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Benedetto Lepori & Davide Bolchini*

USABILITY ANALYSIS FOR RESEARCH INFORMATION SYSTEMS: A USABLE APPROACH AND PRACTICAL GUIDELINES

This paper will present a systematic approach to the usability of so-called Information Research Systems (CRIS) and evaluate how these methods could contribute to improve the interaction between CRIS and their users. Usability is intended as the property of an information system to effectively support the users in accomplishing their goals within the overall institutional mission of the system itself. A step-by-step method called MiLE (Milano-Lugano Evaluation) is introduced to guide information providers, system designers and administrators to assess the usability of their system. The method is based on proven approaches to usability analysis, and uses the notions of user profile, scenario, goal, task, and usability attribute. The relevance and potential application of usability analysis to existing CRIS are discussed. Finally, to show examples of the benefits of the approach, we performed MiLE usability analysis to the research information system of the European Commission (CORDIS).

Keywords: current research information systems, usability evaluation, MILE, web services, user interaction.

* University of Lugano, benedetto.lepori@lu.unisi.ch; davide.bolchini@lu.unisi.ch

1. Introduction[1]

The aim of this paper is to test the use of general usability methods for evaluating and optimizing the ability of the so-called Research Information Systems (CRIS) to answer to the information needs of specific user groups. The word CRIS denotes a very diversified set of on-line applications delivering information on research activities – lists of projects, competences of research institutes, directories of people, funding opportunities – to policymakers, researchers and research administrators and potential users of research results.

While usability methods are a standard practice in many areas of web design (entertainment, cultural heritage, public administration), they have not been until now adopted for the design and optimization of CRIS application, which was mostly driven by technological considerations. Applying usability methods will also require also taking into account some specific features of CRIS concerning their user groups (very specific professional communities), the type of information to be provided and, finally, their embedding in the socio-political environment of research and research policy.

The paper is organized as follows. Firstly, we introduce the reader to the main features of CRIS, as well as to the actual debate on their ability to answer to the needs of the research community. Secondly, we propose a framework for the relationship between CRIS and their users and we introduce the concepts of system mission, target groups and relevance. Thirdly, we introduce usability inspection methods and we present MiLe, the method we will adopt here. Fourthly, we apply MiLe to the European Commission Information System CORDIS and we assess the results. We conclude with some remarks on the general application of usability methods to CRIS.

2. CRIS: features and main issues

The term "research information system" (CRIS) denotes a type of application devoted to delivering information and services to the various stakeholders of a research system. These applications began to develop in

[1] A draft version of this paper has been presented to the 7th International Conference on Current Research Information Systems, Antwerpen, June 2004 (Lepori & Bolchini 2004)

the '80 mostly as large databases containing information on publicly funded research projects, responding mostly to the needs of public administration and funding agencies to keep track of their activities and to report them to political authorities.

However, over the last twenty years, the domain has greatly diversified thanks also to the diffusion of the Web and of Web interfaces to databases, making easier to collect and diffuse on-line research information[2]. Thus, today CRIS comprise research reporting systems of universities, specialized databases on scientific fields (like the Swiss information service on social sciences SOSIG; www.sidos.ch), but also generalist portals on research information (like the European Community Information Service CORDIS, www.cordis.lu, or the Swiss Science web site (www.swiss-science.org), as well as systems specialized on specific information (like CV and people competences for Community of Science www.cos.com). CRIS are also closely linked to systems delivering information on research results like open access portals of publisher's web sites[3].

Moreover, the scope of information contents has broadened. Whereas earlier CRIS focused exclusively on project information, other types of information have been progressively added. Thus, the new version of the Common European Research Information Format (CERIF; Assersson 2002) includes a core of three information types – project information, organizations information, person information -, but foresees also extensions to project results.

These developments had also implications for the architecture of CRIS: the model of a central database, where all the research information is collected and classified according to unitary classification schemes, is no longer dominant and CRIS are evolving towards a greater specialization concerning content, but also institutions. Thus, specialization and networking are increasingly seen as a possible strategy to better address different user needs (Adamczack 1998; Lepori & Cantoni 2002). As a consequence, at the last CRIS conferences many contributions focused on how to network and to transfer information between different systems, including the use of metadata and the automatic retrieval and classification of information

[2] For an overview of CRIS development see the proceedings of the biannual Eurocris conferences organized since 1991 on the EUROCRIS website (www.eurocris.org).
[3] For an overview see Zimmermann 2002 and the Directory of Research Information Systems http://www.onderzoekinformatie.nl/en/oi/dris/.

2.1. User aspects of CRIS: a review

Most of the literature has been concerned with technical aspects of CRIS, like the development of database systems, classification schemes, metadata, automatic retrieval etc. However, in all EUROCRIS conferences since 1998 there was a feeling that the potential and the information content of *existing* CRIS are not fully exploited by their potential users. This reflected a largely technology-centered attitude, where the usefulness of CRIS is taken as granted and the problem is rather motivating to use them.

However, recent years have seen the development of a small strand of research concerned with the analysis of the relationship between CRIS and their users. These include field research on user groups and their information needs (Van Voensel 1998; Koopmans 2002), work on customizing information through user profiling (Lepori 2000), as well as the development of suitable architecture and information formats to answer to the needs of specific user groups (Lepori & Cantoni 2002; Jacobs 2004).

We could interpret this as a consequence of the general development of research information systems in general and of CRIS more specifically (Lepori & Cantoni 2002). Since the development of the Internet, most of the information present in CRIS is also available on the web pages of people, projects and institutions. and can be retrieved using search engines like *google* or *altavista*. Thus users, being more familiar to the Internet, are developing a clearer *hierarchy of sources* according to their usefulness. At the same time, potential *user groups* have greatly diversified as a consequence of the large scope of CRIS, but also a greater facility of access and, generally, a wider interest on research information. The potential user groups are as diverse as the researchers themselves, policy-makers, journalist, research administrators (Van Voensel 1998; Koopmans 2002). Thus, CRIS are no longer in a (protected by technical barriers) information niche for a specific group, but are now inserted in a competitive and differentiated information market. Hence, two issues are of increasingly important for CRIS: firstly, targeting the needs of specific user groups, since systems providing too general information risk loosing their users (Lepori & Cantoni 2002). Secondly, developing suitable access structure to cope with the increasing amount and diversity of information provided.

3. CRIS and their users

The interaction between a CRIS and its users can be represented as in figure 1. Users access to CRIS with goals, which of in most cases are related to specific activities of the user, like submitting a project proposal, getting in touch with other researchers or publishing a newspaper article. In usability inspection methods this combination of a user group and specific goal defines a *user scenario*, against which the usability of the system will be assessed.

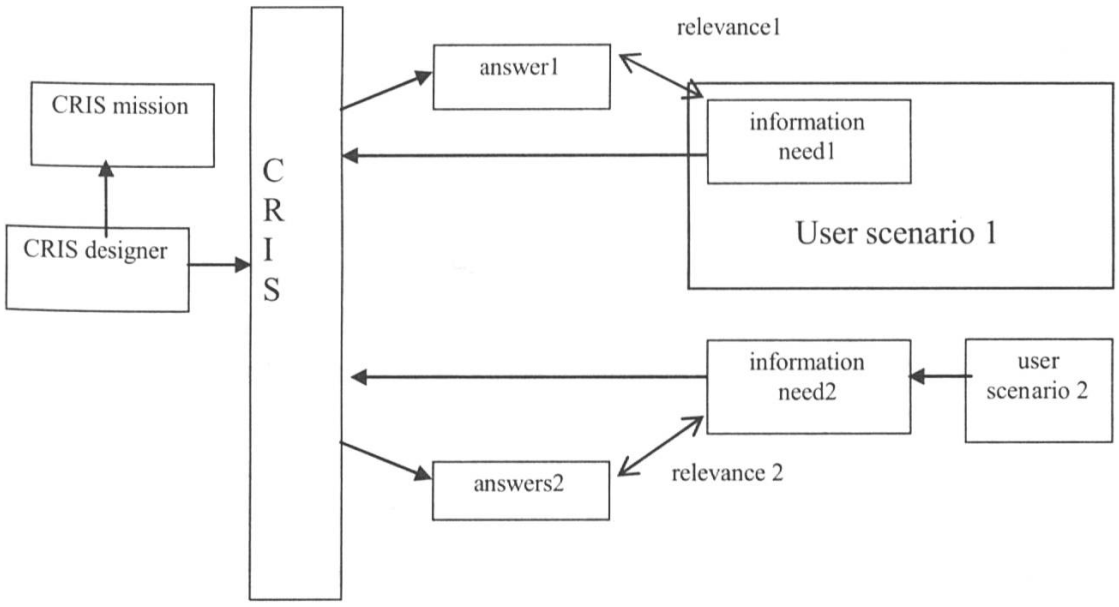

Fig. 1: The relationship between CRIS and users

The relationship between user needs and answers retrieved from the information system is called *relevance* (Sperber and Wilson 1995), roughly speaking a "measure" of how good is this information to reach the user's goals: in our example, if the European users retrieve information on how Chinese could submit grant proposal to the National Science Foundation, this information will be correct, but totally irrelevant. Relevance is particularly important for professional information systems like CRIS, where information is directly used for practical purposes (Lepori & Cantoni 2002).

To satisfy its information needs, the user will perform a series of operations, like navigating through pages, filling forms, performing queries, reading the content of web pages. Thus, he/she explores the system in an interactive way, depending on the answer he/she gets from its previous

action. In this sense, this interaction has some features of a dialogue between human beings (Paolini & Di Blas 2002). The capability of the system to answer to the user's information needs will not only depend on the information content, but also on features like navigation structures, labeling of links on access pages, search possibilities, etc.; these features are also evaluated in the usability analysis. Of course, the set of possible answers is pre-defined by the system designer according to a definition of the system mission and, in fact, an explicit and unambiguous definition of the mission and scope is central both for the designer (to define what the system should contain) and for the users (to know if she is looking for the information in the right system).

4. Usability concepts and methodology

Understanding and evaluating whether the application meets the needs of its users has been a key issue in the field of Human-Computer Interaction (HCI). Here, a major stream of interests focused for a long time on user-centered design and evaluation, thus giving birth to the research area of *usability analysis*.

Usability is intended as the property of an information system to effectively support the users in accomplishing their goals *within the overall institutional mission of the system itself*. Thus usability presupposes a clear definition of the system mission, the intended target audience, and the needs the system should answer to (Nielsen & Mack 1994; Brinck et al. 2002).

Research and practice pointed out two main families of approaches for assessing the usability of an interactive application: user testing methods and inspection methods. User testing methods assume that the quality and usability of a system may be evaluated by observing how end-users use the application. User testing allows to be confronted with the reaction of an actual sample of adopters of the system in front of the application, recording the impact of the interface on the user experience and analyzing the motivations of the problems encountered together with the user. Inspection methods denote a complementary approach which relies on the evidence that usability experts (following methods or guidelines) can detect a large set of usability problems long before recruiting users for a user testing. Thus, inspectors may evaluate in-depth the features of a system and anticipate potential usability breakdowns. Iterating on inspection and redesign, usability experts may provide rec-

ommendations for improving the application before setting up a full-fledged user testing. Given their cost-effectiveness, inspection methods are acquiring a larger consensus among Human-Computer Interaction designers. On the basis of the results of the inspection, a user testing can be planned and executed, trying to explore factors which are not in control of the expert reviewers (i.e. user-dependent elements such as the impression of the interface look&feel).

4.1. The MiLE method

In this paper, we explore how a particular inspection method can be applied to CRIS. We adopt a usability inspection method called MiLE (Milan-Lugano Evaluation; Garzotto 1998; Matera 2002; Bolchini et al. 2003a) which was developed over the last decade thanks to a strong cooperation between the HOC (Hypermedia Open Centre) of the Politecnico di Milano and the TEC-Lab (Technology-Enhanced Communication Laboratory) of the University of Lugano and has been adopted as a methodological basis for the European Union VNET5 Support Action of the FP5-IST program (www.vnet5.org).

The starting point of MiLE is the definition of *user profiles* (the target groups) and of *user scenarios* related to specific objectives. A scenario is a typical situation of usage of the system, where a given user profile aims to a specific goal (Carroll 2002). Examples of scenarios for a CRIS are a journalist looking for good and easy-to-understand examples of research results, a public administration willing to evaluate state funding in a domain or a researcher willing to get general information on research performed in a specific area. Scenarios are defined on the basis of the user groups identified and through reflection on some success stories of use.

Scenarios are the cornerstone of MiLE usability inspection and their proper use is essential for a successful evaluation. Inspectors "perform" a scenario, meaning that they use the application trying in all ways to complete the goal of the scenario. During this activity, they pay attention to how the application behaves and supports the successful completion (or the failure) of the scenario.

Each scenario is not only evaluated by assessing whether the user goal is feasible or not. Evaluators also use a set of *usability attributes* to evaluate specific aspects of the information system. Examples of usability attributes are the quality, accuracy and currency of the content, the impact of the cognitive features of the interface, the accessibility of the

information, and the orientation support provided by the navigation aids. In other words, the evaluation of each scenario becomes more analytic and detailed because a specific comment for each usability attribute is provided.

To facilitate the inspection process, MiLE provides examples of ready-to-use scenarios and a library of usability attributes which can be adapted and reused. Prerequisites are a basic knowledge of the user groups and the patience to put oneself in the shoes of the users. Obviously inspection does not replace a testing with real users. The inspection based on MiLE offers the possibility of detecting most part of the usability breakdowns with limited resources and already provides useful suggestions on possible improvements. Moreover, inspection enables identifying the critical areas of the application, which can then be considered for a focused testing with sample of users.

In summary, performing an inspection using MiLE entails the following tasks:

a) Define salient scenarios. Scenario should have one user profile as its protagonist and set a goal for the user to accomplish. Scenarios should also be feasible.

b) Keep at hand a rich library of usability attributes to be used during inspection.

c) For each scenario:

c[1]) Perform the scenario on the application, and comments the problems encountered trying to express them according to the usability attributes at hand;

c[2]) In parallel, look carefully through the list of attributes and try to check them out during scenario execution;

c[3]) Pass to the next scenario.

4.1.1. Building an usability KIT for CRIS

The inspection sheet depicted in Table synthesizes the elements to prepare in order to perform the usability inspection and to document its results.

Table 1: Usability Inspection sheet

Scenario: <*scenario name*>				
User Profile	**<user profile name>**			
	<provide a short description of the user profile>			
User Goal	**<user goal name>**			
	<Describe the motivations for the user profile for using the site, in terms of intentions and tasks within the scope of the goal>			
	Task 1	<describe a specific aim of the user in order to accomplish the goal>		
		<select usability attribute>	Try to accomplish the task on the site by systematically evaluating the effectiveness of the attribute.	Give an evaluation to the attribute
	...	...		
	...	....		
	Task n			

The basic unit of the analysis is a scenario, which comprises a user profile (a relevant segment of the target audience of the CRIS) and a user goal (a possible motivation for the user to visit the CRIS). A user goal may be decomposed in a set of tasks. Each task may be evaluated looking at different aspect of its usability (such as the quality of the content, the easiness of the navigation, the clearness of the link encountered, and so on). These aspects are captured in a set of usability attributes, which may be defined for each task or selected from a library (Bolchini et al. 2003a).

Once these elements are defined, the evaluator may start the usability analysis by systematically trying to perform each task on the CRIS. By assessing each attribute for each task, the evaluator provides comments on the usability of the task and summarizes the result in a numeric score.

5. An application to CORDIS

As a concrete illustration, we will apply MiLE to the Community Research and Development Information Service CORDIS (www.cordis.lu). CORDIS is the official Commission's information service on RTD and innovation; it is managed by the General Directorate Enterprise of the European Commission. It started in 1991 offering some databases on EU funded research, followed in 1994 by a first web site (Thevignot 2000). In the last then years, the service has grown enormously: it offers now nine databases, ranging from EU-funded projects, to news on the European research policy to result of European research, as more than 30'000 web pages covering almost all of the European

research policy and research activities. These include for example all the information on European Framework Programs (themes, procedures, documents, guidance for submitting projects, contractual information), information on the European research policy and related work, a set of services for innovation and supporting enterprises.

Also, responding to the general objectives of the European policy, CORDIS should fulfill many different functions: informing a wider audience on the strategies and priorities of the European Union concerning Science and Technology; providing guidance to researchers involved in the European framework programs; diffusing to policymaker, media and potential users the results of European research; promoting the exploitation of results especially towards economic innovation. Accordingly, it should address quite different user groups: research community, enterprises, intermediaries, nonprofit sector, information providers, policymakers, media (Thévignot 2000).

These features make CORDIS an almost ideal test bed for usability methods. Firstly, the needs of the user groups are quite different and thus we could expect that the usability level is also different, which might suggest either to focus on some groups only or to improve the system selectively. Secondly, since CORDIS contains a very large number of services and information, it is very likely that content organization and navigation are some very critical issues for its usability, which of course would be probably less relevant for simpler system. Thirdly, given its role as *the* portal for R&D information of the European Commission, good usability of CORDIS is critical for the well-functioning of European research policy and, especially, for the diffusion of its results. Finally, among professionals of research information, CORDIS has the bad fame of being a intricate system where, if one doesn't not know where exactly to look, finding the right information requires much effort and time; thus, it is interesting to assess quantitatively if these criticisms are justified and if it is possible to improve its usability.

5.1. User scenarios

On the basis of its mission and target audience of CORDIS, there are many possible scenarios that can be developed according to the features of the users, their pre-existing knowledge (and experience with the system) and objectives (Figure 1).

Table 2: User scenarios for CORDIS

N.	Scenario	Description
1	Young researcher	User profile: a young researcher in a Greek university preparing its PhD in informatics. He/she has some very general information on the Eur opean Union and on the existence of such measures in the European Framew ork programs, but didn't have direct experience of European programs until know and it is u nsure on the exact organization and particip ation rules to these programs. User goals: to get information on EU funding and, especially, on opport unities for mobilit y to other European cou ntries. Tasks: look for funding opportunities at European level; identify specific measures for the mobility of researchers; look at particip ation criteria and submission proc edures.
2	Experienced researcher	*User profile*: a senior r esearcher in leading European research inst itute in the field of biotechnology. He/she already worked in European projects in the past and thus knows the language and the organization of EU, but didn't until know have exper ience with the 6 FP. *User goals*: to get information on EU 6 FP and, especially, to ide ntify the specific programs in the field of biotechnology. *Tasks*: look for the structure and participation rules to the 6 FP; identify subprograms in the field of biotec hnology, look at specific research themes and submission procedures (call).
3	Private company	*User profile*: research and development responsible of a IT large organiz ation. They already participated in EU projects and wish to build a strong consortium on an innovative IST project, for whi ch they will act as coordinators. *User goals*: Build a consortium for his/her proposal. *Tasks*: gather updated documentation to set up a proposal in the VI IST program; find recommendations, rules and tips to recruit partners for the consortium.
4	Journalis t	*User profile*: a journalist of a national newspaper responsible for a th ematic section dedicated to disseminate latest research results in the area of ICT in the EU. *User goals*: Get an idea of the research mainstreams and about the latest achievements whi ch may be worth reporting. *Tasks*: find description of the research areas in the IT field in which the EU is focussing financial resources; find high -level description of the key results in a given sector and contacts information of the leading researc hers.

Since the aim of this paper is mainly methodological, we limit ourselves in the following to test the first scenario.

5.2. Inspection at work

For our scenario "young researcher" plausible tasks are defined and relevant usability attributes are associated to each of them.

Task 1: understand what is a framework programme and its main objectives;

Task 2: understand how a framework programme works;
Task 3: identify the specific measures for mobility of researchers;
Task 4: find the measures applicable to the specific user (a PhD student in a peripheral region);
Task 5: find eligibility criteria and submission procedures, including deadlines, documents etc.
Task 6: look at selection criteria and evaluating its chances of success.

Examples of attributes selected are accessibility (Is information easy to locate and reach?), orientation (is it clear to know where I am, where I come form and where I can go to?), predictability (are link labels informative enough? Do they anticipate effectively the content of the target of the link?), and richness (Is the content enough satisfactory for accomplishing the task?). To facilitate the inspection, for each attribute a score on a discrete 1-3-5 scale is assigned, whereas 1 means "poor", 3 means "effective but hard", 5 means "satisfactory".

We notice that these tasks are largely sequential, and thus a poor usability record for one of them could let the user to renounce to the search or to switch to other opportunities. Table 3 shows the evaluation sheet for this scenario.

Table 3: Excerpt of an evaluation sheet

Scenario 1: *Being introduced to EU -research*			
User Profile	Young researcher		
	A researcher from a European university who never participated to an EU -funded project. S/he has no idea of how the EU research programme work, but has been told that the Cordis w ebsite provides all the nece ssary information he has to know to be introduced to the funding opportun ities.		
User Goal	Who is Who in EU research		
	The researcher needs general information of research funded by the European Union. He would like to understand who are the institutions involved in the EU research and what kind of research is funded so that he may evaluate the opportunity of preparing or joining a project proposal. It is the first time he visits the Cordis website.		
Task 1	What is a framework p rogram?		Score
	Accessibi lity	• It is easy to locate information about the 6 program fram ework, which is explained in a proper subsite. • However, information about the 6PF highlights the news, the link to the research areas and an easy access to the various a spects of the pr ogram. • Where can the user find a way to get basic information about what is a framework program?	3
	Orientation	• To get an overview of the content hoping to find a basic introdu ction to the EU-research, the link "site map" on the homepage i s selected. • The Site Map page is blank. Even after 10 -20 seconds no co ntent appears on the page. The only information available is the page title "Site Map" at the top-right corner of the page. • Unexpectedly, clicking on this title we discover that this tit le is a link that leads to another subsite: "Cordis Guidance". This subsite does not provide at once an overview of the Cordis content but highlights the news and the Cordis se rvices. So how can the user be oriented in the large amount of the information o ffered?	1

	Predictability	• Link labels about the 6PF are clear and predictable also for first -time users.	5
	Richness	• No basic information at the introductory level about what a program framework is is provided. Users are introduced to the 6PF but are not able to get elementary information such as the roles and the expectations of the institutions involved (partners, funding institutions), and a high-level description of a research program. • From the homepage, it also possible to follow the link "Guidance and Background Information", thus selecting "Thematic Index" > ERA & EU Framework Programs. Here, access to specific subsites for the 5 and 6 PF are available. However, real background information about what a program is seems missing.	1
Task 2	**How does a framework program work?**		
	Accessibility	• The user, as it hard to find a basic and introductory explanation of what a research program is, may look for an easy-to-understand introduction to the 6th Framework Program. • From the homepage, in two-clicks it is possible to locate the section "6PF step-by-step" (homepage> FP6 Sixth Framework Program (2002 - 2006)> 6PF step-by-step).	5
	Orientation	• Local positioning within the navigation architecture of the subsite of the 6PF is clear and visible.	5
	Predictability	• Link labels about the 6PF are clear and predictable also for first -time users.	5
	Richness	• Once in the 6PF subsite, the only brief and generic information available about what a research program is, can be found in the 6PF glossary (see Figure 4). However, this glossary entry is not specific of the 6PF and should be found even outside the context of the 6PF.	1
Task 3	**Find measures for mobility of researchers**		
	Accessibility	The user has to scan more or lee 120 different link labels on the homepage, to finally spot a link saying "Research fellowship". This seems the only category related to funding opportunities for researchers, and therefore for enabling people to be funded to spending a research period abroad.	2.5
	Relevance	A completely different sub site opens up (http://www.cordis.lu/research_openings/fellowships.htm) explaining the new opportunities offered by VI FP Marie Curie fellowship with respect to the ones offered in the V FP. The major problem is that this content is relevant and clear ONLY to those who are familiar with Marie Curie fellowship program and already know what the usual funding opportunities are. Little explanation of what is the program and how it works is provided for novice or less-experience researchers. People facing for the firs time with EU research funding opportunities may be somehow disappointed or lost. Moreover, this is not the official Marie Curie Web Site (www.cordis.lu/mariecurie-actions/), which can be reached only through the FP6 website.	1
Task 4	**Find mobility opportunities for a specific user (PhD student in East european countries)**		
	Accessibility	A section called "previous activity – researchers from developing countries" is hidden at the bottom of the page. However, this section actually presents only measures from the previous FP. To look to specific opportunities for researchers form developing regions in the EU the user has to follow the general link to fellowships (http://mc-opportunities.cordis.lu).	1
Task 5	**Find eligibility criteria, how to apply and necessary documents**		
	Richness	The supporting measure talks about funding opportunities for students coming from "eligible regions"; however, it is not mentioned which the eligible regions are.	1
	Accessibility	From the Cordis website page (http://www.cordis.lu/research_openings/fellowships.htm) one has to pass across three different website until a specific "Marie Curie" website is reached.	3
Task 6	**Find out evaluation criteria and evaluate the chances of success**		
	Richness	The information about the evaluation criteria are quite vague; tools for evaluating the chances of success of the applicants are not provided.	0

Some examples of the results of the usability analysis are the following:

• the researcher coming to CORDIS home-page locates easily information on the 6th FP; however, when looking to the page "What is FP6" he/she finds a puzzling definition of the 6FP ((http://www.cordis.lu/fp6/whatisfp6.htm); only the glossary contains a more clear defini-

tion (http://fp6.cordis.lu/fp6/glossary.cfm), but is all but easy to get to this page. Accessibility of information is good, but content poor;
• the site map of CORDIS is confusing, since it seems blank and the links appear only as roll-over menus (http://www.cordis.lu/en/src/g_003_en.htm; Figure 2).

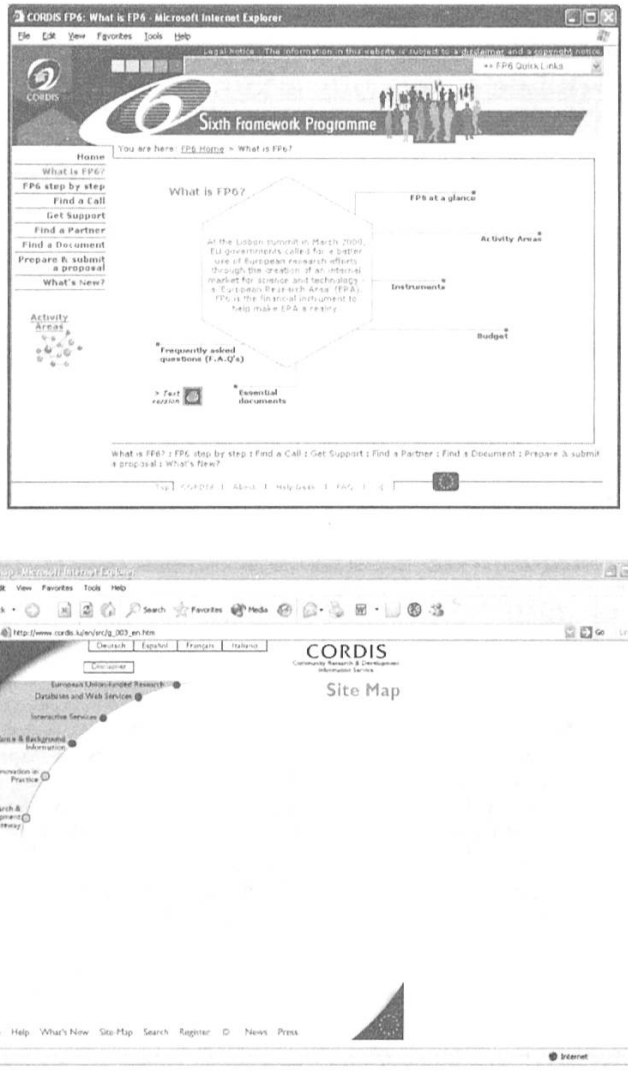

Fig. 2: What is the 6 FP and the CORDIS site map

In general, CORDIS gets rather good results in this scenario concerning the accessibility of general information on Community research policy and framework programs, as well as concerning the predictability of the links. However, accessibility of more detailed information concerning fellowships and richness of information is rather poor: retrieving the relevant information concerning funding opportunities for fellowships and eligibility criteria is quite difficult for a user without previous experience with CORDIS.

This can probably be explained by the fact that this section – and, we might guess, the whole CRIS – was developed having in mind the needs of researchers already expert on European research programs (like people working in research management and administration). However, among the declared target public of CORDIS, there are categories like policy-makers or media or beginners in European research. It seems then that the explicit mission of CORDIS is not identical with the (implicit) mission which was adopted by the designers of this section.

Other usability problems could be explained by the political environment of CORDIS and by its history. For instance, being part of the European Commission, CORDIS has to obey also to political guidelines (Lepori & Cantoni 2002): this might explain the prominence of EU research policy in the homepage and the complicated definition of the 6th Framework Program. This diversity of functions impairs usability if the user is not clearly told for which target a piece of information has been thought. Some issues seem also to indicate a web site development process occurring largely by addition of new information: this is the case of the multiplication of the subsites for the Marie Curie actions.

5.3. Results and overall assessment

The analysis performed suggests that CORDIS website needs interventions both with respect to the content to be provided (e.g. clearer explanation of what a FP is for a novice researcher), to the global navigation within the site (e.g. usable site map), and to the accessibility of the information (e.g. where does the user may find basic info about the current FP?). The more detailed are the task evaluation performed, the more designers may gather material to rethink parts of the application, fix implementation errors, redesign some sections, improve the navigation and visibility of the links, as well as conceive new content to be published.

MiLE works as a methodological guide to the analysis and does not replace the domain knowledge of the evaluator. However, performing systematically each task and assessing the effectiveness of each usability attribute may provide specific insights about the potential usability breakdowns, and pave the way to define the improvements to be done.

The results may be passed on the designers in order to devise strategies to fix the current problems, as well as to discuss and negotiate their actual gravity within the overall economy of the site. In fact, the errors

and problems identified during inspection may be actual obstacles for the users or they may not represent such a hard problem as the evaluator might have imagined. To this end, the results of the inspection serve as input for planning a usability test with a sample of users. Evaluators may then observe users trying to accomplish each task on the website, and take notes about the moments where the user seems disappointed, or where s/he does not find the information, or s/he is lost within a section. The material gathered during user testing may be a good complement to inspection and may confirm, enrich, validate or invalidate the inspection results.

6. Conclusions

The aim of this paper was not to evaluate systematically the usability of a CRIS, but to give an example showing how usability inspection methods work. These methods are complementary to the assessment of user needs done through questionnaires or direct interviews. The latter can be used to identify the target publics and their needs to design an information system. Used as an assessment tools, they register the opinion of the people and give an overall view of their degree of satisfaction. However, it is very difficult to translate them into detailed specification for an information system.

Usability inspection methods allow examining systematically the interaction between a potential users and the system. It is then possible to evaluate the performance of the system for different user groups and to systematically design measures to improve it. However, since their application requires a detailed knowledge of the user groups and of their goals, they can be applied only after the system exist from some time and this limits the possibility to implement changes.

In this context, MiLE provides easy-to-apply tools to guide the evaluators in the maze of the different aspects of a complex application. Once prepared the scenarios according to the mission and scope of the CRIS, evaluators verify a number of dimensions of the usability (content, navigation, orientation, accessibility, etc.) trying to "do specific things" on the site, rather than simply looking at the interface and browsing around. In this way, it is possible to evaluate how crucial scenarios are supported and where are the major flaws of the application. On this basis, we conclude that usability inspection methods should be adopted routinely as a tool to optimize the interaction between CRIS and their users.

The version of MiLE recounted in this work has been improved and extended into a newer release of the methodology called MiLE+, which better distinguishes between the role of the inspector as s/he puts herself in the shoes of the user (performing a "user experience inspection") and the role of the inspector as s/he examines the usability-related aspects of the application in a technical way, i.e. as a usability expert and not as a user (thus performing a "technical inspection"). These activities are supported by specific conceptual tools, which significantly enrich the toolbox available to usability experts.

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