Pocodima: An Example of an Accessible Simulation-based Self-training Tool

Giovanna Filosa and Fabio Gaglini

Glaux S.r.l., Rome

g.filosa@glaux.it
f.gaglini@glaux.it

Abstract

The Pocodima Project (POsitive COnflict and DIfferences MAnagement) has had the burden and the merit to tackle two particularly «hot» socially impacting issues: conflict mediation and service accessibility for any final user (specifically, multimedia didactical contents). Co-financed with Socrates–Minerva funds, the project has received the contributions from ten organizations from six European countries. [1] The project was aimed at trainers, front-office operators, adult learners, including disabled people. Its purpose was to offer conceptually and emotionally effective tools for positive conflict and differences management, using new technologies and interactive, reusable didactical modules. One of the objectives of the project was to create the self-training course on CD-Rom, «Pocodima: Positive Conflict and Differences Management».[2] The course had to be accessible to people affected by several types of physical disabilities, according Wai-W3C[3] Consortium standards (which sometimes are all too rigid). The present article describes the solutions adopted to convert the static nature typical of accessible products into interactive and dynamic simulation-based products using the Must© didactical method.

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[1] The project is coordinated by the Cooperative «Mediazioni» and will be completed in October 2005. Other partners include Glaux s.r.l., University of Rome La Sapienza – Department of Sociology and Communications, Comune di Roma – Professional Training Department, University of Siena Disabilities Section (Italy), Tempo (Czech Republic), Idec (Greece), Business & Development Center (Poland), Dia-Sport (Bulgaria), Afec (France).

[2] Glaux's task in this project consisted in overseeing the methodological aspects of the CD-Rom-based course, in Italian and English language (by applying the Must© method in the «questions» version) and the technical aspects.

[3] Web Accessibility Initiative – World Wide Web Consortium, see also http://www.w3.org/

1. What is the Must© method?

The Must© method (Models of Simulated and Tutorial Universes) is based on the notion of «learning by doing», and on the error knowledge function (Deplano, 2003b). Furthermore, drawing on Constructionist (Papert, 1992) and Cognitive (Setter, 1961) theories of learning, it focuses on the *way one learns*; and, drawing on the psychodynamic theory of the knowledge need (Deplano, 2003a), it focuses on *why one learns.*

Stemming from studies in cognitive sciences and their application in information systems for communication and training (Shank, 1994), this approach aims at improving the learning quality and at making it as operational and interactive as possible to create the habit of learning from errors. In this way, one goes beyond simple transfer of notions enhancing the creative and participatory aspects of training (Deplano, Gaglini and Filosa, 2003). With this purpose, courses have two parallel and complementary universes:

- *simulation* is a virtual environment, which, in a specific historical context, develops a story in the form of questions. The user is assigned a role and a task to be carried out: he/she will have to plunge into the story, cope with difficulties and reach the objective. In the questions version of simulation, it is possible to choose one answer among several answers provided in a list. The simulation will take a different course depending on one's choice (fig. 1);
- *tutorial* is an interactive tree hypertext on three hierarchical levels (topics, themes, and concepts), enriched with such supporting material as examples, passages from literature, further insights on issues, glossaries etc. (fig. 2).

The Must© method has been recognized as a European *best practice*, and for this reason, it was chosen as the didactical methodology for the Pocodima course. While not attaining interaction complexity and not taking into account the wide range of possible reactions to a given event, the simulation allows for an interactive approach to concept acquisition and stimulates, with an intentional ironic style, a critical examination of the issues presented in the course.

2. The Problem: Accessibility and its Standards

According to Wai-W3C consortium (Caldwell et al., 2004), *accessibility* consists in «the art of ensuring that, to as large an extent as possible, facilities (such as, for example, Web access) are available to people whether or not they have impairments of one sort or another».[4] Therefore, limitedly to information technologies, it is the possibility, mainly for people with disabilities, to utilize any element usable via

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[4] See also Diodati 2004.

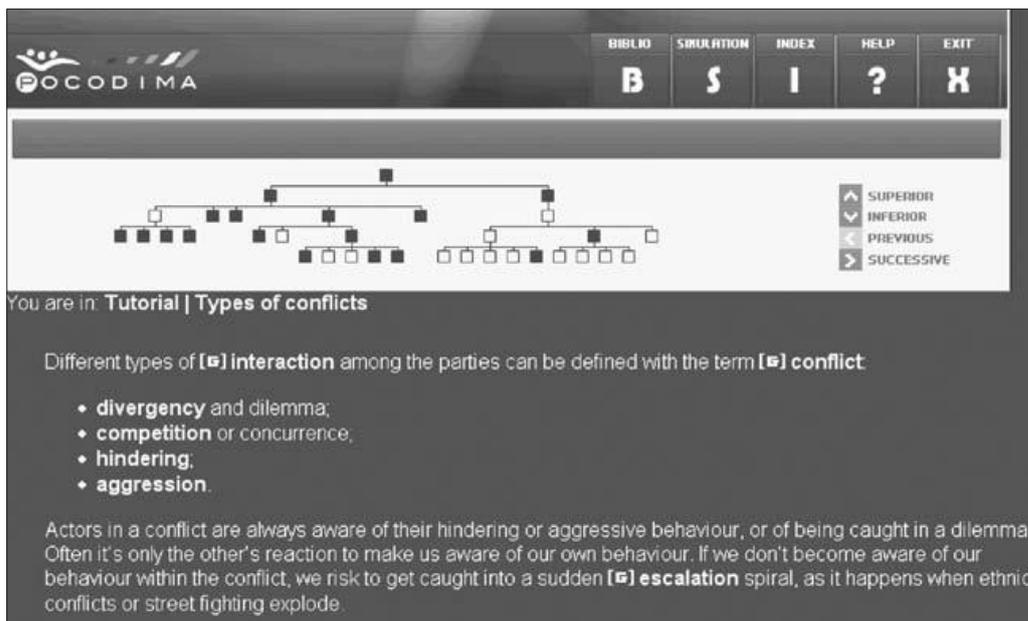**Figure 1** An example of a simulation page from the «Pocodima» CD-Rom.

Figure 2 An example of a tutorial page from the «Pocodima» CD-Rom.

computer: texts, links, pictures, etc. The objective of the accessibility campaign is to overcome the *digital divide*,[5] which segregates normally able people or, at any rate, those who have the ability to access all digital products (software, WBT and CBT, Internet sites etc.) from those which, for whatever reason (poverty, disability, lack of education, lack of infrastructures etc.) cannot access to these facilities.

For example, some difficulties that diversely able people can encounter on the Web include:

- seeing, listening, browsing;
- understanding complex information;
- reading texts;
- using the keyboard or mouse.

This challenge is played out on two fields: on the legislative field, laws in Italy impose the requirement of accessibility to every institutional/government site; and, on the field of hardware and software production, ergonomic peripherals, Braille keyboards and printers, and programs have been created to facilitate computer usage for visually-impaired and disabled people.

There are, for example, specific software applications for the blind, the «screen readers», which not only read all that is present on the computer screen, but also browse, open links, skip to other sections of the page by means of keyboard commands. In fact, screen readers read, not only the text but also the «meta-text», that is navigation commands and picture descriptions. And here lies the difficulty of *accessibility building*.

The problem with screen readers is that they do not function with every type of page and/or with every type of software application, but only with those having specific standard. The most widespread accessibility standard now is the aforementioned Wai-W3C one, based on one only simple principle: «Everything is accessible to a normal people also has to be accessible to the diversely able.» The Wai-W3C Consortium sets very detailed and precise rules for a Web product to be considered accessible. Some of the principal guidelines are as follows (Caldwell et al., 2004):

- in accessible products, all contents — including pictures, graphics, movies and especially keys which must have alternative description for the blind — have to be readable by the most common screen readers currently on the market (Jaws, Bobby, Window-Eyes, etc.);
- software programming has to use «static» programming languages (such as HTML and XHTML), and not «dynamic» languages, (as, for example, Flash or C++). This restriction can significantly limit the dynamism multimedia pages;

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[5] D*igital divide*, that is, differences in the possibility to access digital technologies, is a problem concerning not only the physical disabilities of users, but also inequalities in the economic development of several regions of the world. These inequalities affect rather significantly the quality/quantity of the penetration of the new technologies in the world population as a whole.

- software code must be as «clean» as possible, that is, linear and without super-fluous or anomalous instructions, to prevent the screen reader from reading code (that is programming instructions) instead of the real text. For this reason, use of the so-called «Cascading Style Sheets» (CSS) is preferred. Additionally, use of tables altering sequential reading needs to be avoided in the architecture of HTML pages;
- font contrast has to be well defined for the colour-blind. Additionally, fonts have to be enlargeable for the visually impaired (for example, by using Windows Magnifier) and screen flashes must be avoided as they may cause annoyances to epileptic users.

To mark accessible products in a clear manner, the Consortium offers a series of logos and symbols (fig. 3), attesting Wai-W3C standard conformity: the syntactical correctness of the HTML or XHTML, appropriateness of CSS structure and commands, level of correspondence to the priorities required for the sites.[6]

Figure 3   Consortium W3C logos.

3. The Method, the Risult, the Product

From these few notes, it is clear that making a multimedia service accessible requires lots of effort on the part of developers and project managers. This is especially true when one does not want sacrifice a product's dynamism and interactivity for its accessibility. Webmasters have often chosen to avoid this obstacle, by levelling out the site and transforming it in a banal online text with a few illustrations (the so-called «electronic page-turners») or by making two different versions of the same site, the static and textual one for the blind, and the dynamic and interactive one for the normally able.

To avoid this type of solution, a shell[7] was created to adapt W3C prescriptions to the interactivity and dynamism typical of Must courses by simulating, through a static structure, its dynamic effects.

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[6] W3C Wai and Wcag (Web Content Accessibility Guidelines) standards have three increasing accessibility levels: A, AA e AAA. The three levels do not present substantial differences.

[7] The shell (or structure) of the course was developed by Silent Bay Studios, a company developing software, videogames, simulations and virtual community platforms.

3.1 Technological Difficulties

W3C-Wcag guidelines have all been conceived for the world of the web and, the greatest difficulty, and at the same time the very originality of the product, consists exactly in the creation of a self-training course that is accessible both online and off-line, on CD-Rom, that is, directly on client. W3C standards do not consider accessible files that arrive to client containing script, that is, a program or a sequence of instructions allowing (through interpretation or the support of another program) to active a series of functions. These languages are extremely widespread on the Web (for example, JavaScript), commonly used for their effectiveness and versatility.

Functions, in fact, are accepted only if the server on which the course or the site is loaded manages them, but the single client has to receive «clean» code, only with HTML or XHTML information. The computer of the final user does not require any functions, plug-ins or additional variables for the course to be used in its entirety.

Single parts of JavaScript, Flash or other elements can be inserted within accessible pages, as long as they present alternative contents or descriptions (for example, the navigation tree in Flash of our course offers access to the index as alternative content: see fig. 4).

Nevertheless, a program entirely managed by script cannot be «validated», that is, considered conform to accessibility standards.
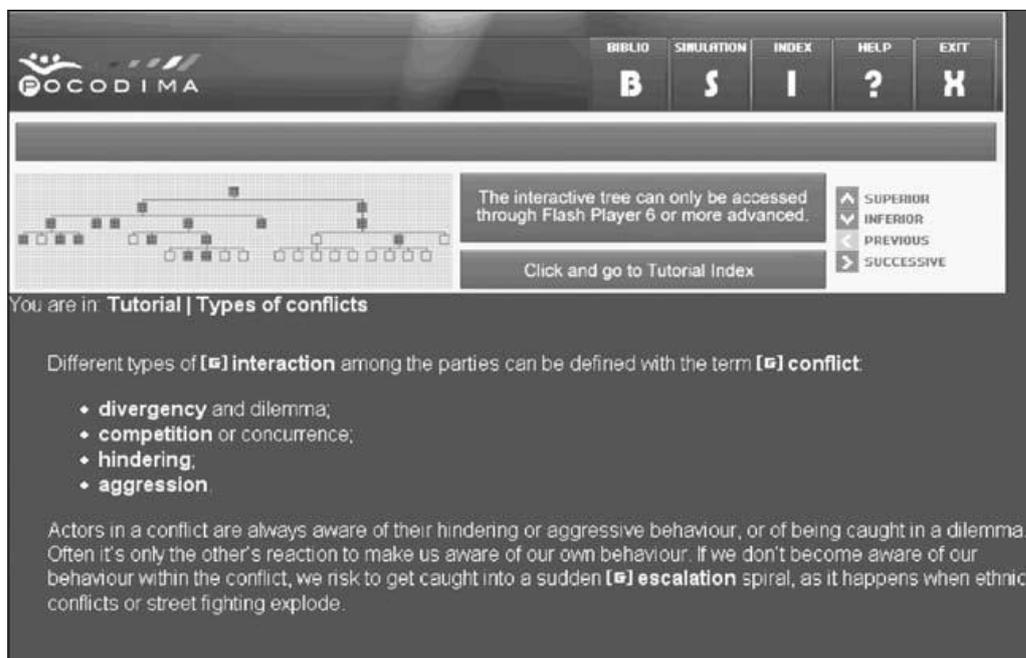
Figure 4   Alternative content of the navigation tree.

Final pages, in other words, have to *externalize* to the server as many functions as possible: a good example are cascading style sheets (CSS), increasingly used to control pictures, text and links in the most flexible and appropriate manner.

CSS, in fact, enable to separate management of content from its formatting, without overloading single pages with commands on size, font, space, colour and objects' positioning on the page. Avoiding overload (and improper use) of tags, that is, the markers setting the characteristics for a paragraph or a word, considerably increases document accessibility.

On the Web, one can very frequently find sites where fonts, thanks to the automatic modification of the CSS, can be substituted, modified and personalized according to the user's decision on the proper modality for page visualization. This takes place on the web, *not* on CD-Rom.

3.2 The Solution

The Must© method provides, as we have seen, two parallel and symbiotic universes — the simulation and the tutorial. A user can move at any time from one universe to the other. Additionally, a user will find him/herself at the exact point of departure, upon returning to the universe he/she left.

This was exactly one of the project's critical points: to keep track of movements inside the course, managing everything through absolute links, without being able to insert an «if» or any other condition — just like preparing mayonnaise without eggs. The adopted solution was extremely effective, and easily replicable by any developer for any type of interactive product: to create a code redundancy. For every simulation page, the parallel universe of the tutorial contents was duplicated. This took place through a file generator, which created a complete copy of the tutorial for every single page of the simulation.

Out of a structure of approximately 2500 files, 100 are pictures, 2400 HTML pages, of the latter only 40 were «unique» files, that is, files not requiring duplication: credits pages, exit pages and 31 pages containing the simulation corpus.

Once the solution was identified, assembling the course was quick and relatively simple: code was so clean and clear in the *what-must-be-put-where* directions, as to be «accessible» and understandable even by the outsiders.

In this way, even those trainers who are frightened by the term XHTML alone assembled the course.

Moreover, the following are additional solutions adopted to create the product:

- a proper use of programming techniques and languages in HTML 4.0 and XHTML 1.0: for example, the «alt» instruction in programming code for alternative texts, the use of the «lang» attribute to allow the screen reader to correctly read foreign words, the use of animated gif's in backgrounds;

- the careful attention to alternative descriptions, detailed but concise, not only for pictures and navigation keys (fig. 5), but also for simulation pages: characters, settings (fig. 6);
- an accurate choice of colours, contrasts and graphics, without forgetting aesthetic and playful aspects: for example, the characters of the simulation characters are reminiscent of and are described as the ones of cartoons;
- a dedicated interface design (Di Giusto and Rastelli, 2002) that is simple, intuitive and usable, in every element, with mouse and keyboard through specific and unambiguous keys combinations.
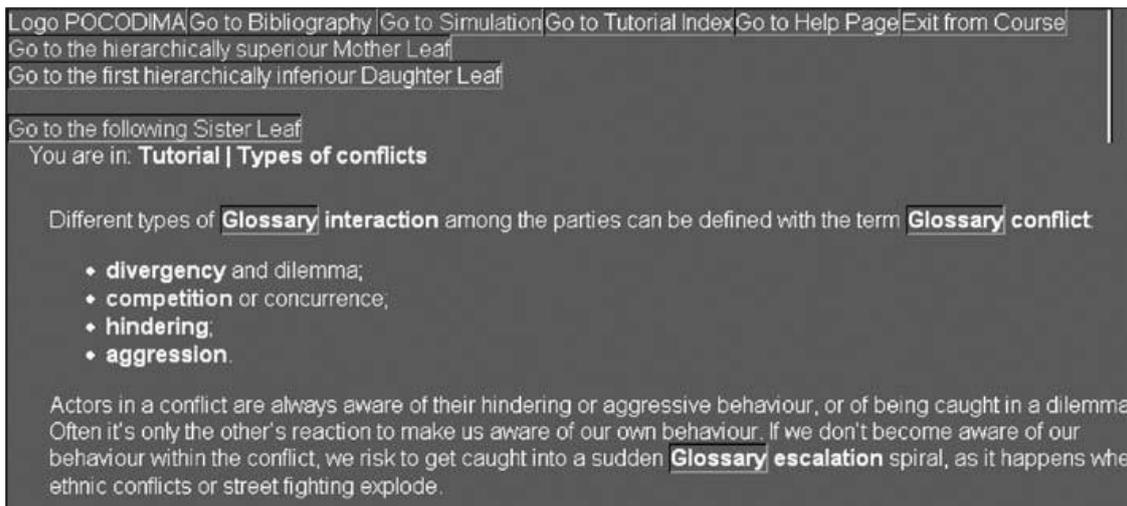

Figure 5 Alternative texts for pictures in a tutorial page.
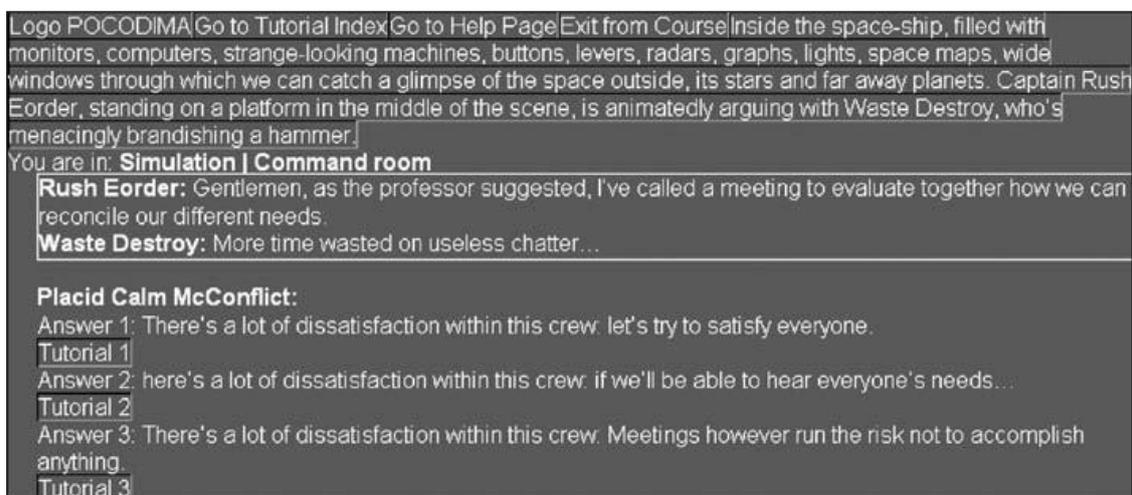

Figure 6 Alternative texts for pictures in a simulation page.

All the elements in the page are essential and functional, because short textual form is the most apt for those using special instruments for screen browsing. Links between the two principal levels of the course (tutorial and simulation) and between those and the glossary and further insight pages are clear and appropriate. Lastly, the interactive tree and compass and the statements «You are in…» facilitate browsing and orientation inside the contents not only for the disabled but also the normally able.

All these features are contained in a product without particularly high minimum system requirements,[8] so that it can be used even in countries of the world where hardware and software equipment is not always upgraded or equal to Western standards (for example, Eastern European countries).

4. Conclusions

The course brilliantly passed every W3C standards conformity test (A level). Tests conducted were both «technical» and «empirical».

- On the technical side, the code of every single course page (including the final evaluation questionnaire, tracking system and the style sheet files) was validated by means of the tool available free on the site: http://validator.w3.org/.
- On the empirical point, a pool of accessibility experts from the Disabled People Office of Siena University (project partner) examined the course with screen readers and Wai tables, on three levels: course structure, information organization and page visualization. In particular, pool coordinator Prof. Massimo Fongaro, declared, among other things that «the course's accessibility level is excellent and superior to any expectation».

This evaluation is even more flattering if we compare the Pocodima's accessibility level with those of other currently available products. If the monotone and metallic voice of any screen reader were to read most web sites or e-learning courses currently available, the result would be embarrassing. It would be impossible for the software to distinguish between the programming code and the real contents, making it virtually impossible for a blind user to understand. Thanks to extreme code cleanliness, this does not happen with Pocodima, exception made for the «cognitive hiccup» of reading links within a hypertext page.

This is exactly Pocodima's originality: having produced a pleasant, CD-Rom-based course that is user-friendly, compatible with the main screen readers, and which does not distort the structure and basic characteristics of the Must method. In short: it effectively conjugates page dynamism, course interactivity, and accessibility.

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[8] For system requirements, we mean display definition and video board, processor speed, Ram and hard disk size, operative systems, browser, plug-in and other hardware and software requirements essential for the correct functioning of the product on a specific personal computer.

The suggested solutions, easily transferable to other types of interactive products, open a new path for multimedia courses, and do away with the sad conviction/convention that accessible is, yes, *politically correct,* but completely *unappealing.*[9]

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[9] For a free download, go to the sites http://www.glaux.it/, www.pocodima.net or http://www.segretariatosociale.rai.it/guests/guests.html.