten minutes or so. If you add also the search for the version you get to about an hour. In the second case the learning time, while still depending on the ability of the individual student, did not exceed ten minutes.

6 Related works

Different tools have been used in our work, and among there we mention wikis and visual maps. Elgort poses an interesting question on wiki (Elgort *et al.*, 2008) “Is wiki an effective platform for group course work?”. Wagner (Wagner, 2004) supports the use of wiki with its statement “It is very interesting the *wiki way*”. Thank to wikis, people can share cross-cultural knowledge by using design patterns, as described in (Schadewitz & Zakaria, 2009). Also the teacher can use wiki to quantify the amount of work or participation to the group (Trentin, 2009). Another interesting approach is the semantic wiki (Schaffert, 2006). The semantic wiki system aims to combine “traditional” wiki systems with the Semantic Web technology.

Visual maps are a tool utilized in many applications. For example in (Margulies, 2002) describes a variety of maps. A visual map can be used to describe concepts related to a brain, a building, a mobile robot, a metro and so on. Anan et al (Anan & Hartley, 2005) use a map for the following three main objectives: “to create a feature-based topological visual map, to use such a map for localization, and to detect the loop-back of paths within the map”. Another application of maps has been used in the monitoring of the agricultural trends of a territory as described in (Dramstad *et al.*, 2006). Mental maps for personal relationships (Buzan, 2008) e for intelligence and body development (Buzan, 2005) are a great starting point to connect the mind to concepts. The union of maps and wikis is the way to better use your brain, to keep it in good shape and to learn faster.

7 Conclusions and future developments

In this work we showed that the documentation written for complex tools, such as RTC, RQM, and RRC, can be addressed in an integrated manner with resources such texts, wikis, maps, audio, video tutorials, examples, exercises, and a glossary.

This approach tends to favor the vertical development of increasing difficulty of the documentation starting from the maps and navigating in its contents which include the single word-concept linked to the glossary. The maps are almost always the entry point of the documentation for the student, who must learn and put into practice the concepts. In some applications, and for very specific uses, the approach for the documentation of IBM® tools is still preferable because it contains details that the graphical navigation and hypertext maps cannot reach. So far, the instrument of the maps has been discussed exclusively from the point of view of the student as an instrument of self-training or as a training tool assisted by coach. However, it can be transformed into a real teaching tool in the hands of teachers who they want to set a university course on software engineering or project management, or requirement engineering or testing. Some

of the maps previously described, in fact, can play the role of conceptual map guides. Just think of the metro maps of Beck (underground) as a valuable aid for teachers in the explanations of arguments for the organization of a course or a lecture.

Widening the field, you can highlight as all other types of maps produced by the team can be used by other profiles. For example, the designer might find useful a hyperbolic map to quickly find a concept lost earlier and immediately have available to all the relevant entries and procedures that could solve the problem that snared. This method could be infinitely more convenient and effective than going to flip back through full English manuals.

The same can lead to the *developer* which today embodies the characteristics of programming and project management. For this reason, a tree map such as that made with yEd could prove useful, to keep an eye on the hierarchy of a system with SCRUM methodology and the various roles to assign or respect within the team, maybe by then deepened individually using the glossary. We find ourselves in such a scenario, where many actors may cover the same material from different points of view. Another future development is that of the completion of the production process of the maps in an automatic manner. Currently it is conducted in a semi-automatic way, but we are developing a tool in order to enrich the spider with more functionality in order to extract a greater number of maps. In this new scenario, the production process of the maps passes through one or more wikis on which one or more spider that extract the maps acts. The process will be reversible so that any changes made on the wiki will be reflected in the maps and vice versa.

Finally, we shared these educational resources with a dozen students during the training and preparation of a course in software engineering. The result was encouraging, however, we became aware that the judgment that they provide is very subjective and therefore we are interested in a more systematic investigation carried out through the provision of a questionnaire. It made us realize that there are some things to improve, others to be introduced. From the questionnaire we realized that an objective assessment objectives guide would bring us better results. As a tool of this type we have chosen to apply the GQM paradigm (Basili, 1992; 1993).

Awards

This work is a part of the ETC Project. ETC (Enforcing team cooperation by using rational tools) is a project supported by IBM in the area of Academic Initiatives. The ETC project has had numerous national and international awards over the past 3 years. Among these, a prestigious IBM faculty award in the 2011 awarded to Paolo Maresca, and an IBM Rational Champion 2012 and IBM Rational Champion 2013 granted to Paolo Maresca. ETC has also been mentioned as

Best IBM Practices 2011 in IBM Innovate 2011 held in Orlando (FL) United States. The ETC project was also invited to present its results in a session of IBM Innovate 2012 held in Rome. A presentation of the ETC project with the title *IBM Jazz for 1000 students in 10 universities worldwide* was accepted for publication in Innovate 2013 held in Orlando (USA). The University of Naples Federico II and its team of ETC-HUB has been cited as one of the three academic institutions worldwide participating in the trial (SDTimes). ETC has been cited as an reading Internal Rational success story and sent worldwide from IBM (Batten, 2011)

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