

Technology Communication: from Design to Use.
Analysis of conflicts and possible mediation between
technical approaches of design and situated practices
of use within a well-defined institutional context

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Foreword & Acknowledgements

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Foreword & Acknowledgements

It is very important for me to introduce the dissertation with a very brief premise concerning the ALaRI institute. Within this institute, I have investigated critical factors around the intranet system that, in my opinion, have led to under-exploiting such technology. Nevertheless, with the following dissertation, I do not absolutely bring into question the very high quality level of research, training, and education which is held in ALaRI. Further, all persons working for and in ALaRI, especially the program manager and the Scientific Director, are the engine of the continuous excellent activities and competences proved at the institute.

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Abstract

Starting from a trigger event - the poor use of a specific technology -, aim of the research is to analyze root cause/s of such a problem, considering not only evident difficulties as regarding usability issues, but also investigating deeper reasons including organizational, cultural and social factors. In particular, the analysis dwells on working practices and communicative interactions that have affected and shaped the life-cycle of the technology (from design to use) within a well-defined institutional context. The goal is to identify those human errors that may have caused faults and weakness during the project development and that often remain undetected.

The technology is an advanced information system based on remote web application to support cooperative processes in the management of complex projects and learning activities among social actors geographically dispersed, but belonging to the same community. Such information system was designed, developed, and then used in the same work environment, where also designers and developers have covered user's role. Therefore, the particular context gave me the opportunity to study both building processes and the phases of release and use.

The research adopts critical perspectives towards those aspects of the work considered routine or however normal procedures by the actors, making use of intertwined and complementary theories which underline the complexity of the research problem. In particular, Activity Theory, as kernel theory, provides conceptual tools to describe complexity and changes of the work place, both at individual and social level. It helps to think beyond what is wrong with the pure technology, shedding light on contradictions within the activity system and on conflicts among actors with different roles but who need cooperation to get satisfactory outcomes. Then, with Situated Action, the attempt is to develop an understanding of work from the inside, focusing on the empirical analysis of situated work practices and of the product; while, Distributed Cognition emphasizes the work as socially distributed practice, where learning processes are strategic for designing tailored technologies. Further, Communities of Practice defines those key dimensions that make a complex activity system a professional community. Finally, within the framework of Argumentative Theory, reference schemes and guide-lines support the analysis of some significant communicative interactions. The identification of distortions, incomprehension, or manipulations during talk at work can help to understand how final outcomes are affected by the communication in work practices.

The research, pinpointing the strong relationships between technical and social aspects, faces problems apparently just technical through human and communicative perspectives. In this way, it discloses how the critical relationships *human-technology* is often symptomatic of difficulties in the *human-human* communicative interaction.

1. Introduction

1.1. Analysis of the problem

Nowadays, we are accustomed to listen to about failures in the use of technical products. Often responsibility for wrong or poor use of the technology is given to user's inexperience or to his lack of goodwill. Yet, deeply investigating the reasons of such failures reveals that frequently several problems occur during the phases of design and development of the technology. In particular, the increasingly large use of software devices leads to lingering on the life cycle of software engineering products.

“Software is used to control transportation systems including subways, trains, and airplanes; control power plants; everyday devices such as ovens, refrigerators, and television sets; medical devices such as pace makers and diagnostic machines. The Internet is certainly powered by sophisticated software. The whole society is dependent upon correct functioning of software”, and also its economic impact is constantly growing (Jazayeri, 2002:1-2). In short, “as new applications and technologies are constantly emerging, the software engineering field promises to stay a vibrant and active field in a constant state of flux” (Jazayeri, 2002:21).

Since the late 1960s, the software engineering field has grown to include many techniques and methods for systematic construction of software systems. These techniques span the entire range of activities starting from the initial attempts to understand the customer requirements for a software system to design and implementation of that system, validation of the system against the requirements, and delivery of the system and its deployment at the customer site. The final objective should be to develop high-quality products, but the matter at issue consist of designing process models that assure the desired quality of the products. In fact, in the last 30 years various models have been developed, trying to define an ideal software life-cycle or how actual software projects should work. Examples of processes are the waterfall model, the prototyping, the incremental delivery, the spiral model, or the open source one (Jazayeri, 2002).

Each model presents benefits and drawbacks. For instance, the waterfall model has represented a starting point for easily studying the software processes, identifying phases and activities, and forcing linear progression from a phase to the next, according to principles based on the manufacturing industry (Figure 1.1).

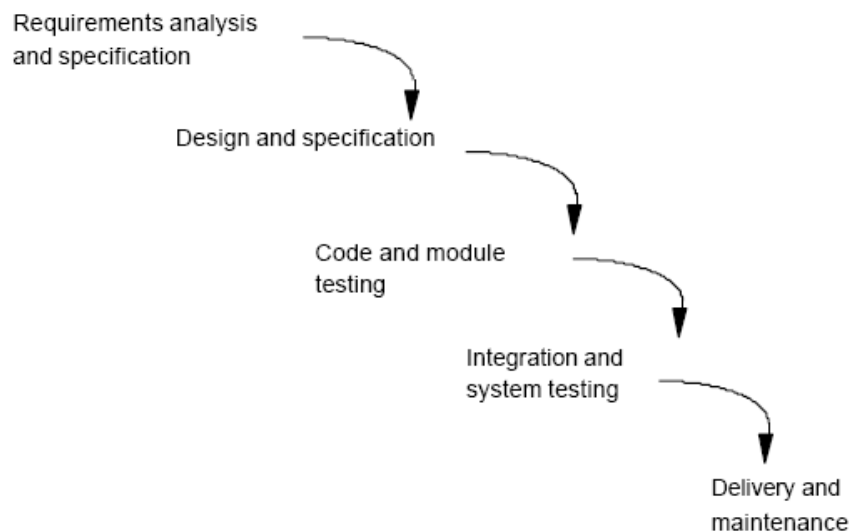


Figure 1.1. The waterfall model of the software life cycle.

On the contrary, the waterfall model does not take into the right consideration the relationships with the customer, considering her only at the beginning and at the end of the project process. Furthermore, the user requirements are often vague, while recycle phases do not exist and the maintenance are considered only marginally.

From the criticism to the waterfall model, other developed life-cycles have tried to tackle unsolved problems. At present the spiral model seems to be the most common approach¹. In parallel, the adoption of quality process to test and analyze the product development (from its inception through deployment, evolution and retirement) has been evolving and becoming a distinct discipline in the last three decades (Pezzè & Young, 2008).

Nevertheless, during the software life-cycle still real and current problems occur, generally regarding (Jazayeri, 2002):

- the cancellation of the project before its completion (25-30% of projects is not brought to the conclusion), due to errors occurring during the project phases
- the enormous increase of the project costs, with a relevant difference between the starting predefined budget and the final real balance (about 53% of projects costs from 100% to 190% of original estimates), also considering hidden costs due to lost opportunities (e.g., the production of reliable software for baggage handling at Denver airport cost over 1 million \$ per day!)
- great delay with respect to the demand, from 2 to 4 years (not keeping to schedule and to deadlines)

¹ The spiral model formalizes the incremental delivery concept, and it bases on recycle phases, repeating task regions, as planning, risk analysis, development, and validation (as external assessment of qualities, i.e.: are we doing the right software?), in a cyclic way.

- backlog of work that prevents from satisfying the demand of technical systems
- great difficulty or even impossibility of evolving an already existent application in compliance with the customer's or user's demands
- often, once the product is completed and released, it does not work properly
- often the developed product is not then used

Such problems are also strongly connected with the growing spread and applications of the software technology which are addressed to an increasing number of users, exceeding skilled and niche markets and reaching a wider public of non-technical users. At first, the continuous request and the urgent software production faced scale troubles, since the high demands of the market often compromised the quality of the product performance, entailing serious problems of use for non-technical persons. In particular, from the mid of the 1970s, with the coming of the mass computer, developing software products has required more attention to users' needs, improving the interface systems together with the control panels with regard to the outcomes of the performed operations, in order to better accomplish the user's satisfaction.

Schneiderman (2005) confirms failure rate as high as 60%, and traces much of the problem to the poor communication between developers and users. On the one hand software-engineering approaches have facilitated the software development process, facing technical difficulties, but, on the other hand, still clear processes lack for studying the users, understanding their needs, and meeting their expectations and goals.

This situation brings in evidence the role different actors should play during the whole software life-cycle, characterized essentially by a multidisciplinary team activity. For instance, the software development, beyond the implementation, requires centering on product designing and testing, through quality assurance activities which ensure adequate dependability of the software product, accurate definition of project schedule, and also product usability. It is widely recognized that "all software development activities reflect constraints and trade-offs, and quality activities are no exception" (such as in case high dependability is in tension with time-to-market). In particular, the quality process has been evolving and becoming a distinct discipline in the last three decades: it bases on elements such as completeness in order to plan appropriate activities to detect important faults; timeliness, in order to detect faults as early as possible; and cost-effectiveness, in order to consider the cost of repeating an activity through many changes over the whole development cycle and product life (Pezzè & Young, 2008).

Another relevant contribution for improving the quality process came from the *software design* discipline, introduced during the 1990s, with the aim of:

"sitting at the crossroads of all the computer disciplines: hardware and software engineering, programming, human factors research, ergonomics, studying the intersection of human, machine, and the various interfaces—physical, sensory, psychological—that connect them" (Winograd, 1996:xv)

One of the pioneers supporting this new approach, Mitchell Kapor, the founder of Lotus Development Corporation and the designer of Lotus 1-2-3 spreadsheet, in 1990, at a major software producer's gathering, issued the following challenge in the form of his *Software Design Manifesto*, then reprinted in Winograd (1996:3):

“Despite the enormous outward success of personal computers, the daily experience of using computers far too often is still fraught with difficulty, pain, and barriers for most people which means that the revolution, measured by its original goals, has not as yet succeeded....The lack of usability of software and the poor design of programs are the secret shame of the industry. “

The merit of the software design approach was to move from a one-sided constructor's-eye view, focusing on engineering methods of function and construction of the objects to design, i.e. hardware and software, towards a designer's-eye view, taking the system, the users, and the context all together as a starting point. That is what the editors Rheinfrank and Hefley stated in the inaugural issue of their new publication²:

“We seem to have moved well beyond the idea that making a computer "useful" is simply to design a good interface between "man and machine." Our ideas have evolved to the point where the richness of human experience comes to the foreground and computing sits in the background in the service of these experiences” (Rheinfrank & Hefley, *Interactions*, January 1994:88).

Within this perspective, Winograd (1996) emphasizes the situated nature of the design, suggesting the importance of taking into consideration not only the technical requirements and the project specifications that must be satisfied, but especially the human context in all its richness and variety where the technology is adopted.

Not considering the context of human, social and organizational conditions in which a software project will be placed can even bring serious accidents. Cases such as Three Mile Islands, Heysel Stadium, Bhopal, Chernobyl, the Challenger, have proved that often accidental reasons should be investigated around failures during the planning of the project, or due to wrong installations, or a not careful assistance, or faulty managerial decisions, rather than around merely products breakdowns or errors attributed to the end users - also called *active failures* (Reason, 1991). In fact, when the planning itself is not suitable to reach the fixed goals, the human failure is the outcome of the mismatch between the task to perform along with the human physical and mental skills on the one hand, and, on the other hand, the features of the product interface that should support the task to perform – the so called *latent failures*. This latter type of error constitutes the most insidious threat against the security of complex systems, in opposition with the

² *Interactions* inaugural issue was in January 1994, it was edited by John Rheinfrank and Bill Hefley, and founded by the Association for Computing Machinery (ACM), in conjunction with the ASD and the ACM special-interest group on Computer–Human Interaction (SIGCHI).

above mentioned *active errors*, associated to the users' operations on such complex systems. The consequences of *latent failures* can remain latent for long time; but they become evident only meeting other factors that then ruin the system (Reason, 1997).

In parallel with a growing awareness of the problem, from the 1980s, more and more studies have focused the attention on the human factor, considering not only the reliability of the technical systems, but especially their compatibility with the human activity. As a consequence, this has led to improving technical product interfaces, to studying the work organization and processes, and to investigating the communities of practices where the product is deployed, with the aim of reducing the possibility that the technical system can mislead the human activity. The *Swiss Cheese Model* (adapted from Reason, 1991) in Figure 1.2 shows a set of variables that can contribute to bring about accidents. These variables consist of failures due to individual errors and organizational or planning aspects that regard not only the processes for the product development, but also the procedures of introduction and adoption of such a product within a working environment.

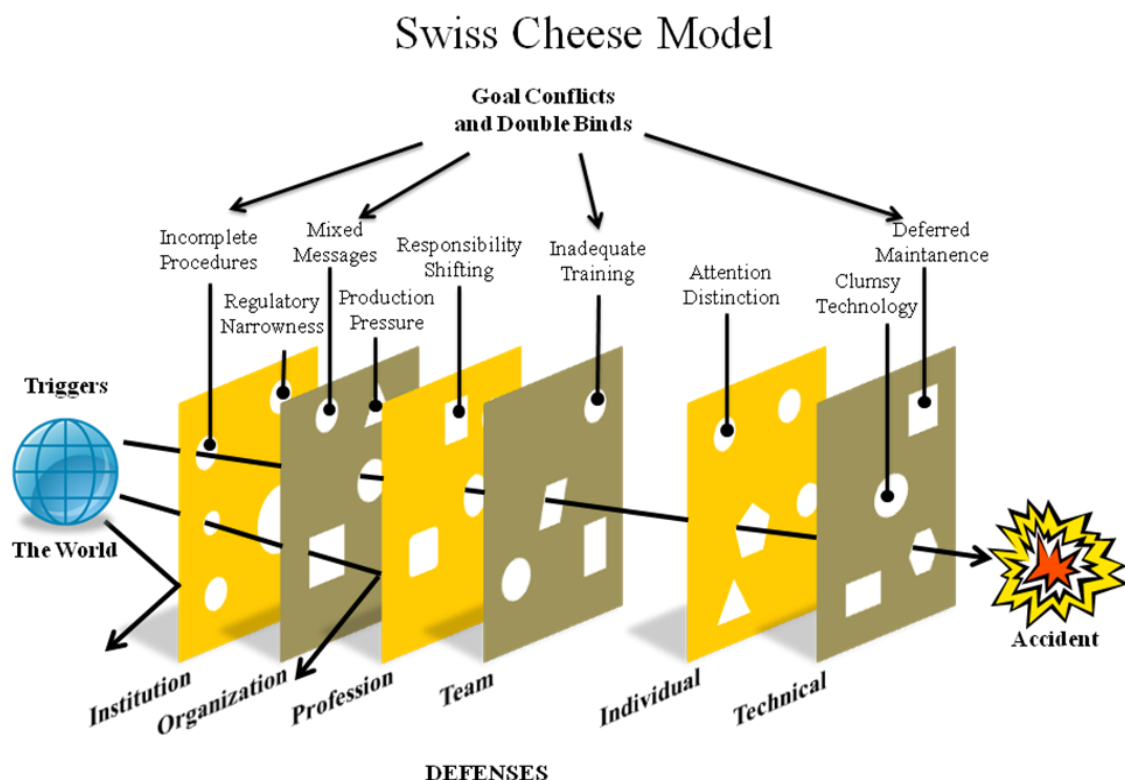


Figure 1.2. The *Swiss Cheese Model* shows possible (blended) variables that can bring about (more or less serious) failures relevant to (complex) technologies.

The *Swiss Cheese Model* represents different organizational layers together with roles and responsibilities during the workflows that can be more or less complex. Ideally, each of these layers should be without faults or critic aspects, but really each layer presents peculiar lacks (consisting of both active and latent errors), generating defects and failures (the holes in the *Swiss Cheese Model* in Figure 1.2) that can even compromise the whole system of production, both in terms of final product and of social aspects. In fact, once delivered, the adoption of a new technology affects both the working and social practices. Therefore, it requires harmonizing the human working organization with the new working practices, meeting the users' expectations and simplifying their activity with and through the technology.

Here on end two paradigmatic cases report about the adoption of innovative and advanced technologies but that did not take into the right account organizational and social aspects.

The first case concerns the e-company Amazon.com. Amazon.com is one of the most famous companies managing the selling on internet. Although the very rapid growth of turnover, between 1995 and 2000 it has been running more and more at a loss (i.e., the turnover increased but the net income was more and more reduced)³. In fact, relying on the customer direct contact through internet, Amazon.com did not care about providing itself with a physical delivery network, charging the related costs. Therefore, this carelessness costs great difficulties to Amazon.com in the organization of its back-office that was overwhelmed by the management of purchase orders and payments. As a consequence, the e-company was wrapped up into a vicious circle, where, paradoxically, the costs to support increased in parallel with the increasing of the customers' contacts, and thus, with the increasing of the selling. In this case, condition of efficiency is based on the back-office organization that should be efficient as well as the traditional delivery. The Amazon.com case gives an example about how a valid business idea cannot produce suitable income due to the inadequate internal organization. The innovative technology, although leading new business processes, did not match the existent work organization.

The second example of technical flop regards the Iridium project, launched in 1998. Iridium aimed at enhancing a personal global telecommunication service, based on a satellite network. The purpose was about making each customer able to connect through a mobile phone to whatever phone in the world. In order to achieve such a goal, enormous technical and financial efforts were sustained: 66 satellites orbiting at an altitude of 780 km were prepared, with thousand millions dollar investments. And what was the outcome? The 66 satellites worked well, but the business plan was a flop. So, in 2000 Iridium announced the services closing and the liquidation of the company. How could it happen? None consideration was about whether the proposed service had a suitable demand – that is the commonplace but fundamental condition of each project,

³ Amazon.com source: Nasdaq.com - Stock Report.

where the bond consists of meeting the market expectations, balancing between the perceived quality and the required price.

Other examples of technical flops⁴ show us how often failures can depend also on not having considered extrinsic variables to the technical product, such as their usability, the usefulness, or the applicability to the real human needs. Just consider the first photocopying Xerox machine, Model A in 1949, very hard to use; or the first personal computer Lisa, from Apple in 1983, that was very slow, too big and expensive; or the Apple Newton, launched in 1993, a sort of big PDA, with a high price (the cost was about \$ 700) and without usable interface.

Starting from a trigger event (the poor use of a peculiar technology), aim of the research is to analyze root cause/s of such a problem, considering not only evident difficulties as regarding usability issues, but also investigating deeper reasons including organizational and social factors. In particular, the analysis dwells on working practices and human interactions occurred during the life-cycle of a technical product (from design to use). The goal is to uncover which types of failures could be at the basis of the project, reconstructing the process of development and trying to understand the errors that led to compromising the correct adoption and use of the technology. Such analysis presents a double aim: at first, looking back, it wants to locate the main causes that allowed the trigger event happened. Studying backwards the temporal sequence of working practices, social interactions and individual behaviors during the life-cycle of the product is possible to recognize which critical factors (of which types and why) affected the final product and its use. Then, the identification and the acknowledgement of these critical aspects aim at suggesting possible interventions to improve the working procedures both at level of product development and use. In this way, the process management is considered along with the actors' involvement in the life-cycle of the technology.

1.2. Objectives and innovative results

In this section, the accent is on which specific objectives drove the research trend and the achieved results.

Starting point are the difficulties tackled during the use of an advanced information system, created for supporting and enhancing the complex network of human communicative interactions in a particular environment. Most difficulties stem from failures and errors during the development phases of the product, and principally regard organizational, social and cultural aspects, rather than just technical issues.

⁴ See for instance on internet, under "technical flops", or in magazines as "Il Mondo", n.34 August 2006, p.47-48 - weekly magazine issued on Friday together with the Italian newspaper "Corriere della Sera"; or technical flops reported in Wall Street Journal issues.

The research approach leads to adopting a critical perspective towards those aspects of the working activities considered routine or however normal procedures by the actors, with the purpose of pinpointing the strong relationships between technical and social aspects, and underlining their great interdependence for the organization and the practice of specific activities. Subsequently, the objective is to make the social actors aware about the nature and the reasons of the difficulties in using the involved information system.

In fact, since the technology adopted did not meet the expected results, an accurate analysis of the working environment and of the actors' practices aims at discovering which critical problems can occur during the various phases of such a technical project, providing reasonable motivations.

Further, through the observation and the study of specific social interactions, the research aims to improve the working activity system, suggesting the introduction of new strategic concepts and possible changes at organizational and communicative level. Some key conclusions lead to reviewing the approaches adopted during the project development, with particular attention to strategic planning, organizational structure (that should be more flexible to and active in supporting the launch and the use of the technology), and to sound communicative interactions within a well-defined communicative circuit.

I believe that the originality of this research relies on the interdisciplinary approach adopted to analyse the root causes of poor use of the peculiar technology (created on purpose for a specific environment but not deployed as wished), intertwining several and complementary theoretical elements that underline the complexity of the tackled problem. Further, it emphasizes the growing contamination among disciplinary areas that not long ago worked separately and were conceived independently, but now are called to cooperate and to interact together, attracting interdisciplinary skills and heterogeneous background.

The results achieved stem from three main perspectives of observation, concerning issues of i) organization and strategic planning; ii) social behaviours and cultural cooperation; and iii) user's role.

As regards organization and strategic planning, the governance plan covers fundamental importance. The technology control issue raises the need for developing a common cultural framework capable of explaining the meaning and the reasons of the adopted technology, besides how use its services (i.e., how interact with the technology). Therefore, models supporting shared interpretation of new virtual environment are necessary. In terms of organizational management, this means developing strategies for constituting and negotiating strong commitment network, internal to the institutional culture, in order to facilitate the introduction, the adoption, and the use of the new information system. Within this perspective, it is necessary a structured governance plan which can provide schemes of coordination to support these strategies. Particular attention is towards the role the project manager plays. S/he should coordinate the

process of development and management of the technology, define roles that other actors may cover, evaluate priorities, and ensure suitable support of human, money, and time resources, in accordance with the project requirements. Further, defining tailored plans of change management – for instance concerning the introduction of new work procedures - through specific communication and training strategies may help to promote the correct adoption of the information system, in order to reach the expected benefits, overcoming cultural barriers that can limit the use of the technology.

As regards social behaviours and cultural cooperation, two main issues stand out. The first one shows the necessity to join complementary and peculiar knowledge distributed among persons with different competences and background, in order to realize products corresponding to actual needs and flexible in sight of new demands or organizational changes. The second issue implies a deep respect for the values and cultural traditions of the various fields of competences. Often, problems of communication are due to stiffness and close-mindedness between different fields of studies, such as the use of an own jargon, or the disagreement about priorities, or a kind of peculiarity that can be dangerous if it drives the community of specialists to the isolation and estrangement from giving the awaiting answers to a larger community of users (Scott, 1999). De Michelis explains that “the cooperation gives rise to a mutual learning process, crossing boundaries that separate different cultures and contaminating them. But cooperation is much more difficult and demanding than simple exchanging ideas at meetings and conferences, because it requires acceptance of other viewpoints, careful listening to the partners’ proposals together with serious and lasting agreements about determinant choices with respect to the outcomes of the design process” (De Michelis, 2000:230).

As regards user’s role, it becomes necessary not only to follow user’s evolving needs, by means of anticipating collaborative practices that can be accomplished through suitable technological devices (as observed in Scalisi, 2001), but especially to recognize the user as directly contributing to the life-cycle of the technology. That means covering pro-active roles, becoming social actor of the technology used as virtual workplace. It means first of all making the user aware of being actor and stakeholder of the adopted technology, through which she can increase her personal and professional growth, also contributing to the knowledge construction and co-sharing. Consequently, it means paying more attention to the actor’ expectations and feedback, through measures of assessment for improving virtual working practices.

Concluding, my overall contribution encompasses four main areas, concerning the methodology of research, the empirical approach, a few conceptual factors and theoretical elements that will be better illustrated in the next chapters and in particular in the last chapter about the discussion on the final results.

1.3. Context of the research

The research study was conducted within the ALaRI institute⁵, at the University of Lugano⁶, in Switzerland. The mission of the ALaRI institute is to promote research and education in embedded systems field. Aware of the real need for a cross-disciplinary education, the institute offers two master's programs and vocational courses, equipping participants with a unique body of knowledge ranging from electronic engineering to computer sciences, including interpersonal skills, such as team work, complex-project management, and market sensitivity. During the master's programs, students are requested to complete a practical project in collaboration with industrial and academic partners in advanced research topics, and focused on industrial applicability and on real-life design issues.

Due to the very fast growth of the institute and the increment of its educational activities, during the academic year 2002/03, there was necessary to develop a peculiar information system in order to provide a suitable technological support to manage both educational and administrative activities.

The peculiarity of this information system relies on being thought, designed, built, developed, and then used in the same work environment, where also designers and developers have covered user's role. This particular context gave me the opportunity to study both the building processes and the phases of release, use, and maintenance.

Therefore, the research analyzes the work place and the social practices within ALaRI, during the life-cycle of the product, investigating especially possible human and communicative breakdowns that can have compromised the full exploitation and use of the technology. Problems that at first sight seem arising from technical issues are faced through humanistic, communicative and social perspectives.

1.4. Knowledge base

The knowledge base of the research refers to a long period ranging from the autumn 2004 until the spring 2008. And it includes:

- Corpus of audio recorded talk and conversations during meetings among designers (5,5 hours), developers, and with the program manager (6 hours)
- Corpus of audio recorded interviews to end users (staff, students, and lecturers: 5,5 hours) and to the program manager (1 hour)
- Documents authored by ALaRI institute concerning the intranet building and the using activity (including the texts of the above mentioned interviews)

⁵ Advanced Learning and Research Institute (ALaRI), established in 1999 – www.alari.ch

⁶ The Università della Svizzera italiana (University of Lugano), active since 1996, is the youngest among the ten Cantonal Swiss Universities and the two Federal Technical Universities belonging to the Swiss Higher Education System and recognized by the Swiss Federal Government – www.unisi.ch

- Ethnography observations and contextual inquiries
- Field notes

1.5. Overview of the dissertation

This first chapter introduces the pre-theoretic framework of the dissertation, with an overview on general tackled problems about breakdowns or failures during the life-cycle of products supporting various communicative processes. The variables at stake are different, concerning not only technical elements intrinsic to the product itself, but especially social and organizational issues. Thus, it becomes necessary to analyse the whole process of project management, from the product building to its release, also investigating human and social interactions, organizational and communicative issues at workplace, both where the product is designed and developed, and where the product is released to improve the efficiency of the activity systems.

Chapter 2 illustrates the theoretical framework of the research, providing the guidelines and the principles I refer to in the analysis of the case study that I present in chapters 3, 4, 6, and 7. Kernel theory is Activity Theory, presented in section 2.1, whose main representative is Engeström (Engeström, 2004). Activity Theory is employed to describe the relationships between the actor and her work place in order to better understand the concept of activity system seen as the community working environment together with its conflicts, difficulties, and transformation. Key concepts in this theory are:

- subject
- mediating artifacts (as mediator of human activity)
- cultural organization (community, rules, and division of labour)
- object of the activity (connecting individual actions to the collective activity)
- conflicts and contradictions
- mediation and renegotiation

Then, Situated Action, conceived by Lucy Suchman (Suchman, 1987 and 1996), in section 2.2, takes as unit of analysis the individual action, culturally and socially situated, as key to understand human interactions with and through the technology. In particular, this theory constitutes my reference point for the empirical analysis of work, observing situated processes of designing and development, and the product implementation for a specific workplace.

In section 2.3, the definition of Distributed Cognition, stressed by Hutchins (Hutchins, 1995 and 2001), focuses on work conceived as socially distributed practice, where learning processes happen through communicative interactions that are strategic for designing technical artefacts tailored to the community in which they are used.

In section 2.4, the concept of Communities of Practice, introduced by Wenger (Wenger, 1998), clearly defines those key dimensions that make complex activity

systems professional communities, and that this approach makes available to the analysis, and namely:

- mutual engagement
- joint enterprise
- shared repertoire

Finally, in section 2.5, Argumentative Theory provides some key elements to approach both in a descriptive and in a normative perspective the analysis of the communicative interactions, as presented in chapter 7. Intertwined contributions come from three principal representatives in this field, and namely Van Eemeren (Van Eemeren, 1984-2004), Walton (Walton, 1995-1998), and Rigotti (Rigotti, 2002-2006). Finally, the section 2.6 describes how the study case makes use of the previously illustrated theoretical framework.

Chapter 3 presents the adopted methodology of research (section 3.1), and it introduces the peculiar case study (section 3.2). In particular, I explain my role both as researcher and observer of the work place, as well as actor taking part in the activity system, involved in social practices and in using the technology as object of analysis. Finally, it is described how the empirical research has been managed.

Chapter 4 is dedicated to present the institutional context of research. The description of the workplace, its mission, along with the stakeholders' roles and their social interactions has a twofold meaning. First it aims at presenting the particular working environment together with its complex network of dynamic relations; in the second place, it is functional to understanding the needs and the reasons that led to creating an ad-hoc advanced information system to support the working activities. At the same time, this presentation anticipates and discloses cultural and organizational difficulties into the adoption of such technology. Therefore, the focus will be on the organizational structure of the institute, underlining those social and cultural conditions that fostered, but also limited, the development of the technology itself. Finally, there are some considerations about changes on the workplace and recommendations for planning and measuring the impact of changes within the organizational structure.

The conceptual background of the intranet technology along with its peculiar features is introduced in chapter 5 (section 5.1). Section 5.2 presents some reflections on the evolution of the intranet, according to the use and the services developed, considering not only which needs bring to adopt new work procedures but also how new procedures can affect social and cultural behaviours. Then, section 5.3 sketches cognitive and social implications on approaching the software design.

The empirical analysis of the case study focuses on the technology building and on its life-cycle, as presented in chapter 6. Section 6.1 illustrates the ALaRI intranet with the principal services and functionalities, and presents the problem encountered during the development process. In particular, the analysis aims at highlighting how drawbacks and breakdown of the product can be brought back to communicative conflicts between the

designer's conceptual model and the user's one. Finally, in section 6.2, the usability analysis of the intranet provides a further specific and more technical evaluation on the efficiency of the system, considering in particular the user's point of view.

Chapter 7 presents the analysis of the communicative circuit relevant to the life-cycle of the intranet. Particularly interesting thing is the involvement of all the real actors who take part into the ALaRI community. Such interactions offer a quite comprehensive view on the communication occurring during the different phases of the product: from its feasibility study to the first release, from its use to the maintenance. The impact of such communications both on the development and on the use of the intranet is then compared with the expected results (section 7.1). Therefore, to improve the current use, a further consideration stresses the importance of taking care of the feedback process (section 7.2). At the end, through the analysis of significant excerpts of talk at work (section 7.3), the aim is to underline possible communicative "distortions", revealing critical factors (e.g., different background, lack of cooperation, missing shared meanings, poor attention to user's real needs) which affected working practices around the product and the following outcomes.

Conclusions, in chapter 8, summarize the impact of the research and final achievements. Particularly, the attention shifts towards those human and social aspects that take part during the technology life-cycle. That entails to pay attention to the micro-social structure of the workplace where the product is developed and used, rather than concentrating on purely technological features or on formal and non-situated models. At the end the discussion opens possible further research outlooks.

1.6. Conventions

In the transcription of original talk I use the following transcription conventions:

[talk]	point of overlap
(0.2), (0.5), (0.8), (1)	silence, represented in tenths of a second
(.)	micro pause, a silence less than 2/10 of a second
-	self-interruption
()	transcriber's description of events

Every name mentioned in the discussion is a pseudonym. Gender has been occasionally modified. The first letter of the speakers' names indicates the role each speaker covers within the intranet project.

For each excerpt, the English translation is followed by the Italian original talk.

2. Theoretical Framework

To evaluate the success of a peculiar information system created for supporting and enhancing a complex network of human communicative interactions in a particular environment it becomes fundamental to take as units of analysis not only the product itself, but especially the social actors who develop and use it, within their workplace, and with their culturally and historically situated practices and communicative interactions.

For this study, I shaped a specific theoretical framework consisting of a kernel-theory, integrated and enriched with the contribution of other four theories that offer suitable supports to build my dissertation.

In section 2.1, Activity Theory (Engeström, 1987, 2004) is the kernel theory which provides conceptual tools to describe the complexity of the studied work place, both at the individual and social level. Its multidisciplinary approach presents the activity context as heterogeneous and multivoiced system, integrating individual perspectives, mediating artefacts, and community of actors. The worth of such approach consists of shedding light on possible conflicts among actors with different roles but who need cooperation to achieve satisfactory outcomes. Further, Activity Theory provides the analysis instruments to plan situated and contextualized changes, leading transformation processes towards actual improvements of the activity system.

In section 2.2, Situated Action (Suchman, 1987, 2002) “brings forth the irreducibility of human actions and interactions to any formalized model and argues against the intrinsic authoritarian objective of building computer-based systems based on formal models”, (De Michelis, 2007). In this way, the observation of situated individual and social actions acquires importance in order to understand how a course of actions develops and what kind of outcomes it produces. Then, focusing on the contingencies in which the actors construct and engage in social actions sheds light on those organizational aspects of work practices on which also mediating artefacts and technology impact.

In section 2.3, the concept of Distributed Cognition (Hutchins, 1993, 1995) aims at emphasizing the work conceived as socially distributed practice, where learning processes happen through communicative interactions that are strategic for designing technical artefacts tailored to the community in which they are used.

In section 2.4, Communities of Practice (Wenger, 1998) clearly defines those key dimensions that make complex activity systems professional communities, and that this approach makes available to the analysis, and namely: mutual engagement, joint enterprise, and shared repertoire.

Then, within the frame of Argumentative Theory in section 2.5, reference schemes and guide-lines help to analyse communicative interactions both from the normative and descriptive point of view. Intertwining contributions in this field come mainly from three

principal representatives: Van Eemereen (Van Eemereen, 1992, 2004); Walton (Walton, 1996, 1998); and Rigotti (Rigotti, 2002, 2006). Their recommendations are then integrated with other suggestions (Heritage, 1997, 2004) for the empirical analysis of specific interactions at work (in chapter 7).

2.1. Activity Theory

Activity Theory is now a multidisciplinary theory that offers a framework and a set of concepts to explicate social components and internal relations of an activity system. The worth of this theory consists of providing both individual and collaborative perspectives on practices shaping collective activity systems, also considering historical development of events (Engeström 1987 and 2004; Nardi, 1996; Kuutti, 1996). The main contribution to the research is that of thinking beyond what is wrong with the pure technology but stressing the complexity of the wider context, including different subjects with their paths of interactions. The activity is conceived as the minimal meaningful context for understanding individual actions. Originally, the representation was reduced to three basic components: subject, object and instruments (or mediating artefacts), focusing exclusively on the level of individual actions mediated by artifacts to the goal attainment (figure 2.1).

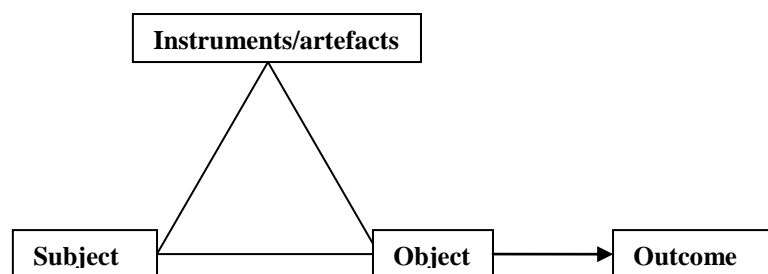


Figure 2.1: Classical triadic representation of actions.

But this level of representation did not explain the actual motives behind the actions, and made it very difficult to account for socio-cultural and collaborative aspects of goal attainment and human behaviour.

To overcome such implicit limitations, Engeström (1987) expanded the concept of activity. In his perspective, it was necessary to move from the analysis of individual actions to the analysis of their wider activity context, changing the original meaning of “subject” and including three more components: rules, community and division of labour. Explicitly considering the relationship between an individual (subject) and her environment made it possible to better understand the concept of activity and to create a new model of Activity Theory (figure 2.2). Engeström’s representation considers the

subject as individual (or sub-group) belonging to a wider context, whose agency or commitment is chosen as the point of view in the analysis. The object refers to the “raw material” to which the activity is directed, connecting individual actions to the collective activity. The object is then moulded and transformed into outcome/s with the help of mediating artefacts⁷, physical or symbolic. The community of the system refers to those individuals or groups who share the same general objects, and are defined by their division of labour and shared norms and expectations. While, division of labour refers to roles and responsibilities, to how a community is implicitly or explicitly organized, considering both the horizontal division of tasks and the vertical division of power and status among the community members. Rules cover both explicit and implicit norms, conventions and social relations that constraint actions and interactions within the activity system (i.e., the work place).

The outcome becomes the result of new and complex patterns of interaction that reflect contingents and constraints of the activity and gives broader meaning to the various individual actions. In particular, also the subject–community relations – communicative relations are taken into consideration as integral aspects of the activity system.

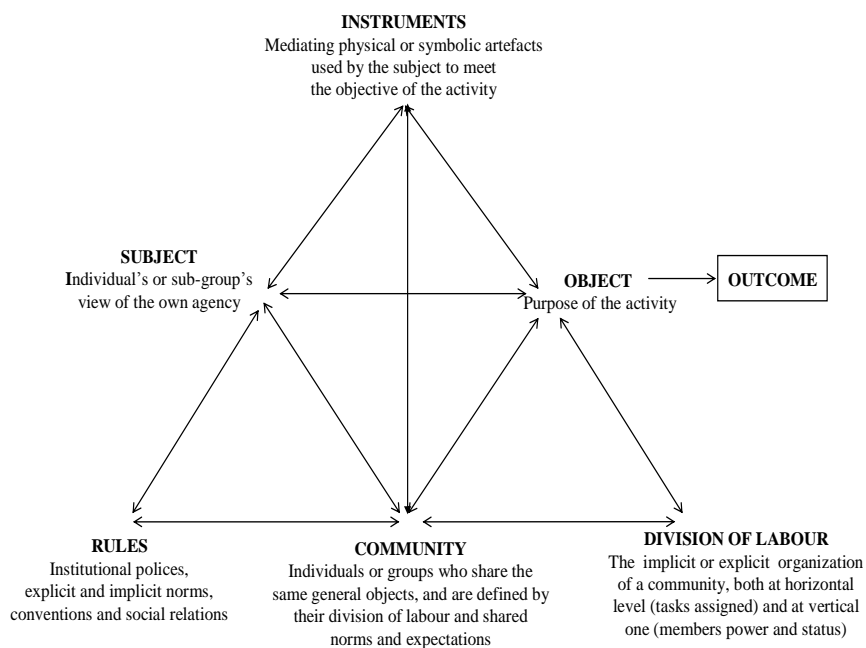


Figure 2.2: A Complex Model of Activity System.
Adapted from Engeström's (2004) systemic model of activity.

⁷ In this context the noun *artefact* refers both to hand-made or machine *tools* and to symbolic or psychological instruments such as signs. Within Activity Theory and the other theories here presented, the artefacts are conceived as integral and inseparable components of human functioning.

Within this perspective, the collective activity of a community will look quite different depending on the point of view of the considered subject (or sub-group). Often individual subjects are not consciously aware of the main object and motive connected to the collective activity. The heterogeneous and multivoiced nature of the activity system consists of subjects who often present different histories and cover various positions in the division of labour, collaborating in the achievement of the object of the activity in different, partially overlapping and partially conflicting, ways.

As a consequence, such an activity system is populated by continuous constructions and renegotiations, presenting incessant movement between the nodes of the activity. For instance, tasks are reassigned and divided; rules may be questioned, reinterpreted, and turned into new instruments and objects; object may be transformed into outcome, and then turned into instrument, and later perhaps into rule (Engeström, 1996). The activity model reflects an intertwined system: if one corner changes, the system becomes unstable and must develop to obtain renewed stability.

In these circumstances, the lack of suitable coherence and cooperation among the subjects can generate continuous conflicts and contradictions, often representing the basis of the activity system transformation. Such conflicts occur between any or all relationships of the activity system. Further, interacting with a network of other activity systems, outside influences may come in and modify the internal status. Engeström (1987) classifies these contradictions within and between activity systems as the driving forces in human learning and development. Four levels of contradictions are described (figure 2.3).

Primary inner contradictions (1) affect each internal component (corner) of the activity system, acting as continuous source of instability and development. They concern conflicts of commodity between use and exchange value. For instance, the tension present in any design project between the best possible solution and what may be designed with the time and resources available.

Secondary contradictions (2) occur between the central components (the corners) of the activity. For instance between object and mediating artifacts, when challenging issues are faced with rather weak instruments of work – these kinds of conflicts are specific to each subject's role: e.g., actors required to use information system may find difficult to perform their tasks if not suitable instruments (such as help manual or intuitive interface) are provided; or designers and developers may not have right instruments (such as proper documentation, time to learn and to work, human resources, etc.) at disposal to develop the information system as object of their activity. Other examples concern conflicts between object and division of labour, when too fragmented division of labour prevents from reaching joint and co-shared vision of the activity object; between community and rules, when the community does not respect or even does not know rules that should steer work practices including those relevant to the use

of specific technologies; or between rules and subject, when there are rules too weak or inconsistent with real practices, thus preventing subjects from meeting the object of the activity.

Tertiary contradictions (3) appear when culturally more advanced object and reasons are introduced into the activity, leading the community of practice to new stages of development. For instance, when new procedures of work are introduced, as making use of peculiar technology, habits and working practices can change, but they require clear and shared understanding of the reasons which led to adopting the new technology.

Quaternary contradictions (4) emerge between the activity looked at and the neighbouring activities. It happens when actors are required to comply with new rules or procedures of work, as working on and through a new technology. For instance, lecturers invited from other companies or universities are required to comply with the activity system of the institute or organization hosting them. This situation may entail changes around teaching and learning procedures, or concerning final assignments, or about how developing research projects. And thus, it inevitably meets resistances.

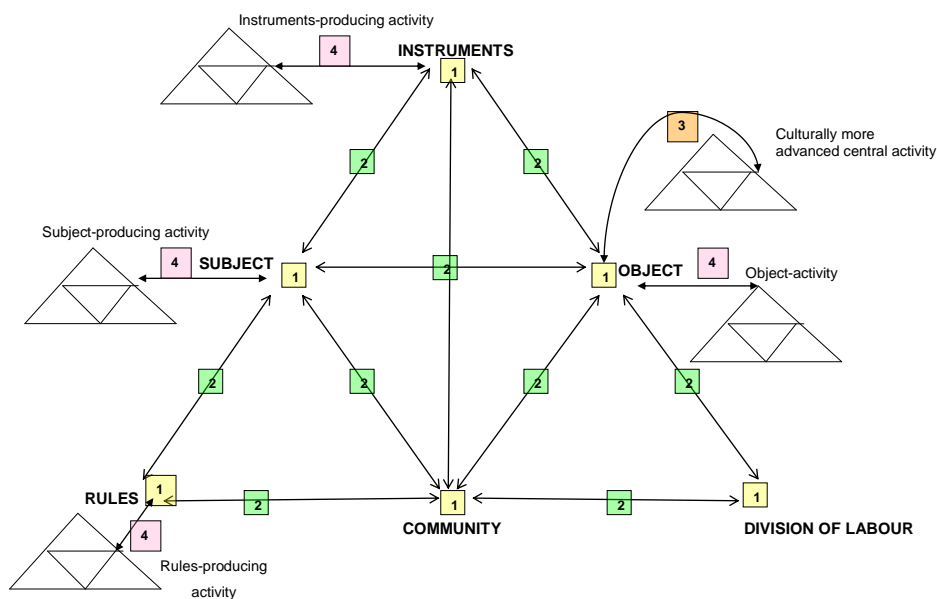


Figure 2.3: Relations between activity systems in terms of classes of contradictions (1=primary; 2=secondary; 3=tertiary; 4=quaternary). Adapted from Carroll, 2003.

Contradictions and ability of mediation are the two key concepts to shape understanding as to how an activity system works.

In Engeström's systemic model, three relationships are conceptualized, each of which is mediated. Instruments mediate the relationship between subject and object; rules mediate between subject and community; whilst division of labour mediates

between object and community. The complex structure of mediation within Activity Theory highlights the historical and mediated nature of the collaborative behaviours. For instance, working practices are culturally situated and mediated by artifacts that are communicative, symbolic, and material, involving also division of labour among community members, and being oriented towards work objects that are partially already provided and partially generated by the activity itself. Historical development implies development of artifacts and environment. And really the building of artifacts reflects modes of acting in the given activity system, allowing understanding both the pre-condition and the result of the social activity (Bertelsen & Bodker, 2003).

Being by its nature multidisciplinary, Activity Theory contributes to maintain the relationship between the individual level and the collective and social ones, grasping emergent features in individual and social transformation mediated by cultural artifacts. But also, it emphasizes opportunities for the innovation and for developing new collective practices and competences, in parallel with organizational changes.

2.1.1. Applicability of Activity Theory to the research

Activity Theory aims at providing a comprehensive prospective of the activity system and of its subjects (or actors). It is deeply contextual, oriented at understanding historically situated practices, the activity objects (partially provided and partially generated), the mediating artifacts, and the social organization. It approaches human cognition and behaviour as embedded in collectively organized, artifact-mediated activity systems, investigating and explaining qualitative changes in human practices over the time.

The contribution of Activity Theory to the research is, first of all, to think beyond what is wrong with the pure technology, and to stress the complexity of the wider context, including different subjects with their working and communicative paths of interactions. Designing technical “core system” alone is not enough, but it requires to handle contextuality in information system design, taking into account individual persons and their relations (Kuutti, 2004). Further, the ongoing transformation in the organization of work is closely related to the development and the implementation of information technology. Therefore, studying information technology requires tackling different issues not only belonging to computer science or software engineering but also, and increasingly rightfully, to the realm of the social sciences, such as psychology and sociology, cognitive science and communication.

Concerning the case study, the purpose is to understand, making use of the activity system model, components and internal relations of the analysed context (i.e., the ALaRI institute), perceived as a multilayered network of interconnected activity systems (such as research and education, but also designing, developing, and using advanced information system). Further, the analysis of the different activities considers multiple

subjects' points of view with the goal of highlighting possible conflicts or contradictions. For instance, if the activity object is developing an accessible and usable advanced information system, supporting remote cooperation to manage research projects and learning activities, the desired outcome will be a technology meeting the community's needs with efficiency and effectiveness. While the subject's point of view will include both persons in charge of the technology building and the potential users; the community represents all the actors of the academic institute (lecturers, students, staff, Scientific Committee, industrial collaborators, alumni). The available instruments include not only technical material such as tutorial that designers need to develop the information system or services that users are required to learn through guidelines or interface tools; but they include also available resources, time constraints and human efforts. Then, the rules concern those institutional policies and social norms that govern the community, and through which the actors should steer their working practices. Finally, the division of work defines roles and responsibilities that should make clear who is in charge of what, and which are the actors' activities.

Tailoring two key concepts of Activity Theory, contradictions and mediation, to the case study gives rise to some interesting questions about factors that have affected development and use of the technology, and namely:

- Are there contradictions between central components of development and of use of the information system?
- Is stable and well-balanced the activity system involving the intranet project according to the present community organization (i.e., mediating artifacts, rules and division of labour) to create useful and accessible information system?
- Is it possible to improve the activity system starting from the identification of these contradictions?

According to Activity Theory, it is possible to argue that a satisfactory and efficient use of the information technology will not be achieved unless attention is paid to:

- Developing instruments and mediating artefacts through which subjects feel able to achieve activity objects, producing useful outcomes for the whole community.
- Developing rules and practices which community feel comfortable with and can apply consistently, enabling subjects to comply with them effectively.
- Developing a division of labour (i.e., roles and responsibilities) which enables subjects to get clear meaning of the activities at the institute, sharing individual contribution at community level.

2.2. Situated Action

Theory of Situated Action contributes to the research as far as it is concerned with the ethnographic analysis of human situated interactions with mediating artifacts like complex technologies, considering working practices and workplace as mutually

constituted. The premise is that human interactions cannot be explained in terms of existing cognitive schema or as determined by institutionalized social norms. But each actor formulates an own awareness of her actions, according to her own particular vision of the activity object and organization. As a consequence, decisive factor becomes the coordination of work towards a shared orientation that is continually reconstituted within the complex dynamic of relations among technologies, persons, and places.

In this perspective, also the design of new technology needs to evolve, shaping new forms of design, intertwining social and technical components, thus constituting strong and recurrent connections between professional design activity and use of the technology, according to a “practice based design approach” (Suchman, 2002). This means focusing the attention at the same time on situated design processes (i.e., coordinating practices and sharing mutually actions) and on the product (i.e., developing features thinking about which activities will support and in which context).

From Situated Action’s point of view, the unit of analysis is now the individual action strongly connected to the social-cultural context in which it takes shape, and to the use of mediating artefacts, such as technology systems (Suchman, 1987). Thus, through the study of specific situated actions is possible to understand and tackle also technological issues. The “situated action” underlines how the development of each action depends on material and social circumstances in which it occurs. Suchman’s studies emphasize “how people use their circumstances to achieve intelligent action, rather than attempting to abstract action away from its circumstances and represent it as a rational plan. Rather than build a theory of action out of a theory of plans, the aim is to investigate how people produce and find evidence for plans in the course of situated action. More generally, rather than subsume the details of action under the study of plans, plans are subsumed by the larger problem of situated action“, (Suchman, 1987:50).

In this way, planned actions - as designing or using information technologies - are worth only when considered as resources to review and to adapt according to specific circumstances, and not as plans binding action details to perform in future. In parallel, the rational calculation of costs and benefits based on out-of-context approach cannot drive the design of technology cut of from the social and cultural context of adoption.

The concept of Situated Action bases on two important premises. The first one considers the cognitive processes as social processes, not occurring inside the individual minds, but distributed among the individuals and strictly depending on mediating artifacts and on culturally and socially determined practices. The second premise considers the actions in relation to the peculiar and specific conditions in which they take place, in order to understand and to explain their primary meaning.

From these premises, the plans of action should be general and not detailed, applied not as an abstract and ideal out-of-context approach to decide the development of concrete actions within a workplace, but as resource and means to direct and to address

the actions already in progress within the local interactions. The goal is to bridge needs and demands of a specific environment by means of situated and suitable answers.

Following this argument, also the language used in a well-defined environment is a form of situated action. The language, in fact, stems its communicative meaning from, and acquires its specific significance in, the contingent environment and circumstances in which it is used. Thus, a co-shared and intelligible action is achieved during communicative interactions, and it refers to specific situations (tacit or explicit).

2.3. Distributed Cognition

The concept of Distributed Cognition drives the attention on the importance of understanding the social organization of the work. In this research, it reveals a twofold purpose. On the one hand, Distributed Cognition shows the necessity of a close examination of the social and technological environment in which work practices take place to develop technologies not for individuals working alone, but to support the interactions among co-actors through tools. On the other hand, the theoretical perspective of Distributed Cognition underlines how the ability to tackle problems is distributed over a network of individuals cooperating with one another to achieve a solution. Therefore, it recognizes the value of sharing different individual knowledge architectures that bring in different representational properties of the resources available. Hutchins explains (1995:262) that “all human societies face cognitive tasks that are beyond the capabilities of any individual member. Even the simplest culture contains more information than could be learned by any individual in a lifetime, so the tasks of learning, remembering, and transmitting cultural knowledge are inevitably distributed”.

In this sense, within Distributed Cognition, the analysis of the life-cycle of the technology aims at investigating how, and at which level, distributed units can be *coordinated*, by considering interactions among single individuals or actors, the material environment, the instruments and the technologies. In particular, the emphasis is on the learning processes that led both to developing the intranet system and then to using it. Within a joined, distributed, and mediated activity system, the presence of and the access to suitable communication flows and channels become relevant to learning process, since these channels determine the measure of availability of the context to the learning process itself. “Lines of communication and limits on observation of the activities of others have consequences for the process of acquiring knowledge, because they determine the portion of the task environment that is available as a learning context to each task performer. The outer boundary of the portion of the task that can be seen or heard by each team member is that person’s *horizon of observation*” (Hutchins, 1995:268).

Such measure of availability can change according to each member’s personal position and role within her/his activity system. The measure of accessibility to the

communication channels for each member depends not only on the existing “open interactions” within a community or group but also on the “open tools”, i.e. on how mediating artifacts have been designed and are used. “The design of technology can affect its suitability for joint use or for demonstration and may thereby constrain the possibilities for knowledge acquisition. The interaction of a task performer with a tool may or may not be open to others, depending upon the nature of the tool itself”, (Hutchins, 1995:270).

The concept of Distributed Cognition shows how gestures, instruments, and communicative interactions contribute all together to support the cognition and the action within a complex social activity system. “The proper unit of analysis for talking about cognitive change includes the socio-environment of thinking. *Learning is adaptive reorganization in a complex system*. It is difficult to resist the temptation to let the unit of analysis collapse to the Western view of the individual bounded by the skin, or to let it collapse even further to the *cognitive* symbol system lying protected from the world somewhere far below the skin. But, as we have seen, the relevant complex system includes a web of coordination among media and processes inside and outside the individual task performers “, (Hutchins, 1995:289).

As a consequence, the focus of attention shifts from the study of individual mind towards the study of relations among more individuals constituting a group, and it considers the processes of distributed cognition within real social contexts of activity.

2.4. Communities of Practice

For the present research, the concept of *Communities of Practice* helps to focus the attention on the effects and on the consequences of how the individual activity is constituted within a well defined social context. In particular, through the key concepts of mutual engagement, joint enterprise and shared repertoire, the goal is to underline whether and how these dimensions affect and characterize the social context of research, and which are the learning opportunities and the level of development of such a community.

The *Communities of Practice* show how human actions are mediated by cultural artifacts and characterized by processes of negotiation and construction of co-shared meanings within specific communities (Wenger, 1998). How these processes develop within the communities, it depends on how the communities face and feel situations of individual identity construction, learning, preservation, and innovation. In particular, three key dimensions characterize the communities of practice during their evolution (figure 2.4), and namely:

- the mutual engagement
- the joint enterprise
- the shared repertoire

The mutual engagement underlines the primary aspect of belonging to a community that bases on sharing with other members different but reciprocal engagements (i.e., doing different things together), around which practices and communicative interactions are organized. “Practice does not exist in the abstract. It exists because people are engaged in actions whose meaning they negotiate with one another“, (Wenger, 1998:73). Thus, the mutual engagement requires complementary actions of participation to the common enterprise, actions that underline the specificity and the individuality of each member’s activity.

The joint enterprise refers to the achievement of co-shared objectives that are not a pre-requirement, but the outcome of a negotiation process starting from the awareness of sharing a mutual engagement. How the sense of joint enterprise is defined depends on how the members interact among themselves through communicative and working practices. “Because mutual engagement does not require homogeneity, a joint enterprise does not mean agreement in any simple sense. In fact, in some communities, disagreement can be viewed as a productive part of the enterprise. The enterprise is joint not in that everybody believes the same thing or agrees with everything, but in that it is communally negotiated“, (Wenger, 1998:78). Even when the community is the outcome of an outside mandate, its meaning is always based on a co-constructed concept of joint enterprise: “The enterprise is never fully determined by an outside mandate, by a prescription, or by any individual participant. Even when a community of practice arises in response to some outside mandate, the practice evolves into the community’s own response to that mandate“, (Wenger, 1998:80).

Finally, the shared repertoire reflects the common shared heritage. It consists of various resources produced during the community history, such as a peculiar language or vocabulary, instruments, gestures, practices. Such common resources can also evolve or change over the time, contributing to the evolution and innovation of the community itself. The dynamic nature of the repertoire makes it possible to build more and more complex forms of activity, provided that the mutual engagement allows opportunities of negotiation. “From this perspective, ambiguity is not simply an obstacle to overcome; it is an inherent condition to be put to work“, and again “The real problem of communication and design then is to situate ambiguity in the context of a history of mutual engagement that is rich enough to yield an opportunity for negotiation“ (Wenger, 1998:84). Often, really a tacit and unspoken shared repertoire provides the awareness of the efficiency and development level of that community.

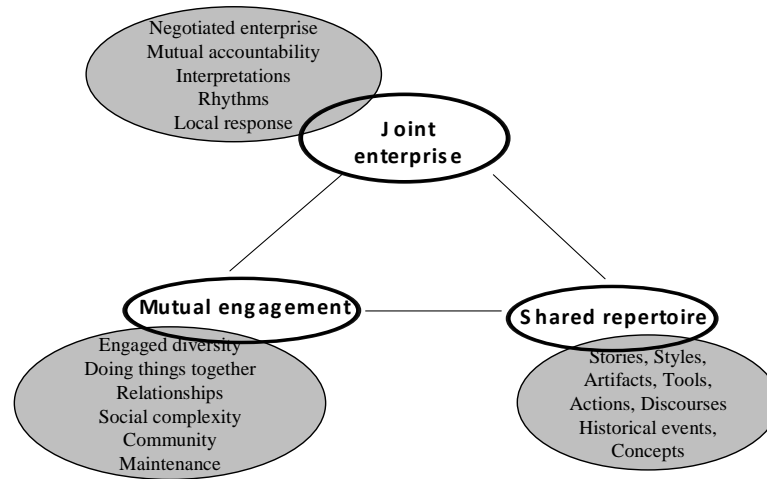


Figure 2.4 Dimensions of practice as the property of a community (adapted from Wenger, 1998).

The community evolution and growth basically depends on intertwining two main contributions: each member's personal expertise and the skill of storing and spreading it within the community. Thus, the expertise is the result of negotiation between each member's personal history and the community history. In this way, learning processes base on two main factors: the world-wide everyday expertise of each individual belonging to a community, and the expertise of the community itself that is necessary to share in order to become real member. Therefore, a real participation in a community of practice leads to acquiring those expertises that are socially built and shared out within the community (Zucchermaglio, 2002).

The community can present three levels of development that characterize a good context to acquire expertise. The first level refers to the community approach towards the acquisition of new expertises and opportunities. The second refers to the aptitude of sharing that support the mutual engagement, i.e. the awareness of each member that the own engagement, interacting together with the other members' ones, contributes to maintain and develop the community. The third level refers to the community awareness about its repertoire and about how this one is integrated within the community social practices. This awareness allows the community to deal with a dynamic repertoire that can be modified and increased, developing the own heritage of expertise.

Within this perspective, great emphasis is also on the interactions and "contaminations" among different communities that can bring in opportunities of acquiring and developing expertises.

The value of Communities of Practice consists in providing a conceptual and practice perspective of the social theory of learning as social participation within a community. This social participation entails not only taking active part into the social

practices, but also building the own identity with respect to the own engagement and to the meaning given to it within the specific community. It reveals an inseparable interrelation between the configuration of the collective (i.e., the mechanism of social cohesion) and the configuration of the subjective (i.e., the individual experience as engagement into the social practices), according to a process of mutual constitution.

Building an identity consists in the ability to negotiate the meaning of the own experience within a community, creating new forms of meanings, socially co-shared, and therefore defining the own forms of belonging to that community.

2.5. Argumentative Theory: argumentation in dialogic interaction

An empirical study of situated practices can uncover local patterns of activity and cultural specificity of communicative interactions. For the research purpose, why should be it important to take into consideration and to analyse specific communicative interactions within the workplace?

As Vygotskij stated (1978), the way a person communicates reveals the social function of the individual thought: on the one hand, it reflects the product of the personal culture, and, on the other hand, it makes possible to take part in the dynamic and social interactions among individuals. How these communicative interactions happen and are performed may have a great influence not only on human relationships patterns but also, and especially, on concrete outcomes deriving from these human activities. Therefore, studying communicative interactions can help to identify possible distortions, incomprehension, or manipulations, also over long periods, that are then visible and tangible as side effects into the production of technological artifacts.

For this research, making use of argumentative analysis can help to shed light on the actors' behavioural models during their communicative interactions. It helps to better understand peculiar conceptual models, as the designer's and user's ones, and also to analyse communicative patterns during problem-solving discussions, deliberations, negotiations, or simple information seeking. Often persons involved in dialogic interactions are more oriented to support their personal interests at stake, forgetting their specific roles within the community they belong to, and the final goal of their activity. For instance, designer's duty should be realizing technologies that meet users' expectations, and make as easy as possible the work procedures. In turn, user should freely express her own point of view without being ill at ease in designer's presence and feeling incapable of understanding the technical structure of the product. Further, discussions on the same topic but with different speakers, and developed in different times, run the risk of missing the primary purpose, shifting the focus of the attention from a detail to another but not considering the kernel problem, and thus not resolving the matter at issue. In this perspective, also the argumentative analysis can be useful to

investigate the complexity and the difficulty in the management of those processes of designing, developing and using technologies, such as in the case here ahead presented.

The adopted approach refers to methods and conceptual tools used to analyze and evaluate arguments during dialogic interactions, in the effort of understanding the importance of the communication processes during specific social practices.

Here below, I briefly introduce some key concepts of argumentative analysis, particularly considering the contributions of three principal representatives in this field: van Eemeren (1992, 2004), Walton (1996, 1998), and Rigotti (2002, 2006).

In order to support the soundness for the arguments used in most arenas of human activity, beside the original criterion of logical validity, the founding fathers of the modern argumentation theory, Toulmin and Perelman, introduced the ideas of *field dependence* (Toulmin, 1958) and of *target audience* (Perelman & Obrechts-Tyteca, 1958-1969) as criteria measuring the reasonableness of an argumentation.

The idea of *field dependence* has influence on the procedural form of argumentation, in which Toulmin distinguishes various steps in the defence of a standpoint or a claim. These steps are always the same, irrespective of the kind of subject the argumentation refers to. Figure 2.5 shows the basic scheme where the warrant, connecting data adduced in the argumentation with a claim that is defended, is made more or less acceptable by a backing.

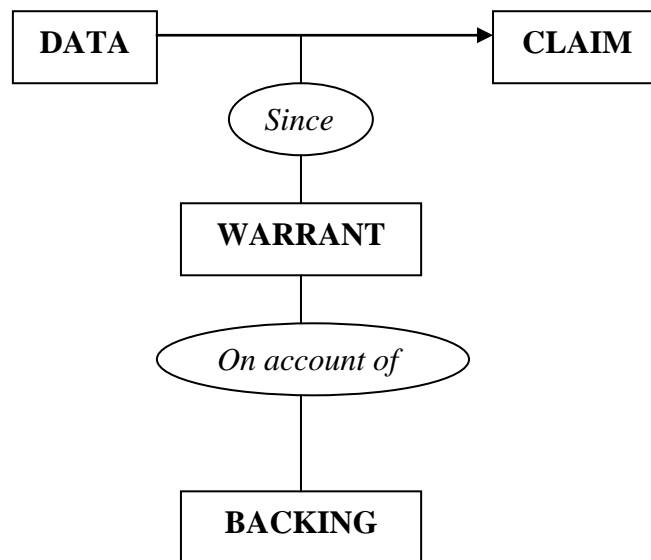


Figure 2.5. Toulmin's basic model of argumentation

But what kind of backing is required depends on the field to which the question at issue belongs. For instance, an ethical justification requires a different kind of backing

than a legal justification. In this sense, the evaluation criteria for determining the soundness of argumentation are “field dependent”.

While the idea of *target audience* regards argumentation as sound if it adduces (more) assent with the standpoint that is defended among the audience the argumentation is aimed at. This “target audience” consists of all those people who are for the speaker or writer the embodiment of reasonableness.

Subsequently, there were various contributions towards more formal or more descriptive dialectical systems⁸. But only later, a dialectical model developed with the aim of bridging the gap between normative and formal orientation and the real complexity of the argumentative interaction (van Eemeren & Grootendorst, 1984, 1992, 2002, 2004). This model, called “the pragma-dialectical theory of argumentation”, is based on complex research strategies for the descriptive analysis of arguments. It provides an ideal structure for the resolution of a difference opinion (i.e. the ideal model of *critical discussion*), reconstructing and evaluating all discourse moves that have argumentative relevance according to this ideal model. This reconstruction results in an analytic overview of the resolution process, representing the conversation in terms of a critical discussion (van Eemeren & Grootendorst, 1992).

The Pragma-Dialectical Theory offers a theoretical device to define a procedure for testing standpoints critically, in the light of commitments assumed in the empirical reality of argumentative interaction, with the aim of methodically resolving a difference of opinion about the tenability of a standpoint (van Eemeren & Grootendorst, 1984).

“A different of opinion is only resolved if a joint conclusion is reached on the acceptability of the standpoints at issue on the basis of a regulated and unimpaired exchange of arguments and criticism”, (van Eemeren & Grootendorst, 2004:58).

The value of the model of the critical discussion consists of providing “a series of norms by which it can be determined in what respects an argumentative exchange of ideas diverges from the procedure that is the most conducive to the resolution of a different of opinion” (van Eemeren & Grootendorst, 2004:59). Such ideal model specifies four stages (figure 2.6) that can be distinguished analytically in the resolution process, considering also the types of speech act that can be instrumental in each particular stage.

⁸ Dascal et al., 2005, pp.1-20, provide an overall view on the main representative authors in argumentation field.

Stages	<i>Parties</i>	
	<i>Protagonist</i>	<i>Antagonist</i>
Confrontation	Advances a standpoint	Express doubt with regard to a standpoint
Opening	Determine the common material and procedural starting points (the co-shared common ground)	
Argumentation	Advances argumentation	Reacts critically to argumentation
Conclusion	Determine the results of the discussion	
	maintains / retracts standpoint	retracts / maintains doubt

Figure 2.6. The ideal model for critical discussion (adapted from van Eemeren, 2004)

A set of ten basic pragma-dialectical rules drives all stages of the critical discussion and the speech acts performed in any of these stages (as reported in note)⁹. The pragma-dialectical rules provides necessary conditions and procedural definition for a constructive argumentation with the aim of preventing obstacles that can arise during the real-life argumentative interactions and that may be impediment to the resolution of the

⁹ Rules for critical discussion (in van Eemeren, 2004): 1. The freedom rule: parties must not prevent each other from putting forward standpoint or casting doubt on standpoints; 2. the burden-of-proof rule: a party who puts forward a standpoint is obliged to defend it if asked to do so; 3. the standpoint rule: a party's attack on a standpoint must relate to the standpoint that has indeed been advanced by the other party; 4. the relevance rule: a party may defend his standpoint only by advancing argumentation related to that standpoint; 5. the unexpressed premise rule: a party may not falsely present something as premise that has been left unexpressed by the other party or deny a premise that he himself has left implicit; 6. the starting point rule: no party may falsely present a premise as an accepted standpoint, or deny a premise representing an accepted starting point; 7. the argumentation scheme rule: a standpoint may not be regarded as conclusively defend if the defence does not take place by means of an appropriate argumentation scheme that is correctly applied; 8. the validity rule: the reasoning in the argumentation must be logically valid or must be capable of being made valid by making explicit one or more unexpressed premise; 9. the closure rule: a failed defence of a standpoint must result in the protagonist retracting his standpoint, and a successful defence of a standpoint must result in the antagonist retracting his doubts; 10. the usage rule: parties must not use any formulations that are insufficiently clear or confusingly ambiguous, and they must interpret the formulations of the other party as carefully and accurately as possible.

difference of opinion. Such impediment consists usually of wrong discussion moves that are traditionally known as *fallacies*¹⁰.

Further, the parties engaged in argumentation while are presumed to hold to the dialectical objective of the discussion stage concerned towards resolving a difference of opinion, they also attempt to have things in their way, resolving the difference in their own favour, according to rhetorical aspects. In this effort, the parties make use of the so called *strategic manoeuvring* (van Eemeren & Houtlosser, 2002), using available opportunities to handle a certain dialectical situation in the way that is most favourable for a certain party. This manoeuvring is seen as a comprehensive management of an argumentative enterprise, in the attempt of reconciliation between dialectical obligations and rhetorical ambitions. Within the pragma-dialectical analysis, the focus is on “the demarcation point between sound and derailed strategic manoeuvring and the conditions under which particular types of strategic manoeuvring must be considered an offence against the rules for critical discussion” (van Eemeren & Houtlosser, 2005:23). Strategic manoeuvring can take place in all four stages of the discussion, and on various levels (on *topics* level, by choosing from the topical potential; on *audience orientation* level by adapting to the audience demand; and on level of exploiting *presentational devices*). Every time both parties may be expected to select the material they can handle well or that suits them best to develop the perspective on the matter that is most agreeable to the audience, presenting their contributions in the most effective way (van Eemeren & Houtlosser, 2002:138-141; and 2005:28-31).

Such approach can exert a triple benefit in the analysis of argumentative interaction, since it allows: i) getting a clearer view of the rhetorical aspects; ii) achieving a subtle and thorough understanding of the rationale behind the various discussion moves; and iii) developing a more mature sense on the nature of the *fallacies*, investigating both the fallaciousness (intentional or unintentional) and the deceptively apparent reasonableness of the various moves occurring in ordinary argumentative practice.

Another important contribution to the analysis of argumentative interactions concerns the definition of the dynamics of *commitment* as dependent on the *type of dialogue* (Walton & Krabbe, 1995) in which participants are engaged. In particular, Walton (1998) underlines the relevance of an argument as relative to the specific goals and rules of the type of dialogue in which it is put forth.

In this direction, Walton provides a theoretically motivated toolkit for the identification, the analysis and the evaluation of argumentations within argument schemes (i.e., argument forms representing inferential structures of arguments used in everyday conversations, like the argument from expert opinion, and in special fields of context, like legal or scientific argumentations, Walton, 1996) along with a set of

¹⁰ A classification of fallacies as violations of rules for critically discussion that prevent or hinder the resolution of a difference of opinion are widely discussed in van Eemeren, Grootendorst et al., 2002, ch. 7 and 19; and in van Eemeren & Grootendorst, 2004, ch.3 and ch.7.

matching critical questions. The key conceptual tools concern: *argument schemes*, *diagramming* of arguments, the use of *critical questions* and the classification of *dialogue types*. These tools help to grasp whether and how an argumentation scheme that is neither deductively valid nor inductively strong can be binding. In fact, “many of the most common argumentation schemes are based on generalizations and warrants that are not absolutely tenable, and are subject to exceptions. They result to be useful in situations of uncertainty where knowledge is incomplete.” (Walton, 2005:52). Thus, arguments can be diagrammed to identify missing premises and to evaluate the achieved conclusions. Then, once a particular argument identified in the diagram fits a given argumentation scheme, a set of matching critical questions are raised. Asking the right critical questions allows pinpointing the critical weakness in the argument, by shifting the weight of presumption back to the arguer. Thus, the argument is subject to doubt and it is not restored until the question has been answered by giving the right type of reply.

Particular interesting for the research purpose is the attempt to classify the type of dialogue and goal, representing the context in which the argumentation is used (Walton, 2005). In this perspective, different *dialogue types* (Figure 2.7) impose different constraints on the critical questioning of arguments schemes and on the type of admissible response to criticism.

Type of Dialogue	Initial Situation	Participant's Goal	Goal of the dialogue
Persuasion	Conflict of opinions	Persuade other party	Resolve or clarify issue
Inquiry	Need to have proof	Find and verify evidence	Prove (disprove) hypothesis
Negotiation	Conflict of interests	Get what you most want	Reasonable settlement that both can live with
<u>Information-seeking</u>	Need information	Acquire or give information	Exchange of information
<u>Deliberation</u>	Dilemma or practical choice	Co-ordinate goals and actions	Decide best available course of action
Eristic (quarrelsome)	Personal conflict	Verbally hit out at opponent	Reveal deeper basis of conflict

Figure 2.7: Set of dialogues types characterized on the basis of joint goals shared by participants (adapted from Walton, 2005).

Obviously, in real conversational settings often there are mixed dialogues, combining features of the six basic types, and entailing dialectical shifts from one type to

another during a sequence of argumentation. Such dialectical shift reveals to be crucial for analyzing and evaluating the soundness of real argumentations. When the shift is based on embedding two dialogues that are structurally connected, the argumentation in one helps to support the argumentation in the other, towards the final goal. On the contrary, some shifts can be negative or illicit, and be associated with fallacies, representing a deterioration of the dialogue.

As further contribution, Rigotti elaborated a scheme (the *Argumentative Interaction fish-map*, 2005) conveying and integrating some main aspects of the previous mentioned contributions. Rigotti proposes to approach the analysis of argumentative interactions following a path that can be roughly divided in three main steps.

The first step refers to the constitution and proposal of the discussion object (constitution of the standpoint). The starting point is the individual decision making along with the “desire” of achieving a specific “goal”, but also the necessity to interact within a community. Such a starting point is very important because it shows the argumentation practice as social practice, where the emphasis is on the pragmatic and dialogic dimension of the communication, oriented towards a specific addressee¹¹ and seen as an *inter-action* between two or more participants. As a consequence, the knowledge of the communication context together with the dynamics of human relations (the “interaction field”) acquires a strategic relevance in order to recognize both possible communicative practices to adopt (negotiation or bargaining; mediation; problem solving; deliberation; controversies; etc.), and the final purpose of the community itself, that should be in compliance with its specific activity.

The second step concerns the choice of the argumentative strategy, building a strategic manoeuvring according to rules and stages of the critical discussion. Basically, this step consists of two main dimensions: one critical and one relational. The critical dimension is supported by the logic, which includes logical reasoning¹² and specific *topics* of argument¹³ (Rigotti & Greco, 2006). The relational dimension is supported by the psychology, focusing on psychological and behavioural elements, habits and emotions. During this step, the argumentative analysis aims at shedding light on the soundness and validity about how the argumentation has been built and conducted, with respect to rules, stages, but also considering the mission of the interaction field. In fact, possible derailments can lead to upsetting a correct argumentative structure, entailing fallacies or manipulations which take far away from the activity primary mission.

¹¹ The addressee is not merely a passive hearer, but during the argumentative interaction she is called to be a real and aware stakeholder, since what is decided at the end of the argumentation will have an influence on herself, her own environment or work place.

¹² Here the noun *reasoning* includes both the notion of rational (i.e., respecting logical coherence, non-contradictory) and the notion of reasonable (i.e., considering all relevant aspects with regard to the topic concerned).

¹³ In this context, *topics* consist of a systematic method to produce and locate arguments, defining their specific structures, in order to support or defeat a thesis.

Then, the quality of the overall argumentation is evaluated in the third and final step, considering the exposition (according to classical models), the logical validity and the communicative effectiveness in reaching the chief goal.

A sound argumentative interaction should be able to create reasonable consensus starting from shared values, and then it moves towards non-shared values to be discussed and to achieve an agreement. In this way, the role of argumentation consists of bridging the gap between established common ground and new issues on which consensus must yet be found.

The approaches to the argumentative analysis here above presented offer several advantages for evaluating communicative interactions. First of all, a reference normative framework of analysis is provided, and not only descriptive. Second, the focus is on participants' verbal behaviour, considering the whole evolution of the discussion and of the single communicative interactions, and not only the final outcome. Finally, empirical, real, and natural interactions are object of analysis.

Referring to a normative framework allows investigating on which basis and why a discussion can derail, and which the problem consists of, considering the implications of the observed elements. Further, it is possible to point out the consequences of these elements for the resolution of the discussion. And it helps to focus on the very elements that need to be observed, that are relevant during the discussion for its resolution. Finally, from the analysis it is possible to suggest improvements for a real fair and constructive discussion.

Listed below are five key-concepts on which the analysis of communicative interactions is based.

1. Joint Action: an action resulting from the coordination of the actions of the participants (Clark, 1996, pp.60-91). A joint action can take place when an agent is not able or does not want to pursue her own goal herself and negotiates with other persons their engagement in the causal chain. Two different scenarios of joint action can be envisaged:
 - a. Cooperation: when both agents share the same goal to pursue in a cooperative way, since it brings benefit to both the co-agents, and so without competition or rivalry
 - b. Interaction: each agent pursues his goal by realising the goal of the other, as described in the "bar" model (Cantoni et al., 2003). Two inter-agents having different goals, leave the realisation of their respective goals to the action of the other, relying on each other for the satisfaction of their desires.

As Rigotti explains (2002:5), "in order to realize cooperation as well as an interaction, humans need to communicate. And communication involves, in its turn, forms of cooperation as well as forms of interaction. Here different mutual commitments are

exchanged in relation to the different speech acts that are accomplished each time. Communicative interaction allows each inter-agent to construct an action scheme coinciding to some extent with the action scheme of the other inter-agent”.

2. Common Ground: the set of common knowledge, beliefs, interests and values which interlocutors as individuals and members of a certain community share and are aware of sharing at the moment of their interaction, with the aim of building an important component of community's identity. It consists of assumptions that speakers take for granted as being part of the shared background, on which every human group (nation, race, political party, social class etc.) founds itself (see also Clark's definition in 1996:92-121). In an ongoing conversation, each new utterance relates to the common ground in two ways: it updates the common ground with new information; and it presupposes that information of such and such a type is already present in the common ground.
 - a. *Endoxa* (gr.: ενδοξα): the culturally shared beliefs and values within a community. According to Aristotele, *endoxa* represent the very core of the enthymemes, giving a very important role to the *enthymematic arguments*. *Endoxa* may be considered as the relevant elements of the common ground of a community, activated and selected through the reference to specific *keywords*, which are of particular significance within the community. Therefore the analysis of some *enthymematic arguments* occurring in community real interactions can show the role of the community keywords and of the *endoxa* in enthymematic arguments (Tardini, 2005; Rigotti and Rocci, 2003).

“The common ground evolves and increases in communicative interaction in two distinct ways: through all the factual material explicitly manifested in communication, and through *accommodation*, i.e. through an adjustment of the common ground imposed by the presuppositions of what has been said” (Greco, 2003:1).

3. Presupposition: the information that an utterance requires in the common ground in order to function as an update is called presupposition. What is presupposed is already part of the common ground of the interlocutors, i.e. it is part of the set of knowledge and beliefs they share. “To presuppose something is to take it for granted, or at least to act as if one takes it for granted, as background information – as *common ground* among the participants in the conversation”, (Stalnaker, 2002:701). So, what is presupposed is what is shared by the interlocutors and constitutes the basis of their relationship; therefore it must not be discussed. Presuppositions are also essential for the developing of culture and science (Tardini, 2003).

There are cases in which the common ground is enlarged by a particular process called presuppositional accommodation. In these cases, the presupposed content is directly introduced into the common ground together with the asserted content, while the truth of presuppositions and the interlocutors' awareness of it are simply taken for granted by the speaker. Presuppositional accommodation can be seen as a device used to let the conversation proceed when the presupposed material can be accepted without being discussed, even if it is not already part of the speakers' common ground. (Greco, 2003:4-5). Accommodation, the process by which new presuppositions are introduced into the speakers' common ground, is a useful device in everyday communication. Nevertheless, there are many possible cases in which the use of accommodation may turn out to be manipulative.

4. Manipulation: a manipulative strategy is able and succeeds to escape the awareness of the manipulated subject. In the specific, "a message is manipulative if it twists the vision of the world (physical as well as social – or human - actual as well as virtual) in the mind of the addressee, so that he is prevented from having a healthy attitude towards decision (i.e. an attitude responding to his very interest), and pursues the manipulator's goal in the illusion of pursuing his own goal" (Rigotti, 2002:6).

The dynamics of manipulation are very close to the dynamics of human error: manipulation involves an error on the part of the manipulated person. In this sense, the verb *to manipulate* means "to induce into error", in other words to foster somebody's errors while blinding him by concentrating his attention only on some positive, but very partial, aspects of the situation under judgement in the decision making process – then if the inducement to the error is intentional or is an unwillingly behaviour should be investigated as a more subtle interpretation (Rigotti, 2002).

5. Fallacies: a form of manipulation that arises from undue inferences; they look like a sound argument, but they are not. As Rigotti (2002:9) explains, "manipulation can intervene also in the inferential processes of elaborating knowledge and making decisions on the basis of reliable information. Within the rhetorical tradition this type of manipulation is called a *fallacy*."

Within the pragma-dialectical approach to argumentation, manipulative moves such as fallacies are evaluated with regard to the broader framework of the pragmatic context of the discussion. Van Eemeren and Grootendorst (1992:103-104) affirm that "in dealing with the fallacies it is important not to exaggerate the role of logic, even if the absolute certainty that a purely logical approach appears to offer is thereby sacrificed. The practical significance of "logical" errors in comparison with other fallacious moves can only be properly assessed if it is first clear what place the argumentation or other speech act in which they occur occupies in the wider context of a critical discussion".

2.6. Research approach to the study case

Using the illustrated framework, the research aims at investigating tackled problems and risks during the phases of design, development, adoption, and use of a peculiar technology. The technology is a web-based remote system created to support a complex network of workflows (in particular, *remote project-centered learning*), integrated with virtual workplaces. In the specific, the research considers not only the designer's technical approach and the user's satisfaction, but especially how the whole management process of the web technology has been driven.

The investigation mainly bases on the analysis of those social practices which are relevant to understand how the life-cycle of the technology developed. The multidisciplinary approach allows discovering different kinds of difficulties internal to the organization itself, stressing those communicative conflicts between who design according to technical approaches and who make use of the technology according to situated practices of use. The aim is to pinpoint the relationships between technical and social aspects, underlining their great interdependence also into the management of the life-cycle of the technology, as well as concerning design, development, maintenance, and use.

Given such premises, the research investigates three principal aspects:

- the institutional¹⁴ context of the workplace;
- the empirical case study (i.e., management and developing processes of the technology);
- the communicative interactions concerning the life-cycle of the technology.

Here follows an overview of the research approach into these three areas of analysis. Details are discussed in chapters 4, 5, 6 and 7.

The Institutional Context is investigated together with the organizational settings considering on the one hand how the context can shape development and adoption processes of the technology, and on the other hand how introducing and using a new technology can affect the organizational settings. In fact, according to Engeström's Activity Theory (1987, 2004), the analysis of the workplace is fundamental, because it provides both individual and collective cultural framework, referring to specific rules and division of labour. Therefore, an accurate description of the *institutional ontology*¹⁵ (Piccini et al., 2006) becomes necessary to recognize the primary purpose of the

¹⁴ The use of the term "institutional" will be better explained in chapter 4.

¹⁵ The *ontology* considers the reference domain as entity defined by essential categories (events, objects, actions) and elements, and by static and dynamic relations among these elements. Where "essential" means "constituent", i.e. without these elements and these relations the reference domain would stop being such a one. In particular the *institutional ontology* defines a set of objects, relationships and events that exist only because their existence is accepted by the community members (see also Piccini, Carassa, & Colombetti, 2006).

workplace and the activity system, by which social actors' roles and responsibilities should be defined, according to formal regulations. The definition of the members' roles along with their work practices and interactions aims at highlighting both the involvement of each individual member in the activity system, and the relationships among the various members. In this way, the accent will be also on the social actors' level of cohesion, evaluating their feeling of participation into and of belonging to a community, according to the key dimensions of mutual engagement, joint enterprise and shared repertoire suggested by Wenger (1998). The aim is to identify the "organizational climate" of the institutional context, i.e. the mood of the organization and of its social system, with its ethical values, but also with its contradictions and ambiguities, where it becomes crucial the ability of negotiation to create trust and approval, especially to support organizational processes involving new technologies and consequently new workflows (Pontiggia, 2001).

Studying such dynamic relations and their impact on the organizational setting leads to uncovering *breakdowns* (Winograd & Flores, 1990), failures or shortcomings as they occur within the community and affect the life-cycle of the technology. This fact emphasizes a strong interconnection and a mutual dependence between the management of the technology (i.e., how it is conceived, developed, released and used) and the organizational setting itself. Whereas focusing only on the efficiency and the functional dimension of the technology reveals the limits of the activity system (Pontiggia, 1997).

In turn, the introduction of the technology affects both the organizational climate and its setting, entailing changes into the processes and procedures of work, altering the *coordination of interdependence activities* (Pontiggia, 1997:122), and consequently individual, groups, and organizational behaviours.

Therefore, within the institutional context, it becomes important to evaluate which conditions or instruments (material or symbolic) are available to provide the social members with suitable supports both for developing useful and efficient technology and for easily adopting it. Supporting the social members also entails reinforcing the concept of community, making them aware of being real stakeholders, with joint interests and benefits that can rise in parallel with the community evolution. The individual and collective growth requires fostering learning processes, through *formal*, *non-formal*, and *informal* approaches (Colardin et al., 2004). At first, because the community itself can be seen as *shared learning histories* (Wenger, 1998); and then because it leads to building co-shared system of meanings that is the *conditio sine qua non* interactions among members of a community can happen. It requires participation and knowledge sharing, through the understanding and continuous renegotiation of joint enterprises, reducing ambiguity, and giving the possibility to create new co-shared meanings within a dynamic community, open to new expertises (Mantovani, 1995; Castells, 2000). In particular, sharing the meaning of the technology helps the social actors to recognize objectives and reasons of adoption, both at the individual and social level, avoiding possible distortions

of meaning that can prevent from using it. In this way, it is necessary to spread awareness of new working procedures and of how these can modify and transform the activities of the community, rather than merely emphasizing a high performance of the technology. Further, particular attention requires collecting the actors' feedback, investigating how individual perceives the adopted technology, the levels of use, the interactions through it, and their expectations. Once the feedback is received, it should be analysed and evaluated addressing the outcomes to the designer and developer team. In turn, they should take it into high consideration and make use of the feedback to improve the technology already developed in compliance with new and actual needs.

On this subject, the interaction design of the technology should be planned from its beginning, counting on a tight collaboration between users and designers¹⁶ who start up a cooperative learning process (Winograd, 2000; Dieng et al., 2000). Users can become collaborative actors for the technology building, as also expressed by the Bannon's (1990) slogan: "from human factors, to human actors", and supply more accurate information about the task and the final use of the system, with the consequence of having more probability of success in the technology use. But it becomes also necessary to evaluate limits and possible difficulties that can arise such as the high cost requested, as time and resources; or the difficulty of finding suitable solutions that satisfies all people taking part in it (Pontiggia, 1997, 2001; Bodker & Gronboek, 1996). Designing advanced information system to support human interactions needs a deep understanding of the practices developed within a specific community, taking user needs at the starting point of the design process, and optimizing the relations between user needs and technology features.

Investigating conventions and practices, seldom explicit within a community, emphasizes the relevance of shifting the designers' focus of attention from the individual to the cooperative work, from the interaction between user and technology to the interaction among users through the technology (i.e., human-human communication, using the information system as media), in order to design a system effectively used by groups of people cooperating together.

The second area of research concerns the processes of management and development of the technology that is an intranet system, supporting remote project-centred learning, educational and administrative activities. The analysis bases on the observation of the various phases of the product life-cycle (i.e., the empirical case). In the specific, the

¹⁶ The collaboration between users and designers that schedules the total involvement of the user, from the beginning of the project development phase (and not only finally to test the product) is called *participatory design*. It relies on the maxim: "to design with the end users" rather than "for". The *participatory design* has been developed mainly in the Scandinavia countries and it originates from the case of Norwegian company *The Iron and Metal Workers Union* at the beginning of the 1970s. But the origins of *participatory design* are into architectural and urban field, due to the necessity of well knowing needs and wishes of those people who would have directly lived and used the designed spaces (houses and cities), people who would have interacted with them.

research investigates technical methods and behavioural models adopted during the intranet design and development (i.e., how designer, developers and project manager worked together to build the intranet system; and how they took care of the following phases of maintenance and improvements, with particular reference to the users' involvement). This analysis gives also the opportunity to verify the consistency between the design of the intranet as information system, and the real requirements of the informative workflows, supposing that the information represents, at the same time, resource and product within an activity system: resource because the spread of information is at the basis of the working practices; product because an activity system produces information (Pontiggia, 1997; Castells, 2000).

Then, the intranet usability analysis contributes to locate difficulties of use, starting from the users' point of view. Investigating usability aspects of the interface helps to focus on "the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments" (ISO 9241-11, 1993). In the specific, the evaluation avails of methodologies and heuristic techniques borrowed from experts in the field of usability, such as Nielsen (1999, 2005), Kluniavsky (2003), Spool (2004), Cantoni & Bolchini (2003), Cantoni & Piccini (2004).

Before tackling the empirical case, the social value and the evolution of the intranet technology are introduced as conceptual background to provide reference points that help to understand critical issues in the case study. Literature suggestions from Winograd (1990) stress the importance of *taking part in the world contingent activities*, in order to design and anticipate future solutions. Designing artefacts is designing (new) ways of being, and therefore designing real practices, and how these can be realized through artefacts. Thus, the designer's ability relies on generating new *frameworks for social actions*, where the goal of the technology is to support future needs. Therefore, the activity of designing cannot be considered just a technical discipline, cut off from the user's social context, but it becomes skill of communication and interpretation. The designer's ability consists of understanding the user's requirements, fixing relationships of affinity and quality between user and technology, and consequently among the users through the technology. Further, the concept of *affordance*, applied within a psychological vision by Gibson (1977, 1979), returns in Norman within a technical perspective (1986, 1988, 1992, 1998). Here, the *affordance*¹⁷ plays a decisive role in revealing the designer's *sensitivity* towards the users. In fact, the adoption and the use of technologies strongly depend on the easiness of use and on how users perceive them. However, not just intrinsic technical features compete to provide user's benefits, but also external aspects, including organizational and social context of adoption, become

¹⁷ The noun *affordance* encompasses that set of natural bounds, bents or invitations provided by an artefact. The natural bents suggest the range of possible uses; whereas the bounds restrict the possible alternative uses. The combined clever design and practice of both allow the end user to know what to do even in a new or unexpected situation.

decisive. In this sense, Rogers (2003) identified five distinctive attributes at the basis of the commercial success of an innovative product, and namely: the relative advantage, the complexity, the compatibility, the triability, and the observability.

The necessity of a synergic interaction between user and designer, and among experts from different disciplines, recalls the studies on Distributed Cognition (Hutchins, 1995), where the emphasis is on the ability of acquiring a “professional vision” through cognitive process, not private or internal, neither invisible nor silent, but as social activity, public and jointly co-developed, taking active part in a professional activity system.

Finally, the third aspect of analysis dwells on the inextricable link between work practices and communication. The accent is on the multiplicity of voices into the community, as continuous deliberations, problem solving and resolutions of local crises, underlining the contrasts between different viewpoints with respect to roles, cultural settings and experiences. Within the context of study, the observation of the communicative practices led to defining and representing a peculiar communicative circuit. The representation of this circuit was useful to consider the impact of the communication on the life-cycle of the intranet technology, with respect to the processes of designing, development, adoption, and use (Figure 2.8).

Overall Communicative Circuit

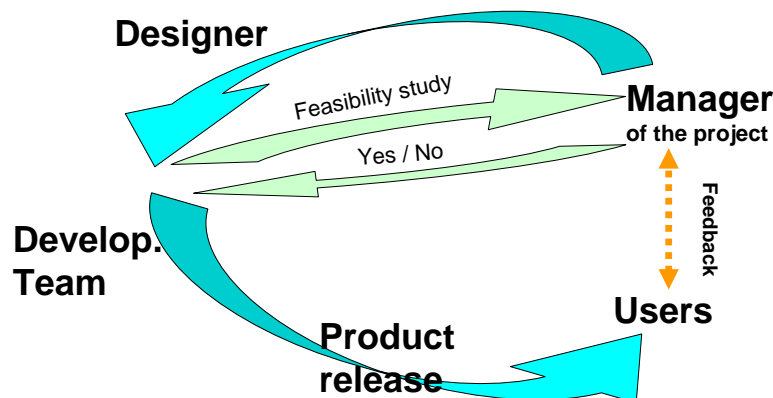


Figure 2.8: The basic communicative circuit identified within the intranet life-cycle.

From Figure 2.8, two main communicative loops are evident: the first one is the upper technical loop, where persons involved are technicians and responsible for the project; while the second is an irregular and broken loop, from which the lack of fertile interactions with the end users is clearly evident. In fact, the intranet was simply released and “presented” to the end users, who, in turn, exchanged limited, informal and not

structured communications with the intranet project manager. Therefore, this peculiar circuit shows an awkward communicative gap in the middle stage of the representation, not considering the value of a circular and constant communication among technicians of the system, manager of the project and end users. As result, quite a few repercussions affect practices of development and use.

A further evidence of the tackled difficulties is then given comparing the ideal communicative interactions that were expected the actors exchanged with and through the intranet system (Figure 2.9) and the real situation at the moment of the analysis.

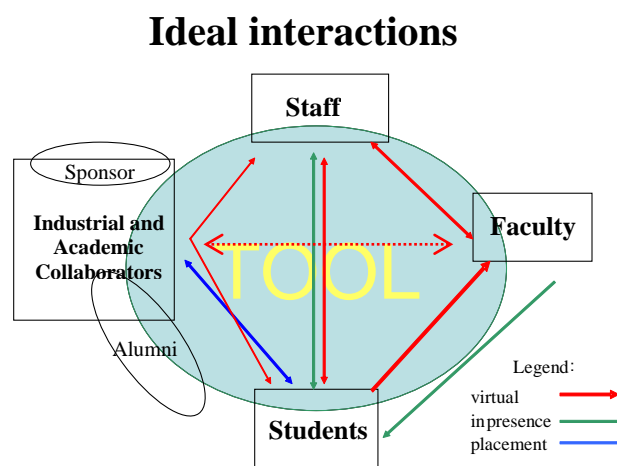


Figure 2.9 Ideal actors' communicative interactions on the intranet system.

This latter analysis aims at evaluating i) how the actors use the system, assessing their participation in the knowledge co-construction, ii) which are the most used functionalities, and iii) which types of information are exchanged. Then, interviewing the actors highlights the most common complaints, disclosing also users' expectations, and contributing to better understand needs and requirements to be implemented as intranet services. As a consequence, the communication on and through the technology acquires strategic importance. In this sense, the presentation of an alternative communicative circuit would suggest possible improvements to the current management of the intranet.

Finally, the analysis of some specific communicative interactions among social actors around the intranet project pinpoints problems at cultural and organizational level that can obstruct both the possibility to quickly find reasonable resolutions, and to tackle problem-solving processes with efficiency and effectiveness. In particular, the communication analysis takes advantages from the argumentative study approach, as above mentioned. The goal consists in highlighting how the critical *human-technology* relationship is often symptomatic of the difficulties in the *human-human* communicative interaction. In fact, possible distortions, misunderstanding, or wrong communicative

practices (or even the lack of them) during the product development can affect the final release and adoption.

The methodology adopted to explore and to investigate the network of such complex social interactions, mediated by the technology within the activity system, is subject matter of the next chapter.

3. Methodological Approach

The purpose of this chapter is to explain the methodology adopted, and to introduce the study case, defining my particular role and illustrating how the empirical research has been conducted.

3.1. Methodology of research

Focus of the research is the work setting by which, for which, and in which a peculiar technology has been built with the aim of supporting specific interactions and collaborations among its social actors. This approach has involved turning to disciplines associated with workplace study, and notably sociology. Further, ethnomethodology exploits ethnographic and fieldwork approach, concerning empirical analysis of work and the workplace, together with the analysis of talk at work. The basic attempt is to examine a domain of work in order to understand what the particular constitutive features of work activities are and how, interacting one another, social actors are recognizably engaged in performing their activities. As Suchman (1987) demonstrates, work practices can be studied as part of the process of designing interactive systems for the workplace, attempting to understand the work *in situ*, from the inside. In this way, the ethnographic study is useful not only to analyze the impact that a system has on the work setting but also to investigate the organizational principles behind the work domain and possible points of conflict with the introduced technology. Emerging contributions aim at making aware the social actors of the organizational and cultural root-causes that have affected the design process and the efficient running of the intranet technology as object of study.

The qualitative method of the research presents the double aim of i) highlighting the current design landscape of the technology in object, and ii) suggesting some elements of improvement into the management of the product life-cycle. The worth of the qualitative approach consists of reflecting the actual complexities of real situations of design and use of a specific technology. In this sense, the research effort addresses towards the achievement of detailed knowledge to understand whether, and in which way, the technical product has met both the users' requirements and the organization demands. In fact, a qualitative research complies with the need of understanding various aspects like the environmental context, the business domain, and the technical constraints of the technology, identifying patterns of behaviour and cultural background of those persons involved in the technology building and use (i.e., the stakeholders). Therefore, the research can offer a common and united understanding of domain issues and user concerns to the social actors, empowering them to make more informed decisions about

design issues, thus avoiding guesswork or personal preference. Handling these qualitative data can be useful to provide complementary suggestions not only to the current product but also to improve future implementations.

Borrowing techniques from anthropology, sociology and conversation analysis, the research reports a micro-sociological analysis of working activities locally constructed and negotiated, through an empirical study. The study required an ethno-methodological approach through systematic and immersive observations of work within the actual workplace. This led to analysing the social activity system, as working context, and specific situated practices, oriented, in this case, to develop, manage, and use an advanced information system. Further, with respect to interaction and social organization, talk and social structure, particular attention is on peculiar communicative excerpts that inform about the actors' behaviour in this work setting.

The worth of the ethnography approach consists of attempting to develop an understanding of work from the inside (Carroll, 2003). The ethnographic observation allowed me to gain insight into individual behaviour and organizational context. In particular, I explored the complex relationships between technical and cultural aspects, making use of the same interpretative categories of the social actors. It was important to focus on *border zones* of observation in order to define the context of analysis and then gathering and selecting the relevant local data through a qualitative-interpretative analysis. In fact, the qualitative method allows grasping contextual distinctions that explain the *situated actions* of the actors and are congruent with, or at least linked to, the terms and categories deployed by the group members (Suchman, 1987). To reach such goals, the constant interactions with the different social actors have required creating feeling of trust and approval in order to deeply investigate their social practices (both tacit and explicit). In particular, such methodological approach required a continuous participant observation¹⁸ that, in this case, was over a period of about 4 years (from spring 2004 to spring 2008), characterized by an active engagement and participation in the activities of the institutional context, as I will explain in the next section.

In this way, I have tried to join the complementary perspectives of the actor and of the observer, considering the relative strengths and weakness, as described in Raeithel (1996), and taking some suggestions for an ethnographic analysis from Zuccheromaglio and Alby (2005). In the specific, the adopted ethno-methodological approach consists of:

- gathering the social actors' point of view, with respect to the event or interaction analysed, considering the meanings and interpretations that the social actors give to that specific event, through the analysis of their communicative interactions;

¹⁸ Participant observation is a set of research strategies which aim to gain a close and intimate familiarity with a given group of individuals (such as a religious, occupational, or sub-cultural group, or a particular community) and their practices through an intensive involvement with people in their natural environment, often though not always over an extended period of time (Cooper, 2007).

- focusing on the daily activities, since these practices are based on implicit and tacit co-shared knowledge, constituting the social actors' joint enterprise; the study of the daily activities allows accessing co-shared meanings of the community, observing also how the actors negotiate and build them;
- writing thick descriptions, underlining how and through which particular structures the social actors interact each other, and which meanings they give to their daily activities. The objective is that of describing a specific social and cultural environment along with its peculiar aspects, providing real and recognizable descriptions that can be useful for and used by the social actors themselves.

Through the ethnographic study of working practices and of relevant communicative interactions, the purpose is to identify the inter-subjective meaning that the individuals give to some analysed events, revealing how they interpret their activities and their workplace. A further perspective within this study sketches how new virtual interactions can shape the social-cultural context and the working organizational structure through the technology.

The validity of the research consists of the set of authenticity, plausibility, and credibility of the descriptions and of the results of the analysis provided to the observed social actors. Consequently, the principal objective results in providing them with useful and reasonable knowledge for improving their local (at work) and virtual (on the intranet) interactions.

3.2. Introduction to the study case: my role within the work place and management of the empirical research.

The research took place at ALaRI¹⁹, the institute at the University of Lugano²⁰, in Switzerland, that since 1999 has promoted research and education in the field of embedded systems. Here I entered in September 2003 with the task of managing the external and internal communication of the institute. From the beginning my activity based on continuous interactions with all the persons involved in the academic institute, and in particular with the staff group and the program manager, in order to be aware of the current research trends and of the provided educational programs. Therefore, my activity concerned spread and updating news and information about the learning programs, promoting them through off-line and on-line communication media, such as press release and advertising. But especially my activity required making use of the academic institute web site and of the intranet. Particular attention was paid to the management of the internal communication, since the several members working at or for

¹⁹ The Advanced Learning and Research Institute – www.alari.ch

²⁰ Università della Svizzera italiana, Lugano, Switzerland – www.unisi.ch

the institute are often geographically dispersed; while rhythms of works are very hard and intense, and frequent organizational changes affect both the educational programs and the administrative tasks. This situation has entailed quite a few problems, discovering communicative weakness that risked of compromising internal relationships. Therefore, one of my tasks was to understand which problems of communication occurred, and take part in the attempt to solve them.

Such conditions allowed me to know inside out the peculiar cultural and social aspects of the institute workplace, participating in the community, observing the actors' interactions both direct and mediated by technological systems. In particular, the intranet platform was created *ad hoc* with two main purposes. The first one concerns the support and the enhancement of asynchronous communication among different actors (students, tutors, lecturers, staff members) geographically dispersed, often working from remote places, with respect to training, team working as well as to all the phases of work planning. The second purpose regards the possibility to collect and to manage the increasing institutional know-how in a structured way, promoting the knowledge co-construction, the sharing and re-use of the educational materials and of the results from the research projects.

During my period of observations, several difficulties of use arose around the intranet, clashing with the necessity of providing and using an efficient system. Analysing such problems, at first the focus was on usability aspects, but then it widened including also the study of all those communicative practices relevant to the life-cycle of the intranet. In fact, the continuous critical observation within a micro-sociological context, where the technology was both developed and adopted, allowed me to extend the inquiry about the intranet problems, building in this way the case study of the research.

The study started during the academic year 2004/2005, and since that time it has developed into an individual, doctoral research project. In the specific, three principal reasons led me to choosing the case as object of research as it well fitted for typology, timing and location.

For typology, it is because the case study consists of analysing an advanced information system²¹ acting as mediating artefact within a professional community. Such analysis aims at understanding the nature of difficulties of use, also and especially involving communicative issues at the basis of the life-cycle of the intranet. Further, the technology configuration, including different levels of access according to roles and

²¹ The technology bases on an advanced web remote application, integrating heterogeneous services to support both blended learning, consisting of teaching in presence and remote cooperative teamwork, and the management of administrative activities. Its continuous implementation aims at enhancing synchronous and asynchronous human-human communication mediated by virtual interactions, improving the accessibility to the institute know-how, and the organization of the work place.

positions, rules of use, and a specific division of labour peculiar to the institutional context, becomes the *reification* of those complex practices and workflows within the institute (Wenger, 1998). But besides the concept of *reification* used in Wenger (1998:58-61) referring to the process of giving form to experience by producing congealed forms or objects that represent this experience into “thingness”, the continuous implementation of the intranet, going on in parallel with the institutional changes, represents an *evolving reification*, reflecting the projection of the institute itself, trying to adapt, to answer, and to anticipate transformations and needs of this professional activity system.

For timing, it is because the analysis started in parallel with the technology implementation, offering the opportunity to know the reasons of its building and to evaluate over a long period the expected results against those really achieved. In this perspective, the contribution of the research is also addressed to the effort of improving the intranet use.

For location, it is because the empirical study took place within a socially and culturally well-situated environment, involving all the social actors' profiles, and thus allowing the definition of the research plan. Finally, the role covered within the institute granted me to conduct the research without being perceived as stranger by the community members.

In addition, the identification and the analysis of a communicative circuit fulfilling the different phases of development gave the possibility to tackle problems that, although at first sight seem to be just technical, reveal to have social and situated root-causes. In particular, the analysis of specific excerpts of institutional talks has yielded special insights into how the actors shape their conduct in this institutional context, bringing additional data, and thus contributing to confer some original aspects to the dissertation. Therefore, the research mainly focuses on two complementary and intertwining trends of analysis. As this latter it focuses on recorded communicative interactions, cutting across basic problems associated with the gap between what persons say and what they do (Heritage, 1992). The other constitutes a sort of *contextual inquiry*²² (Cooper, 2007) which makes use of ethnography field study and observation combined with direct conversations and interviews with the various stakeholders involved in the life-cycle of the intranet.

Moreover, acting also as collaborator within the institutional context gained me the advantage of preparing interviews generally already filtered down and tailored on the observed needs and difficulties. In this sense the Cooper's slogan “design is a conversation *with materials*” (Cooper, 2007:52) is adapted to my thesis into the slogan

²² Hugh Beyer and Karen Holtzblatt were the pioneers of the ethnographic interviewing technique that they called *contextual inquiry* (as reported in Cooper, 2007).

“design is a conversation *with social actors*”, pinpointing that all meetings and interviews conducted had the goal of deeply understanding the following aspects:

- business and social context surrounding the technology;
- which reasons drove the intranet project and which were the business objectives to achieve;
- the intranet development processes;
- roles, power and responsibility of the actors involved in the phases of development, maintenance, and management of the intranet;
- what behaviour the project-team kept with respect to the end users (with the possibility of finding significant disconnects between what project-team believes and what users need);
- institutional meaning and vision of the intranet compared with the perceptions social actors have on the product (which differences or partial visions);
- in which way the intranet meets and fits in actual actors' workflows: tasks and activities required, and expectations.

All the meetings with the social actors, as all the observations and the audio recorded talks, took place in the institutional context and they were particularly useful to develop a common language, clarifying misunderstandings, and overcoming problems that could stem from a not mutual understanding. In fact, taking the time to listen to the main social actors' perspectives becomes the starting point from which it is possible to suggest solutions really reflecting their priorities and needs. In particular, according to the *master-apprentice* model of learning (Cooper, 2007:58), I put myself in the new apprentice's shoes, considering the persons interviewed as master craftsman, and thus, encouraging them to tell me specific stories about their experiences with the intranet, learning what they consider important, and trying to single out their goals, before specifying their tasks. In this way, interviews and observations took the tone of collaborative explorations that allowed questioning and answering both at level of macro-structure and at level of functional detail.

In order to do not lose individual views in a crowd, open interviews (with open, and not predefined, answers) were conducted at workplace, in a one-on-one setting form, encouraging candour on each part and discovering to which extent everyone shared - or did not - common perceptions and meaning of the intranet. It happened that I met same actors more times, but each interview never lasted longer than one hour.

Usually, to capture what the social actors said or did, I made use of a simple notebook and a little audio recorder, avoiding other instruments too obtrusive that could compromise the honest exchange of information.

According to the methodology adopted, all data and materials collected during the research reflect true and not distorted situations, stemming from the actors' real work conditions. All observations, personal analyses and outputs of this research have been

showed and discussed first of all with the program manager of the institute, who has always been one of my direct speakers, and then both with the principal designers of the intranet platform and with the end users who were interviewed or observed. Therefore, they provided me with the authorizations and informed consent to report my notes and analysis in the dissertation.

4. The Institutional Context

The analysis of the workplace describes the macrostructure of the activity system including organization and social frame within which situated interactions among social actors take place.

The description of the context is critical in order to understand the primary purpose and the mission of the institute, along with stakeholders' roles and work practices²³. The formal organization of the work constitutes what is often defined as *background ethnography* (Zucchermaglio & Alby, 2005:50) and it allows grasping significant aspects of the organizational culture.

Considering the macrostructure of the activity system it is possible to uncover and to better understand its local meanings. In fact, what the macrostructure of the activity system consists of deals tightly with the actors' professional activities. But, while from the actors' point of view the workplace context is essential and integral part of their interactions, from the observer's point of view the workplace context cannot be inferred or observed during situated interactions, and thus the identification of the context has the value of providing a framework of shared meanings to the observed interactions (Piccini et al., 2006).

One of the goals of this chapter is that of defining which elements contribute to constitute the context of the workplace. The specificity of the elements that shape the peculiarity of a context consists in what Piccini (et al., 2006) defines as *institutional reality*. In each form of activity, and particularly in work contexts, there are institutional realities. Within a community, the identification and the analysis of the institutional context can be useful to explain mechanisms of, and peculiar effects on, working interactions. In fact, describing fragments of the institutional context reveals the specific institutional ontology and the normative system of the context.

After such premises, the institutional context along with a detailed description of social actors and their interactions is now presented, in particular taking into account the following elements:

- mission of the institute, along with social and cultural framework;
- stakeholders positions:
 - roles and status
 - duties and responsibility
 - work practices and goals
- formal and informal relationships, internal and external to the workplace

²³ The observation of interactions and behaviours takes the observer to reconstruct models of practices. The ways the actors answer to the heterogeneous set of bonds, goals, and resources, provided by their work context, are the practices. Therefore, reconstructing specific practices of a community requires a global understanding of the whole activity system of the community.

- social climate
- level of cohesion and involvement (individual feeling of participation into and of belonging to the community)
- main communication flows

All these elements help to shed light on the organization of the work at the institute and on how all the social members interact each other.

Further, this presentation will be useful to understand needs and reasons which led to creating an *ad-hoc* advanced information system; and, at the same time, it will disclose social and organizational difficulties that have slowed down the process of adoption of such a system.

4.1. The workplace

Context of analysis is ALaRI²⁴, the academic institute that, since 1999, promotes research and education in embedded systems field, at the University of Lugano (USI)²⁵, in Switzerland.

ALaRI is the outcome of the synergic interaction between European and American academia, and international high-tech industry with the aim of fostering academic-industrial collaboration in the field of embedded systems. In this perspective, ALaRI has been the first European institute offering in such area a cross-disciplinary education, through design laboratories and projects, involving fields from electronic engineering to computer science, as well as the development of personal skills, such as team work and complex-project management. Mission of the institute is to bridge the gap between software technologies and electronic engineering, by both exploring cutting-edge topics and addressing its research toward real life design issues, generated by actual technical and electronic industrial requirements. The research topics focus on security and cryptography of mobile systems, on pervasive computing, on system-level design, and network on chip.

Within this framework, ALaRI's challenging goal is to prepare high level, specific profiles in embedded system design through the educational opportunities of its master's degree programs, vocational training and seminars. The institute offers two master's programs, differently tailored, which welcome international participants from all over the world, having technological or scientific background in electronic or telecommunication engineering, computer science, or mathematics.

²⁴ The Advanced Learning and Research Institute _ www.alari.ch

²⁵ Active since 1996, the Università della Svizzera italiana (USI or University of Lugano) is the youngest among the ten Cantonal Swiss Universities and the two Federal Technical Universities belonging to the Swiss Higher Education System and recognized by the Swiss Federal Government _ www.usi.ch

Since 2000, the Master of Advanced Studies (MAS) in Embedded Systems Design is a one-year program, addressed to postgraduates or candidates with work experience, who can follow the program courses on a different and personalized schedule, involving them part-time and spreading their activities over two years.

Then, since the academic year 2004/05, the University activated the Master of Science (MSc) in Embedded Systems Design, a two-year program for students with a Bachelor degree or with at least 180 ECTS (European Credit Transfer System), equivalent to three years of study. This MSc program complies with the latest European Study guidelines²⁶ and with the CRUS²⁷ instructions. Further, it offers two tracks of study between which participants can choose after the first year: *Design and Research* oriented to the design and research activity in academic or industrial environment, and *Business Projects* for the management, economics and marketing of embedded systems.

Both master's programs require attending fundamental and elective courses, entirely held in English, where students can personalise their study according to individual interest. In turn, the students are required to complete practical research projects in collaboration with industrial and academic partners as integral part of their study programs and leading to the final master thesis. In this way the ALaRI educational programs are characterized by strong cooperation between academic world and industry, together with an effective interdisciplinary approach through design laboratories and projects. Both programs start in September and finish in July.

The Faculty of the institute relies on about thirty international lectures, coming from prestigious EU and US academia and research centres, as well as experts from high-tech multinational companies, who assure top-quality teaching.

Every year no more than twenty-five participants per class²⁸ are selected on the basis of their application form - that includes educational background, study official transcript (list of courses attended and final marks), and recommendation letters - to attend the ALaRI master's degree programs at the University of Lugano. During their stay, participants have the possibility of exploring and studying in depth the subjects related to embedded systems design, acquiring theoretical background and practice with design tools.

The peculiar characteristic of the institute consists of its teaching schedule: an innovative approach to the working organization and learning environment, combining learning in presence with *remote tutoring*. In particular, two main activities, partially overlapping, run in parallel during the master's programs: the course's lessons and the

²⁶ The guidelines of the *Bologna* study model consist of three years of *Bachelor* school plus two years of Master (3+2)

²⁷ *Conferenza dei Rettori delle Università Svizzere* (CRUS) - Rectors' Conference of the Swiss Universities

²⁸ Every academic year three classes start: one for the MAS program and two for the MSc (one covers the first year courses, and the other the second year courses).

development of master's research projects, according to a project-centred learning approach. While the courses are held following the classical face-to-face learning fashion, with lecturers and students in presence, the projects are developed through a remote tutoring that requires *remote cooperation* from all the team members. In fact, students, physically working at the institute need to interact with their project supervisors (lecturers, industrial experts, and tutors), who, instead, are mostly geographically dispersed.

During the academic years, the learning is organized into teaching units, also called “modules”, that may be basic, requiring mandatory attendance, or elective, requiring participants to choose a number of electives covering a predefined total of credits. Modules length may go from 12 to 36 hours, inclusive of theory, exercises and practice. Modules end with an individual evaluation that may include assignments or a module project.

With very few exceptions, lecturers are present at the institute in Lugano only during their period of teaching that normally is distributed over 1 or 2 weeks per course. This means that both master's programs consist of very intensive cycles of lessons concentrated during the lecturers' short physical presence.

Then, the master research projects are integral part of the programs, completing the students' training, and leading to the final master thesis (i.e., the project outcome with the final dissertation). The applied-research projects are normally suggested by the industrial sponsors or collaborators of the institute and concern actual pre-competitive research, design activities and technological needs. The projects are assigned to each student early in the academic year (in the first academic year for the MSc students), and checked periodically by lecturers and industrial experts through remote interactions. Several parallel projects may complete a larger research activity, where practical experience in teamwork allows participants to grasp the problems of design management from the perspective of work organization as well as financial relations.

The assignments and research projects are checked periodically through remote interactions by the lecturers as well as by the industrial sponsors, who act as mentors for the research projects. Thus, during the master's programs students are trained to work both on their own (and in team work) and interacting remotely with their supervisors tutoring the development of the projects. Normally there are three figures covering the roles of supervisors, namely: an academic member belonging to the ALaRI Faculty who provides scientific counsel for the project; an industrial sponsor or collaborator offering guidelines and suggestions on the project topic from an industrial perspective and evaluating the project's results in the light of his/her expectations; and a tutor, who often is a PhD student belonging to the ALaRI staff and in charge of supervising projects of his competence. The tutor is, among the three supervisors, the closer to the student(s) in everyday work.

Such a scenario provides a first idea about the great effort required for integrating learning in presence with *remote teamwork cooperation*, coordinating the synergic interactions among all the social actors involved in the learning processes.

4.2. The stakeholders: roles and social practices

Within the ALaRI environment, the various social actors cover different roles in compliance with their duties, pursuing complex interactions. The ALaRI actors can be grouped into six principal profiles, and namely: the Scientific Committee, the Faculty, the Industrial and Academic entities (collaborators or sponsors), the ALaRI staff, the Students, and the Alumni (the former, graduated, ALaRI students).

At a very basic level we can roughly represent the ALaRI actors' roles and their interdependence as showed in Figure 4.1.

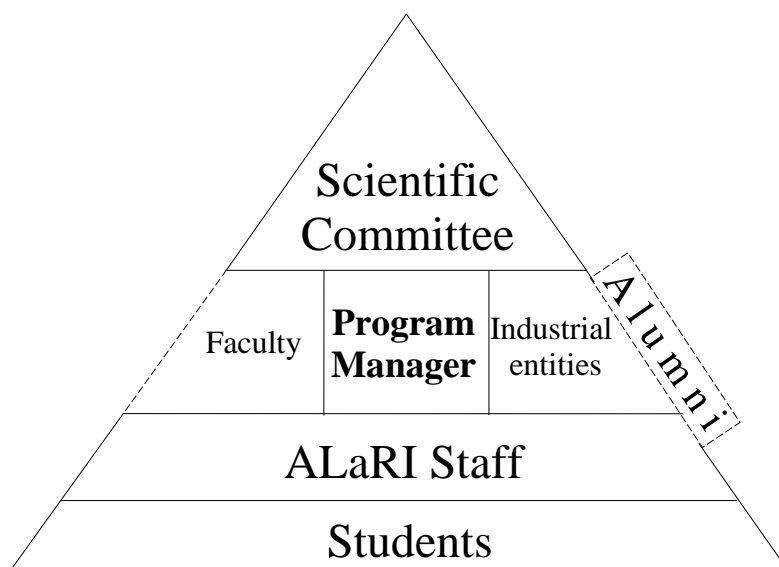


Figure 4.1 Simple chart of the ALaRI members' interdependence.

This representation, anyway, does not illustrate how really complex are the relationships among the social actors. Therefore, a more detailed presentation of the ALaRI members' profiles along with their actual work relations and social interactions is provided here below.

The Scientific Committee consists of five persons, including the Scientific Director, having the duty of planning the scientific strategies of the institute. They have a complete supervision role above all the institute activities devoted to education and training, including teaching courses and orientations for the research projects. They manage relations with the international lecturers who are invited to take part in the

Faculty, and they select the candidates attending the master's programs. Further, some members of the Scientific Committee are also lecturers in master's courses, and cover full professor positions in other universities. Such a condition, obviously, implies that they have other activities and commitment besides the ALaRI environment. Therefore, their presence at the institute is usually limited to their period of lessons, with the exception of the Scientific Director, who exerts continuous supervision and coordination not only among the ALaRI social actors, but also maintaining institutional relations with other external parties. In particular, the Scientific Director takes care of the scientific directions of the institute, referring then to the Scientific Committee, and tightly interacting and collaborating with the ALaRI program manager. In fact, together with the Scientific Director, the program manager covers the most important role within the institute, engaging in the global managing of the community. Both Scientific Director and program manager are the reference points for all the ALaRI community members.

The program manager is totally, full-time, involved in the institutional activities, with a physically constant presence at the workplace. He is responsible for the management and supervision of the general ALaRI "performance", ranging from the organization of the academic learning schedule, and consequently keeping contacts with all the faculty members, up to taking care of the relationships with current and potential ALaRI sponsors or industrial collaborators, and of preparing and submitting research projects. Furthermore, the program manager not only looks after financial and administrative issues, but also he is looked for by the ALaRI students who do not hesitate to contact him for any kind of problems (from those related to their lessons' courses, up to those concerning the co-shared apartments or their life in Lugano). And, thus the program manager is the pivot around which all the ALaRI activities move, interacting with all the social actors. But, in turn, the program manager is overloaded by many and different commitments that force him to work very hard and almost without any day off.

Faculty consists of about thirty lecturers, coming from different and international universities, research centres, and companies, and holding courses or seminars. They are present at ALaRI only for a very brief period that coincides with their teaching (usually, each course is very intensive and it is spread over not more than 2 weeks). In this period, they interact face-to-face with the students, but afterwards they supervise students' activities remotely (typically, answering students' questions or acting as supervisors in the master research projects). Usually, before the beginning of the academic year, lecturers agree remotely on their teaching schedules with the program manager; and, after the conclusion of their teaching period, they inform, always remotely, the program manager of the students' final evaluation, the assigned marks, as well as of administrative issues. Further, they normally rely on the staff members who act as teaching assistants and support them distributing, correcting, and evaluating work assignments.

Normally, ALaRI lecturers do not have contacts with each other during the courses; while each of them is in contact with the members of the Scientific Committee, the program manager and some staff members assisting them or covering tutor roles in Master research projects. When at ALaRI, the lecturer usually meets frequently the program manager, discussing teaching matters and further possible collaborations.

Industrial and academic entities acting as ALaRI partners or sponsors are about twenty. Partners have collaboration agreements with the ALaRI institute. Usually they are involved in developing research projects with ALaRI, and/or they offer internships to brilliant students after finishing the master's programs. Industrial entities may also be or become sponsors supporting research activities through scholarships (total or partial)²⁹ for worthy students, and suggesting specific research themes that can be developed as master projects by the ALaRI students. In case of sponsors, a non-disclosure-agreement (NDA), signed between the company and the ALaRI institute, defines the conditions about the project development and the management of the final results. In this case, the sponsor covers an active role: controlling the project development, defining the initial specifications, setting the project milestones, checking the deliverables in progress, remotely supervising the student's work, and expecting some concrete results at the end of the project. Each team member can access only those private documents concerning her/his own project; whereas the Scientific Director and the program manager access all documents, private or public, of all master research projects, since they supervise and are responsible for all the research activities at the institute. The development of the project is generally followed through remote interactions among the various actors involved in it (sponsors or industrial collaborators, student/s, tutor). During the ALaRI final workshop (mid July), the students present the achieved research results of their master projects in public. And at the end, all ALaRI social actors (i.e., lecturers, students and others not directly involved in the project) can access the public documents of the project.

During the academic year, the industrial entities have direct contacts (through physical meetings, conference calls, or emails) only with the Scientific Director and the program manager who take care of getting sponsorships or agreements for internships and of defining interesting and up-to-date research themes.

Within the ALaRI environment, the industrial presence covers a fundamental role both for its contribution on real-life matters to the research projects and for providing students, after their graduation, with placement opportunities. In turn, industrial entities can take advantage from the research results achieved by the students during their master projects.

The ALaRI Staff consists of about twelve persons, headed by the program manager, who work at the ALaRI institute and cover different roles. Their number can vary

²⁹ Scholarships can cover, totally or partially, tuition fees and / or accommodation costs, depending on funds and bilateral agreements.

according to the PhD students or post-doc researchers actually present, and thus entailing a quite lively turnover, especially when, having finished their academic experience, the researchers leave the institute. Currently, there are eight PhD students and one post-doc researcher who, in parallel with their research activities, work for and in the ALaRI institute. Almost all of them have previously attended one of the ALaRI master's programs, and now are working at ALaRI as tutors of the current students, supporting them during the development of the research projects. Further, they provide teaching assistance, and collaborate with the program manager for preparing and submitting proposals of projects to various national (Swiss) and international (European) calls or foundations. The proposals of the projects are very important because, if accepted, they contribute to the funding that assures continuity to the research activities of the institute. Furthermore, the ALaRI staff relies on the presence of two assistants who also attended the ALaRI master's programs and now are working at the institute as collaborators of the program manager. Finally, as member of the ALaRI staff, I was in charge of the communication and promotion for the institute (meanwhile I was working on my research study as PhD student in the Faculty of Communication Science at USI).

All the staff members are usually physically present at ALaRI and have direct contacts with the program manager who, in turn, coordinates the internal staff activities and the relations with the students. Generally the staff members are very young, between twenty-five and thirty-two years old; the program manager, who is the oldest, is just thirty-eight years old.

Three rooms on the fourth floor of the University make up the location of the work place, while in the corridor the coffee-machine is the informal but very used and representative meeting point among the ALaRI staff members. On the same floor, a classroom and a computer laboratory are reserved to the ALaRI students (another classroom, actually the main one, is located in the Informatics Faculty main building).

Another person, not physically present at ALaRI, but partially working for the institute and the program manager, is the secretary, who stays in a different building at USI and is in charge of the secretary's office of the Faculty of Informatics (present at USI since 2004).

Students are all the participants attending the master's programs. Usually they are no more than fifty per year (e.g., forty-five students finished the academic year 2007/08). With very few exceptions, they are very young, between twenty-one and twenty-five years old, and come from all over the world (thirty-five different countries represented up to now; and each class consists of persons from a number of different nationalities). Students spend most of their time studying at ALaRI, in two large rooms at their disposal, attending the program's courses and developing research projects (on their own or in a team). As previously described, they meet lecturers for a very short period during face-to-face teaching lessons. Later on, students interact remotely with lecturers,

especially for developing master research projects. They also receive great support from staff members acting as tutors, and who also are physically the ones closest to them.

Further, students can collaborate with the staff members doing some little part-time jobs for the ALaRI institute. These part-time jobs are little tasks on campus, provided with the double aim of (i) helping staff members and program manager in different activities, and of (ii) covering students' basic living expenses during their stay in Lugano. The activities can be various from the routine ones with poor added value (e.g., making photocopies, assisting the lecturer during his/her stay in Lugano - distributing teaching materials, booking hotel rooms or calling the taxis) to those that, once decided, require time to be performed (e.g., updating information on web site or on intranet, etc.), to more demanding activities that require specific skills or attention (e.g., bring to an operative status a web-based Database Management System; reading particular documents to extract and report accurate information; installing EDA tools³⁰ and identifying key strategic differences to report; self-training on specific case tool to become developers able to solve bugs and design new portion of web applications). Doing such part-time jobs, students receive an amount that can range depending on the kind of job and on its duration (i.e., the required work hours), but without the possibility of exceeding a fixed maximum amount (and thus a sum of hours per month). Students can freely choose whether to apply for such jobs or not, without interfering in or compromising their study programs.

Students meet together also to organize extra-learning activities (dinners, parties, trips, and so on), soon constituting a sort of "big family" at ALaRI. In fact, usually for the first time, they spend in Lugano one or two years faraway from their family, friends, and origin countries, working very hard to achieve the final degree, and sharing not only the same educational environment, but also the same apartments, living together with persons with different cultures, religions, and life styles. The apartments they co-share are in most cases directly provided by ALaRI. Students pay a monthly amount and a bail that is held back only in case of damages.

Alumni are all the ALaRI former (graduated) students (up to now they are one hundred and twenty with MAS degree and thirty-five with MSc degree). They constitute a great resource for several reasons. First of all, they act as the most effective promotion for the institute, both thanks to their acquired competences and thanks to the suggestions they can spread about attending the ALaRI master's programs. Further they can foster, through their new job positions, new industrial or academic collaborations, involving new partnerships to start institutional research projects from which, in turn, other master

³⁰ EDA is the acronym for Electronic Design Automation that is the category of tools for designing and producing electronic systems, and particularly integrated circuits.

projects can stem³¹. As far as ALaRI is concerned, alumni are provided with some facilities for a few years after their graduation, such as the access to public documents of the institute or to private reports of their former master projects. Therefore, keeping contacts with them becomes extremely important both for possible new forms of collaboration and for promoting the increasing interest towards the institute activities. In fact, alumni act as “mediators” (the *boundary resources*, according to Wenger’s definition, 1998) between the institute and the external work environment, covering a particular role and position, different from the one of the lecturers or industrial entities, because alumni’s evidence is more pervasive, flexible, and unselfish.

Finally, guests are those persons outside the ALaRI institute and its network, who can be interested in knowing the research and training activities of the institute. They get in touch through direct contact with the program manager or through internal acquaintance to ALaRI.

Having described the different social actors’ profiles along with their principal status and responsibilities within the ALaRI community, it is now necessary for a deeper understanding of such work place to spend a few words about the organizational setting, considering the existing social relations and the developed work practices.

According to Engeström’s model of Activity System, in the ALaRI environment most tasks (especially concerning the administration of issues surrounding teaching activity) and rules that should control the interactions among the different social actors have been left implicit for long time, because of the necessity of resolving day by day other pressing critical matters having priority. Sometimes this situation has generated problems about the responsibility of specific tasks, and, consequently, the internal knowledge about who is in charge of what, or about some general behavioural rules. For instance, until two years ago, there was a lack of written and explicit policies to regulate the general students’ behaviour both with respect to training (e.g., considering the procedures for the project’s assignment or supervision, and students’ relations with the tutors to regulate time-meeting and tutors’ availability), and with respect to extra-learning activity (e.g. about how to manage problems of cohabitation, house-cleaning, or preservation of provided supplies in apartments co-shared with other ALaRI students).

Further, some procedures, although written, were not sufficiently visible or known, or even sometimes ignored. For instance, preparing the educational material requires the collaboration between lecturer and staff member, such as sending and uploading software necessary for course lessons, but when such collaboration was missing, it entailed last-minute pressure on the staff to make the material ready and available to the students in due time for their lesson.

³¹ For instance, recently a new partnership was born among ALaRI (CH), some ex-students (alumni) come back in Sardinia (IT), the Infineon company, and the professor Peter Marwedel from Dortmund University, in Germany (DL).

Therefore, problems of organization and coordination of the activities have often requested very timely and unplanned interventions to resolve them.

Such situation was mainly due to having devoted much care to increase and improve the institute prestige at learning and research levels; while less care was devoted to formally organize human resources and the administrative management.

In my opinion, this happened due to three principal reasons, about:

- few persons concentrating on the very high quality level of the education led to focusing the attention more on program's contents rather than on managing organizational and administrative issues;
- the very fast and exponential growth of the institute, which has led to rethinking very quickly structural changes at educational level, leaving out organizational changes at management level;
- the very informal, "free and easy" social climate of the institute, that if, on the one hand, has always encouraged new research trends and innovations, on the other hand, has led to disregarding a more formal regulation of the work activities, through explicit and written norms.

In such multicultural and heterogeneous context, where relations are so complex and dynamic, the necessity of written, clear and explicit institutional policies and norms, in order to settle carefully the working procedures, becomes pressing. In fact, paying more attention to the formal organization of the work can help to avoid the risk of compromising the efficiency of all the activity system.

Then, other elements characterizing the community organization and its social climate include work structure and rates, the types of contracts and the level of cohesion and involvement of the members within the institute (what is defined by Wenger as dimensions of *mutual engagement*, *joint enterprise* and *shared repertoire*). Providing a description of these elements can also contribute to understand (i) how the institutional context may have affected (encouraging or limiting) the introduction of a new technology, and (ii) how the actors were available towards its adoption. Further, these considerations reveal if and which procedures have been adopted to promote the technology use and to meet the actors' needs.

In ALaRI, there are different levels of cohesion and involvement, according to the role each stakeholder plays within the institutional framework. In fact, work conditions and interpersonal relations define two macro scenarios that disclose different feelings of participation in and of belonging to the community social dimension.

One scenario takes shape basing on authoritative and hierarchical relations where Scientific Committee, lecturers, and other industrial or academic persons decide how to manage and organize learning activities. Yet, these types of relations are also sporadic, less present and distant from the daily work practices. In fact, these persons have just partial collaborations with the institute (even if for several years) and their physical

presence is very restricted over the academic year. Normally they never interact all together and seldom organize physically meeting (at least, not in ALaRI: as members of the same scientific community, they usually know each other well, meeting at conferences, workshops etc.). On the other hand, each of them keeps in touch with the Scientific Director and/or the program manager in a one-to-one fashion, both remotely and in presence. On end, the Scientific Director and the program manager have to coordinate all educational and research activities. In particular, the Scientific Director keeps the historical memory of the activities at the institutional level, taking care both of setting up formal external relations and of moulding and planning the scientific research quality carried on at ALaRI.

On the contrary, the other scenario consists of continuous, informal and lively internal social relations, carried out day by day, among the program manager, the staff members, and the students. In fact, they are all deeply involved in the everyday community life, being present at the institute throughout the whole academic year, and thus shaping the real community history and repertoire.

Within this framework of relations, the pivots of the whole activity system are the program manager and the Scientific Director who represent the rings joining the two social scenarios. In particular, the program manager is the only ALaRI member who is completely devoted to the community activities, working full-time at the institute and helping the Scientific Director to keep relations also with external persons who can collaborate with ALaRI. Due to the amount of responsibilities, the program manager often works until late at night, managing the relationships with students, staff members, lecturers, industrial entities, and taking care of administrative matters, not rarely working also during the week-ends. Due to such amount of engagements, the program manager's interactions with students and staff are usually very quick and informal, often not scheduled well in advance, but giving priority to the various emergencies.

In turn, the young staff members are free to organize their daily work, benefiting from a great flexibility in terms of times and work rates. In fact each person is required to complete his/her own work in compliance with the respective deadlines, but without strong restrictions on daily schedule. Generally, they can choose their work hours, and it is not rare to find persons working during the night at the institute. This condition is mainly due to the peculiar staff members' activities devoted in part to education and research projects at ALaRI, and in part to develop their own research studies.

Further, staff members work at the institute for a limited number of years (usually from three to six years): they have short-term or annual contracts that can be renewed but that cannot be indeterminate (only the secretary sticks to regular office hours and has an indeterminate contract).

Therefore, due to the particular work positions and contracts, there is a staff turnover about every four years. This condition promotes a fairly frequent renewal of personnel consisting of new PhD students who come to ALaRI with the aim of completing their

research. The staff members' ability consists of getting the most advantage from the ALaRI learning environment. It offers a fertile ground to increase professional competences and to pursue very interesting experiences that can open good chances for other and new works, once they leave ALaRI.

In this way, staff members cover several roles at the same time, performing activities sometimes intertwining and complementary to their research studies, but sometimes totally different. For instance, they are required to help in drawing up research proposals to obtain funds for the research, and then to follow their development; or they can follow interesting students' master research projects; on the other hand, staff members' duties concern also taking care of the licence agreements, maintaining companies contacts and updating the software released; or developing communication devices and tools used internally (e.g., intranet features, wiki platform). Generally, staff members know each other's duties and responsibilities, even if these are not formally assigned; while the program manager keeps trace of each member's activity in personal cards, recently uploaded and updated on the internal wiki platform³². Usually, each staff person works by his/her own, concentrating at the own desk in the office, but during coffee-breaks or at lunch-time staff members meet together, speaking with each other about ongoing activities or research themes and exchanging ideas, often also taking the opportunity for organizing some entertainments *extra ALaRI moenia*. This kind of relations contributes to shape a climate of true familiarity and trust that it is not always possible to take for granted in every workplace.

As for students, they usually attend course's lessons in the morning; while during the afternoon and evening they have time for studying or for collaborating with the staff doing some part-time jobs. They also organize parties or trips during vacation or after the conclusion of an intensive cycle of study, often inviting the ALaRI staff and other students from USI. Once they are graduated, they keep contacts as alumni with the staff and program manager.

Such very informal social climate within a context of learning is also due to the very little pressing vertical hierarchy. In fact, while a more complex academic environment, such as the University of Lugano, exerts strong, formal and official recognition of each academic position according to a vertical hierarchy³³, within the ALaRI institute bureaucracy and formality are nearly absent. In this sense, for instance, the communicative interactions between the University Director and the ALaRI program

³² The ALaRI wiki platform implementation started at the beginning of 2006. It is mainly divided in two parts: one accessible and dedicated only to ALaRI staff and the other dedicated to students and accessible also by the staff.

³³ The vertical hierarchy includes President, Administrative Director, Deans of the Faculties, Directors of the various institutes, and full or assistant Professors, doctoral researchers, the PhD students, the administrative offices, secretaries, students, and so on.

manager, or between this latter and the Dean of a Faculty, are much more formal and rigid than those among all the various ALaRI members.

In particular, the peculiar context of learning at ALaRI and the very young average age of its members allow especially the program manager, staff members and students, who work very close day by day, to easily exchange and build interpersonal relations, frequently having direct and informal interactions and conversations about different themes, not only strictly relating to the institute activities. For instance, ALaRI students write to or come to staff members and program manager for any kind of problems, concerning both the learning program and other extra matters; or it happens that the program manager urgently calls a meeting with one or more staff members for making rapid decisions or for resolving unexpected events or sudden problems; and staff members are used to switch from an activity to another one very quickly, being engaged on different topics encompassing both their research programs and other ALaRI activities.

This particular social climate facilitates collaboration and relationships between the program manager and the ALaRI staff, and among these ones and the students, also thanks to very flexible work hours. Further, within the staff, good amount of irony during meetings or simple talking is not missing. Which is particularly significant, since irony can be a very precious resource, especially during negotiations or problem discussions, because it helps to create a co-shared meaning, re-building together previous facts and giving a common sense to what happens (Zuccheromaglio & Alby, 2005). For instance, nicknames given to some objects come to constitute a sort of ALaRI *jargon*, only recognized by staff and program manager. That is what happens for the intranet system: sometimes called *Oratio* due to the assonance with the name of the provided basic technology *WebRatio* - www.webratio.com -; and sometimes called *strazio* - the Italian noun for “appalling”- when technical problems occur.

At the end, the complex network of social interactions at ALaRI discloses *direct and remote* relations. Direct relations are various and can be one-to-one fashion, such as between student and tutor, program manager and student, program manager and staff member; or one-to-many, such as among program manager and staff members; lecturer and students; program manager and students; or many-to-many, usually among persons of the same profile, such as students or staff members.

Then, there are remote and apparently simple relations, usually one-to-one fashion, among persons who do not share and live the same environment daily, and that are also more formal, such as between program manager and lecturer; program manager and industrial or academic collaborator; lecturer and student; lecturer and tutor. All these relations, both direct and remote, entail a huge and continuous effort of coordination, including collection and distribution of information that almost always the program manager has to communicate and organize.

Such a complex social network of members geographically dispersed, and covering different roles, needs many and continuous processes of negotiation and construction of co-shared meanings to constitute a real professional community, combining formal face-to-face lessons together with research projects developed by heterogeneous team.

But, just due to remote interactions and partial work engagements, it becomes very demanding and challenging to fully develop co-sharing meanings by all members, involving the whole community participation and awareness. Persons physically present at the institute and working in team on master projects have less difficulty and are naturally (and socially) more inclined to shape and promote those dimensions of *mutual engagement*, *joint enterprise* and *shared repertoire* (Wenger, 1998) during their specific activities. Whereas, creating and reinforcing these dimensions at comprehensive community level becomes more difficult, since it entails to involve each member even if not physically present at the institute, or if s/he does not take part in master research projects.

The co-sharing of the same engagement is crucial between students and staff members or in teams developing master projects (e.g., project milestones to respect, reports to upload or to supervise, etc.) to achieve common objectives: for instance, project results are achieved in due time thanks to cooperative work among student, tutor, and project mentor or sponsor. But work and communicative practices (through emails, phone-calls or meetings) are usually restricted and limited within little groups of persons who most of time, at the end of a specific activity, do not spread the results to all community members, and thus making it impossible to create a true shared repertoire of common heritage for the whole community.

This situation results from the lack of matching community culture and suitable instruments (physical and symbolic) to collect single members' knowledge and expertise and spread it at community level. In fact, since the beginning, more commitment was towards increasing learning and research contributions from the individuals, rather than building and shaping a corporate identity, through conceptual models and suitable instruments, involving all members' participation and awareness. During the time, such lack has entailed troubles for maintaining and delivering knowledge property. In fact, due to the physiologic turnover of individuals in such an academic environment, many efforts are addressed to make knowledge property independent from the individual know-how, as well as to avoid missing intellectual property.

Therefore, although offering a good context to acquire expertise thanks to its opening towards innovations, research, and experimentation, the ALaRI community presents a level of co-sharing still limited within little groups or specific profiles, not really supporting a common and aware mutual engagement. In this way the community awareness about its own repertoire and heritage of expertise is not uniform and well distributed across all the social practices. If members physically present at the institute (program manager, staff members and students) are aware of building the own identity

within the community, negotiating meanings of own experiences and creating new forms socially co-shared (as result of a bottom-up effort), the “top management” does not perceive such identity construction at the same way. In fact, Scientific Committee members and lecturers if, on the one hand, strongly contribute with their individual expertise, on the other hand they lack the effort to integrate it within the community identity.

Finding suitable instruments (physical, symbolic, and cultural) to promote the knowledge and expertise co-sharing can provide all members not only with the possibility of improving the own individual know-how but also with the awareness of being part of a real community, whose evolution and growth depends on the inseparable interrelation between the subjective and the collective, according to a process of mutual constitution.

Therefore, the introduction of a peculiar information technology in the community can reflect a double purpose. It aims at enhancing the relationships among the difference social actors geographically dispersed, both at research and teaching level. And at the same time, it contributes to reinforce the social meaning of the community identity, breaking distance and communication barriers, providing an effective and common support to collect and co-share individual expertise and knowledge. Further, cooperating through and on a shared information technology would also reduce the effort to coordinate the informative workflows, what has been always matter of the program manager’s activity.

The ALaRI context if on the one hand it seems to be well-disposed towards introducing such new technology, on the other hand it also presents some cultural and organizational problems. Favourable aspects concerning the adoption of the technology regard:

- the scientific nature of the academic institute, oriented to technical learning and innovation, where competent and young human resources work on testing new solutions;
- the social actors’ skills, coming from technical background and whose familiarity with the technology is taken for granted;
- the friendly and informal social climate, open to relationships and to a sound competition;
- the creation of trust and approval among members cooperating together;
- the mutual and interdependent nature of tasks and work-flows individually developed.

On the contrary, the introduction of a new technology cannot rely solely on the actors’ ability of adaptation, even if they have the right technical skills. First of all, the adoption requires a shared cultural perspective on the technology use and benefits. Otherwise, its introduction risks of producing different attitudes and behaviours of use, compromising the expected benefits. Moreover, the plurality of complex activities along

with the dispersion of the social members makes evident the necessity of an overall governance plan drawing a common cultural framework capable of explaining, at community level, shared meanings of the new technology, beyond its services and functionalities. Thus, laying out a governance plan should be the outcome of a synergic effort, involving the participation of the ALaRI top members, and not only requiring the program manager's coordination.

Finally, here on end the reasons that led to adopting a peculiar information technology at ALaRI are explained.

4.3. The need of an advanced information system

The particular teaching program characterized by face-to-face lessons and remote tutoring risked compromising the quality of the relationships not only between Faculty and students, due to the lecturers' very short presence at the institute, but also among the other social actors geographically dispersed who need to interact remotely to define and complete the educational activities.

Further, initially, personnel dedicated to the general administration of the institute were missing; while the program manager alone was in charge of totally managing all administrative and learning issues. This entailed a huge amount of messages, emails, and phone calls overwhelming the program manager's work.

Thus, from the beginning, this situation has required a great organizational effort in order to coordinate all the activities for and during the academic year, such as the teaching schedule, the course planning, the selection, assignment and development of the master's research projects, and so on.

Briefly, it was necessary to tackle two main problems. One concerned the management of well-defined workflow procedures, based on static information that can be fixed and stored year by year in a suitable repository in order to find it quickly or to update in case of need. For instance, the organization of the courses, before and after the lessons in presence, requires: scheduling in compliance with each lecturer's availability, distributing teaching material on time and letting students access it; or assigning credits and final marks. Further, the increasing number of persons around the institute (students, staff, lecturers and industrial experts) required quickly adding, retrieving, modifying and updating personal data and relative administrative documentations.

The other problem concerned the management of remote cooperative processes which can be only partially defined in advance, but never completely specified until runtime (Ceri et al., 2007). In fact, these processes require to manage dynamic and brief-length information that evolves frequently in periods ranging from two weeks to three months (e.g., during the development of research project reports), and that needs to keep track of the results, such as tutoring students working on complex projects through remote cooperation processes.

In ALaRI, the project-centred learning covers a strategic importance for the master's programs. The project follows a sequence of phases constituting the project life-cycle. Some of these phases have well-defined and structured processes; some others have an unstructured set of procedures which cannot be arranged in a pre-defined way at design time. The projects are developed by teams geographically dispersed, whose members cover different roles, and have different competences and background. Thus, the team members need to interact also remotely to participate in the completion of the research work. For instance, students need to expose some results during the project evolution; while teacher or industrial expert needs to evaluate the outcomes. For this reason, each team needs tools supporting both asynchronous and synchronous communication. Further, some project resources are available at the beginning of the project, but most of them are created by the project's members when the project is still ongoing. This situation requires keeping track of the developments in order to maintain the know-how and expertise on the project, until the final release of the achieved results. The project resources can be public (like the final report) or private (like some documents produced during the evolution of the project) and accessible only by the persons strictly involved in the same project, or by the Scientific Committee or program manager.

Another issue concerned fixing a common infrastructure to the project's management, since each team managed the research project according to own practices and methods. Lacks of a common practice made difficult to control and supervise the evolution of many projects during the academic year, and also it prevented collecting and presenting the various project's results in a recognized and formal layout at the end of the master program.

Then, the achieved results and the increasing educational materials required creating a knowledge base repository with the aim of supporting the knowledge co-construction, sharing and re-use, exploiting the results obtained from the completed researches. In particular, the retrieval of the project outcomes constitutes a worthwhile support to enhance not only the individual learning, but also the knowledge property of the institute, making it independent from the individual know-how, and reducing the leak of intellectual property due to the physiologic turnover of human competences, such as in an academic environment.

Finally, the management of project's data opened the security issue related to use of information technology. In fact it was necessary to develop an access rights mechanism to protect the industrial partners' know-how and to manage permissions among the different actors.

It is easy to understand that from such a complex scenario, it was very urgent to find a suitable solution. Minimizing the direct relations, it became necessary promoting the high quality of the remote interactions, through asynchronous and synchronous communications, ensuring interactive participation of all the social actors and facilitating

their remote cooperation with respect to training, team working as well as to all the phases of work planning.

The answer to tackle such problems was the building from scratch of the ALaRI intranet: a web-based remote application accessible from the ALaRI web site - <http://www.ALaRI.ch/intranet> - with the aim of building a virtual workplace fully operative, capable of supporting a truly distributed reality, within a steady, sturdy and secure environment.

But, why was it necessary to build another web based tool instead of using one of the many cooperative existing? There are three simple reasons. The first is that the ALaRI intranet was conceived as a part of a broader tool, with the aim of increasing and improving the application step by step, facing the many different demands of the institute and of its actors, as they appeared. This effort was addressed to broaden and boost the management of all the ALaRI activities on a unique remote platform.

The second reason is that, when the ALaRI intranet building began (during the academic year 2002-03), there was no tool available that truly responded to the ALaRI real needs, while those at disposal were not capable of integrating asynchronous and synchronous services. Therefore there was no *ad hoc* application complying with ALaRI requirements, and it was found to be less expensive to create a new one.

The third reason is that the existing tools (in 2002/03) were neither modular nor integratable, and interfacing them with each other was far from easily and efficiently feasible, if at all. Further, the ALaRI institute is by its nature a centre of academic research, encouraging the scientific knowledge, and thus, it was natural to entrust the ALaRI intranet building to internal members in order to realize a tool suitable to this specific environment.

How the building of the ALaRI intranet has been managed is subject of the next chapter 6. The section below analyses the impact of such technology on the work place and on the social actors, investigating what should be required and what really lacked.

4.4. Organizational requirements and changes

While, on the one hand, the introduction of the ALaRI intranet has been thought to tackle and fix the above mentioned problems and necessities, on the other hand, to work properly, it requires active cooperation and interaction on behalf of all the social actors, who, in turn, demand easiness of use and immediate understanding of the available services. On such a platform, the benefits for the single user are strongly correlated to the frequency of use on behalf of the other members. In fact, the set of joint benefits should be the basis on which a virtual workplace can become really effective (Pontiggia, 2001).

Starting from these premises, it becomes strategic to involve all the ALaRI actors to whom the technology is addressed. To reach this goal, several choices at governance level can provide communicative and organizational supports to drive the work-flows

changes, assuring coordination and cooperation among all the actors. In particular, it is possible to identify a sort of ideal “roadmap of change” through six phases running in parallel with the life-cycle of the technology. These phases aim at defining specific activities that should go with the development and use of the information system, and namely:

1. the phase of *strategic concept* should underline the expected impact of the technology, identifying how this will contribute to the management of the institute activities and to the needs of the various social actors, defining the objectives and the expected results, assigning the main responsibilities and involving the end users;
2. the phase of *governance plan* should decide roles and rules to coordinate both the intranet development and its maintenance;
3. the phase of *design & development* should convey the user requirements in specifications for the implementation of technical services and functionalities of the system;
4. the phase of *release & launch* should introduce the system in the community and promoting its adoption and use;
5. the phase of *current maintenance* should assure a good performance and a high level of use of the system over the time;
6. the phase of *feedback & assessment* should analyze the achieved results and the organizational impacts in order to plan improvements whereas required.

Although devised through a sequential order, these six phases are strictly intertwined, so that in each phase it is important to bring forward bonds and demands relative to the successive phases, as Figure 4.2 shows.

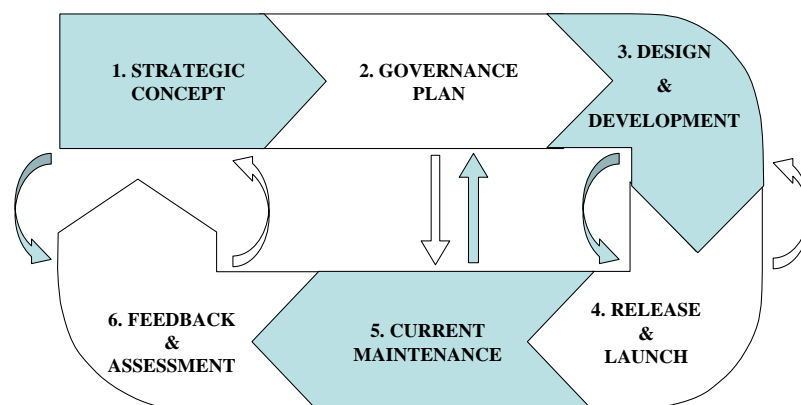


Figure 4.2: The ideal “Roadmap of Change” (adapted from Corso et al., 2006).

In this way, during the phase of *strategic concept* it should be appropriate to bring forward needs of analysis and measurement of the achieved results that will arise in the phase of *assessment*; while, during the phase of *governance plan*, it is important to define roles and rules that will allow the phase of *maintenance* to be effective. And finally, during the phase of *design & development* it should be required to make provision for promotion actions of the technology that will occur during the phase of *release & launch*.

Taking into consideration what the phases here above identified require, here follows an analysis of what really happened within the ALaRI environment.

As first phase of this ideal roadmap of change, the *strategic concept* aims at identifying, at governance level, the main benefits both for the whole community and the individual actor, according to common and well-balanced advantages and values. In this perspective, the building of the intranet system and its use needs to be planned over the long period, considering its social impact during the time, and involving actively all the intranet stakeholders, i.e., all the personnel charged of its building and also the main potential users of the system, whose vision and objectives contribute to determine the success of the intranet. In particular, the persons in charge of the intranet building should master well the provided technology, integrating different applications or services in a common technological infrastructure both currently in use or required to be added in future. In this sense, the developers should foresee a certain flexibility of the platform that allows also tackling future organizational requirements and changes. At the same time, the involvement of the end users can help in focusing better on the principal requirements of use.

Within ALaRI, since the beginning, the top-management, represented by the Scientific Committee members, have involved the program manager and some internal staff persons (PhD students working part-time in ALaRI) to realize an *ad-hoc* intranet system for the specific educational workplace. In this phase, in my opinion, the main problem was that the intranet building was not conceived as important strategic instrument for the whole community. In fact, the Scientific Committee entrusted the supervision of the intranet development to the program manager – who thus also became the intranet project manager - and the intranet building to a PhD student who became the intranet designer. But then, the Scientific Committee did not take care of elaborating a wider and comprehensive strategic concept of such technology to spread at community level.

Further, at least during the first two years, the intranet building was managed according to a *top-down* approach, involving few end users, further only marginally and in a sporadic and informal way. This lack of involvement reveals several cultural and social difficulties (as presented in chapter 6 about the analysis of the intranet development), and, especially, it emphasizes a prevailing “technical approach” of building, whereas the specific and peculiar nature of the intranet system requires, first of

all, an organizational rather than technical vision, paying particular attention to the context of adoption. On the contrary, the technical approach did not allow perceiving the intranet as a continuous process of which taking care over the time, but rather as a spot or independent activity, ending with its release. Moreover, just relying on users' individual and collective ability of adaptation, there was a progressive carelessness of its management.

As a consequence of such intranet short-sighted strategic planning was that neither feedback processes nor any assessment of the application were planned. Only after two years from the first release, a complete assessment about the intranet usability was performed, since its use did not meet the expected results (in particular, usability aspects are studied in depth in chapter 6).

The second phase, concerning the *governance plan*, underlines the importance of formalizing roles and coordination rules within the two principal intranet governance dimensions that are development and maintenance. In particular, key roles should cover the following positions of:

- *strategic guide*: responsible for the definition of the intranet objectives and evolution, assuring the intranet development in compliance with the mission and the strategy of the institutional context;
- *development team*: responsible for the technical and organizational intranet development according to project objectives, in terms of cost, time, and quality, and in charge of eliciting the user requirements;
- *intranet manager*: representing the core figure within the intranet governance, the principal promoter and the link between the dimensions of development and maintenance;
- *maintenance team*: involving all the actors who contribute to the management of the intranet services and contents;
- *end users*: or better all the potential social actors of the virtual platform, who not only access specific services, but especially determine the intranet success on the basis of their own contribution during the use, taking advantage of benefits, considering possible improvements, and reporting usability problems or complaints.

How rules and mechanisms of coordination of these key roles work are illustrated in Figure 4.3, representing the “governance hourglass”.

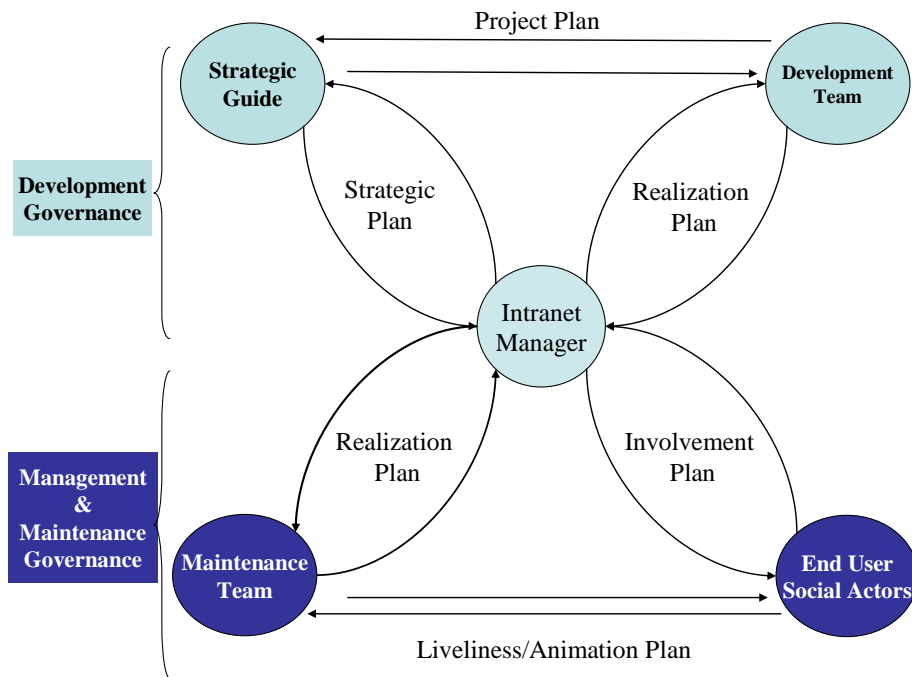


Figure 4.3: Governance Hourglass

The hourglass shape highlights the central position of the intranet project manager who is responsible for the technology correct release. In fact, he is called to balance and mediate between a top-down approach, oriented and restricted to specific technical needs, and a bottom-up approach, arising from the end users' demands.

In this perspective, the intranet becomes the main instrument through which addressing the process of organizational change, and through which work-flows and social practices can evolve, transforming and re-forming on a virtual workplace. Therefore, the life-cycle of the intranet needs to be supported and constantly monitored. Not paying enough attention to this aspect may compromise the efficiency of the whole organizational system, often generating conflicts and internal difficulties among the social actors, as when both the evolution of the work practices and the maintenance of the provided services on the platform are neither controlled nor coordinated.

In ALaRI the definition of key roles and of coordination rules was partially missing. In fact, besides the program manager who was in charge of the intranet supervision and the PhD student who was the first designer and developer of the intranet, no other role was defined in advance. Further, other peculiar aspects of the ALaRI context converged to prevent from establishing an accurate intranet governance plan, allocating the required human resources. In particular, it is necessary to consider that:

- neither the program manager nor the PhD student, as intranet designer, were able to entirely devote their work-time to the intranet supervision and development, due to their other activities and responsibilities;
- usually, some master student was in charge of acting as developer, following the PhD student-designer's instructions, and building the technical applications, after having learnt basic principles of the provided intranet technology. However the master student's engagement is always limited to his/her part-time job, and it can only be performed during free-time, when not devoted to the master studies;
- assuring the presence of the same student, acting as designer assistance or intranet developer, is always an issue restricted to the master program attendance at ALaRI during the academic year. Thus, each academic year, a new student is required to take over the previous engagement about the intranet development, while the activity is subject to continuous transfers;
- the frequent turnover, along with broken and irregular activities, has also repercussions on the intranet know-how, entailing high risks such as knowledge dispersion, handing over of intermediate products, and intranet traceability due to the difficulty to document each phase of building.

As a consequence, not only the intranet development took a long time, but especially the lack of an overall governance plan for managing the strategic development compromised the intranet release, its efficiency and maintenance within the community.

The third phase concerns *design & development* which leads to defining the system specifications and to realizing new useful features. During this phase, the focus is on the personnel choice, in terms of number, time and budget allocated.

Considering the situation at the time of the ALaRI intranet beginning, the human resources available were by far fewer than those necessary. In fact, until the academic year 2004/05, only the program manager and other three PhD students constituted the ALaRI staff. Among them, just one was engaged to work out with the program manager a feasibility study for the intranet development. Therefore, only internal resources were employed, according to a *self-making* approach. Such approach is symptomatic of a twofold objective, presenting positive and negative effects. As positive effects, the use of internal human resources assures a better control and guidance of a project considered strategic for the community, exploiting internal competences, and thus saving costs in terms of money (not requiring further external personnel) and of time (presuming that internal persons know better the community context and its needs; while external persons need to be previously informed about the community and personnel conditions). As negative effects, overloading few persons available with new tasks and further duties, it risks giving poor importance to the intranet project both as strategic activity and as social practice for the community. A particular risk lies in believing that less efforts and

attention in terms of human resources and maintenance are necessary once the intranet is developed.

Another risk of the *self-making* approach, also present in ALaRI, is the development of ad-hoc services and features that usually represent first experimentations for the designer, since they are developed according to contingent community demands but they can produce difficulties of use and management.

During the fourth phase of *release & launch*, indeed, the promotion of the technology, once developed, aims at leading to its complete adoption and use. In order to reach such goal, a policy of “change management” should be defined in advance, promoting among the social actors a cultural perspective of the community *work-on-the-net*. In fact, the technology success strongly depends on how the management of its release is planned.

In ALaRI, this phase was mostly disregarded. Two principal reasons concern:

- the specific technical and scientific nature of the academic milieu led to overestimating the end users’ ability of adaptation, relying on their general familiarity with the technologies and on their habit of navigating and working online (since almost all come from the ICT field);
- the exclusively technical development approach that did not take any care of the release issue.

As a consequence, the necessity of creating and promoting a shared meaning of the new introduced technology was not taken into account. In particular, at corporate level, it was missing the individual and collective awareness of using the intranet platform to cooperate together, collecting and sharing knowledge and competences, and providing each other with benefits to enrich the whole community.

Further, in my opinion, it is worth remembering that the ALaRI intranet was immediately introduced as advanced information system with the aim of creating virtual workplaces to manage community work flows remotely (both at research and educational level). On the contrary, generally, the intranet is first introduced as basic support for internal one-way communication, and thus acting first as element of cohesion to reinforce the feeling of belonging to the community culture. Only later on, the intranet evolves, integrating new services and functionalities, and thus truly becoming an interactive and multidirectional support, making the virtual workplace really efficient.

In ALaRI, such progressive evolution of the intranet was lacking and this made it more difficult not only to create and to accept a shared meaning of such technology, but also to recognize the intranet as principal communicative support to find and share information, in place of writing a lot of e-mails or making phone-calls. In addition, the heterogeneous composition of the ALaRI community required a particular attention especially towards those members less present at the institute, who usually interact remotely. In fact, they were less available to adopt the new technology with respect to

the actors physically present (i.e., students and staff members). The combination of several factors can explain such different predisposition/availability. For instance, the different level of involvement in the community, due to the different rate of work engagement and the physical distance from the institute, is an element that affects the adoption. Also the different social and professional status, along with the difference of age, cause young members to be more inclined to experiment and to use something new (e.g., students are supposed to have more free time to test new products, and to be more willing and available).

Finally, although most members come from the same educational background (being electronic or informatics engineers with technical expertise and skills), their approach and predisposition towards information systems, such as the intranet, changes completely when they cover the role of end users. In this way their ability of adaptation and the consciousness of use cannot be compared or made equal to the designer's or developer's knowledge around the system itself.

The fifth phase of *current maintenance* aims at assuring a good performance and a high level of use of the technology over the time through clear rules of use and continuous actions of promotion. This process requires the involvement and the coordination of all the actors of the platform, who, in turn, should have ripened the awareness of performing interdependent tasks and activities, on which depends the efficiency of the whole intranet system. In fact, in this phase, two operations are particularly important, and namely: the actors' contribution to the intranet contents and the coordination for the contents management and their relative services.

In ALaRI, the Scientific Director imposed strict rules to manage the scientific research quality on the intranet which entailed considerable individual contributions to the intranet contents – especially on behalf of staff, students, and program manager -; whereas the comprehensive harmonization of all contents together with the provided services did not receive a systematic management. The risk was that of compromising the intranet coherence and usability. This shortcoming was frequent until two years ago, due to the lack of a careful supervision of the intranet and of a formal role taking care of its maintenance. Then, the intranet maintenance was officially given to a new PhD student and to another staff member, who started to take care of the intranet liveliness, managing not only the contents but also, and especially, the relations with the ALaRI intranet actors. In fact, they two were in charge of informing the actors every time the intranet requires changes or specific actions to be performed. In this way, they also try to motivate persons less involved to access the intranet contents and to contribute adding or completing information to be shared. Other ways to involve actors in using the application could be “forcing” them to enter specific contents by making available only on intranet some important information, and by sending them only the link to the intranet section where there is the necessary documentation.

The last phase, concerning *feedback & assessment*, suggests the need of monitoring the intranet value for the community through its use, considering two main aspects: the performance level of some key processes and the users' feedback. In ALaRI, key processes are, for instance, the development of master projects; or the remote management of the educational activity, requiring lecturers to upload learning material in time for the students' lesson, or to assign students' marks using specific intranet functionalities, without sending general emails to the program manager or to some staff member),.

These aspects allow knowing direct benefits perceived by individual users. But sporadic analyses are not enough to evaluate the general level of the users' satisfaction; whereas systematic methods of feedback collection through questionnaires and direct interviews can contribute not only to analyze the achieved results and the organizational impacts with respect of those expected, but also to promote the intranet use. In fact, a later assessment of the intranet services and their performance allows supplying crucial elements to plan improvements whereas required according to the actors' expectations. It means reviewing the analyzed process and evaluating the effectiveness of specific functionalities.

Further, comparing with best practices acts as *stimulus* to get new ideas and to improve the intranet services. On the contrary, habit of auto-reference hinders from finding new interesting and better solutions. In particular, this aspect stood out during some direct interviews about the intranet usability (as presented in chapter 6).

Therefore, in this phase, it is important to involve the end users, and then to make aware of the final appraisals not only intranet technicians, who should improve the system according to the feedback received, but especially the top managers, pinpointing the real level of intranet use and satisfaction at community level.

On the contrary, not taking in to the right consideration the phase of *feedback & assessment* reveals how poor importance is given to the intranet application, disregarding possible individual and collective benefits the intranet could bring to the community.

In ALaRI this phase, although not foreseen or considered at the beginning of the intranet building, has been subsequently introduced with the aim of understanding the reasons of poor use. At the moment, a systematic approach has not yet reached, but part of the investigation presented in this research aims at suggesting a new vision of the intranet system, taking care of its strategic and organizational impact for the community. In particular, a well-structured intranet governance plan should involve all the main intranet stakeholders and social actors in tackling the change management in ALaRI with success.

Concluding, as suggested in (Zuccheromaglio & Alby, 2005), technologies do not cover a neutral role, but they reflect historical dimension and social characteristics of the work practices which produce them. In this sense, the technology design does not consist

of simply producing instruments, but rather of shaping specific practices producing such instruments.

For this reason, the ALaRI intranet building seems to represent what Wenger (1998) identifies as *reification* process of the practices and of the knowledge developed within the community. Moreover, in my opinion, it seems to be an *evolving reification*, representing an object not at all frozen but reflecting and “reifying” the ongoing evolution of the institute activities. In fact, within some aspects, difficulties met in the life-cycle of the intranet reflect difficulties tackled in organizing and managing some institutional issues. The intranet acts as a sort of material and symbolic projection of the history of the institute, representing both the reification of the work practices in ALaRI, and its progressive evolution in the social world. The ALaRI identity awareness as community of practice runs in parallel with the awareness that the intranet is a support to the interdependent growth of its actors, both at individual and collective level. Over the time, the level of the intranet use can be taken as measure of the social members’ level of awareness of belonging to the community.

In this final section, the accent was on those organizational and management issues that can contribute to shape a real virtual community on the intranet system, paying more attention to cultural and social factors rather than to technical ones. In particular, my purpose was to emphasize the critical dimensions of the intranet, underlining the need for clearly defining institutional roles for its maintenance and use that can contribute to benefit all the community members.

After having illustrated how the institutional context and the social actors are involved in the intranet building and use, the following chapter 5 introduces the intranet conceptual background; while chapter 6 presents a critical analysis of the development of the ALaRI intranet, underlining the impact on its usability and adoption.

5. Intranet system: conceptual background

5.1. Intranet definition and its peculiar features

The term “IntraNet” was conceived during the summer of 1994 by Steven Telleen to define an infrastructure based on Internet standard and technologies, with the aim of sharing information and contents within a restricted and well-defined group of persons. The term first appeared in print on April 19, 1995, in *Digital News & Review* in an article authored by technical editor Stephen Lawton (Lawton, 1995).

The intranet, used by members of an organization, allows to securely sharing part of information, communication, or operations, due to limited access assured by one or more security techniques. Security measures typically used are passwords, encryption, and firewalls (O'Brien, 2001). When part of the intranet is accessible by customers, suppliers, or other approved parties, this part becomes an "Extranet".

Increasingly, intranets are being used to deliver tools and applications, e.g., collaboration supporting business processes (to facilitate working in groups and teleconferencing) or sophisticated corporate directories, sales and project management, and to advance productivity. Intranets are also being used as culture change platforms. For example, large numbers of employees discussing key issues in online forums could lead to new ideas. Further, intranets brought to fruition concept of knowledge management, defined as “the management of processes that govern the creation, dissemination, and utilization of knowledge by merging technologies, organizational structures and people to create the most effective learning, problem solving, and decision-making in an organization” (Ubon & Kimble 2002).

The building of an intranet system should rely on planned strategies for its deployment in such a way as to achieve one or more pre-defined organisational objectives. Therefore, many organizations develop their own internal intranets (often much more complex than their respective public websites because of the scope and variety of content and the number of system interfaces), allowing employees or social actors to access secure information both on-site and remotely. However, it is all too often the case that organizations do not follow any strategy in the implementation of their intranet and thus fail to exploit its full capabilities, with negative impacts.

General advantages of using intranet systems usually include:

- workforce productivity, since the intranets can help employees to quickly find and view information and applications relevant to their roles and responsibilities. Via a simple-to-use web browser interface, users can access data held in any database the organization wants to make available, anytime and - subject to security provisions - from anywhere within the company workstations, increasing employees' ability to

- perform their tasks faster, more accurately, and with confidence that they have the right information. It also helps to improve the services provided to the users;
- time saving, since exploiting the appropriate time, organizations can make more information available to employees on a "pull" basis (i.e., employees can link to relevant information at a time which suits them) rather than being deluged indiscriminately by emails;
 - improvement of the internal communication, since intranets are powerful tools to vertically and horizontally communicate strategic initiatives within an organization;
 - maintenance of and easy access to '*cumbersome*' corporate knowledge throughout the company using hypermedia and web technologies, such as e-manuals, benefits documents, company policies, business standards, newsfeeds, and training courses, updating online the most recent version of a document;
 - business operations and management, since intranets are also used as platforms for developing and deploying applications to support business operations and decisions across the internetworked organization;
 - corporate promotion, since every user can access same information within the intranet;
 - collaborative enhancement, since with information easily accessible by all authorised users, teamwork is enabled.

On the other side, some troubles and disadvantages can occur when not enough attention is paid to i) the publication of information, that must be controlled to ensure only correct and appropriate information; and to ii) appropriate security permissions, that must be in place to ensure there are no concerns over who accesses the intranet or abuse of it.

In this way, the intranet reflects the company organization and its corporate communication with the aim of emphasizing transparent processes and knowledge sharing, ridding of useless or low-value work. Reinforcing the management control over the whole activity system, the intranet becomes a pillar of the organizational change, and its level of flexibility³⁴ contributes to making the organization itself capable of supporting novelty or innovation (Mantovani, 1995).

The intranet social importance affects human relationships as well through the creation of new work practices among members of a working environment or community. In my opinion, the intranet can be included in what Pontiggia defines as "relationship technology" (Pontiggia, 1997), since the intranet covers a double role: it is both a working and coordination support among different individuals, and a social tool

³⁴ The concept of flexibility complies with a dynamic reconfiguration of the working and organizational processes, allowing a more quick answer to external market or internal community needs.

for communication, leading to the definition of an interactive (even if virtual) institutional context. In particular, the intranet system contributes:

- to integrate different fields of competence, making it necessary the systematic organization of the information;
- to create new groups or teams of work, joining heterogeneous competences and background to be competitive and innovative (team members cover various and temporary assignments, usually defined within and throughout the assigned project);
- to shape new forms of social interaction, reducing the level of hierarchic relationships and the authority division;
- to promote work mobility and remote working;
- to reduce mediation phases, making the work-flows fast and nimble (avoiding bureaucracy procedures).

Promoting interpersonal relations, benefits for intranet users strongly depend on other users' behaviour, considering how and how much they use the intranet system. The efficiency of the system both at individual and collective level relies on interdependent relations of work practices producing joint benefits. A strong component of personal involvement prevails, providing the single user with high discretionary powers. For this reason, it is important that all social actors of a community co-share and acknowledge goals and reasons that lead to the intranet adoption.

5.2. Intranet Evolution

During the years, the role of the intranet has changed. Born as channel of information to manage the internal one-way communication towards the employees according to a top-down approach, year by year, it has exerted an increasing importance on business and organizational processes.

At the beginning, during its first phase, the main objectives of the intranet system regarded:

- the improvement of internal communication (more timely, transparent, reliable) thanks to a unique and integrated information system;
- the identification of corporate identity, reinforcing the culture and the feeling of belonging to a community;
- the simplification of information process management and diffusion, saving hard costs and paper production.

But, since 2004, a new phase started, awarding a more strategic relevance to the intranet concept. Always centred on the person, the intranet is also oriented towards the creation of an integrated and complete work environment, i.e., the virtual workplace. Close to the communication services, other functionalities are developed and oriented to

the business and to the operative work spaces, through the access to devices supporting knowledge management and cooperation among social actors. In particular, really the growing importance of the working practices on the intranet has actually led to giving an increasing strategic role to integrated information systems, involving in the processes of designing and maintenance a wider and relevant part of the internal community hierarchy, ranging from the IT and Communication personnel to the top management. Further, the coming of new procedures of human interactions and communicative practices, through and on the intranet, leads to re-thinking the organizational structure itself and the working processes within a community. In this way, the private computer network becomes strategic element for organizational change and innovation.

Currently, the concept of intranet, besides being oriented to services to the person, entails a greater and higher attention towards the way in which new integrated and advanced processes support such services, shaping new virtual workspaces within the organizational systems of various communities. In particular, according to an Italian study on the intranet applications in industrial and business milieu (Corso et al., 2006), an intranet system can consist of four main spaces, concerning:

- *the employee service space*, that provides access to various supports and general facilities, usually according to self-service modalities, useful for the person belonging to a specific community (such as the management of the working hours, expense-refund, job posting, booking of meeting room, library service management, etc.). The goal is to improve the internal online service, removing persons from performing low-added value activities (activities of support without added value).
- *the internal communication space*, oriented both to the institutional (formal and one-way) and collective (informal and interactive) communication (such as the main news, internal open work positions, forum, mailing list, suggestion or recommendation box, etc.), promoting social exchanges and also extra-work interactions and entertainments among the community members. The goal is to improve the internal social climate, increasing the feeling of corporate identity and of belonging to a community. This has particular relevance in communities whose members are geographically dispersed or during considerable organizational changes, since it allows quickly driving the corporate mission and its organizational vision, eventually reinforcing the community culture and identity among all the social members. Further, it provides a direct channel to anybody wishing to present ideas or suggestions. The result is twofold: i) promoting the social members' participation in the community organization, making them aware of taking into consideration their opinions; and ii) monitoring the internal social climate, grasping the individual perceptions about the community or some aspects of it, and thus underlining problems as well as positive elements.

- *the business community space*, characterized by services of knowledge management (like indexed search engine, recommender system) and cooperation (teamwork and project management), with the aim of improving and developing the management of common know-how (acquiring competition at community level), and of sharing individual expertises and competences (enhancing the individual professional growth). When direct relations among individuals are limited, due to their work mobility or frequent turnover, it becomes necessary to increase (virtual) supports reinforcing individual and community professional growth. These services, based both on asynchronous and synchronous communication (such as videoconference, chat, online presence, or blog, wiki, project or document management, e-learning, etc.), contribute to overcome geographical and temporal barriers, promoting collaboration and cooperation among team members geographically dispersed and with heterogeneous background.
- *the operative work space*, oriented to support single member's activities with applications integrating virtual workflows and information services, aims at providing more flexibility and independent training ability.

Such spaces then can differently develop according to four principal dimensions of Community, Relation, Interaction & Collaboration, and Individual which represent different ways of conceiving the *virtual workspace* as support to the person. The complete and fair integration of all these dimensions along with the relative spaces of development (Figure 5.1) is still an ongoing process.

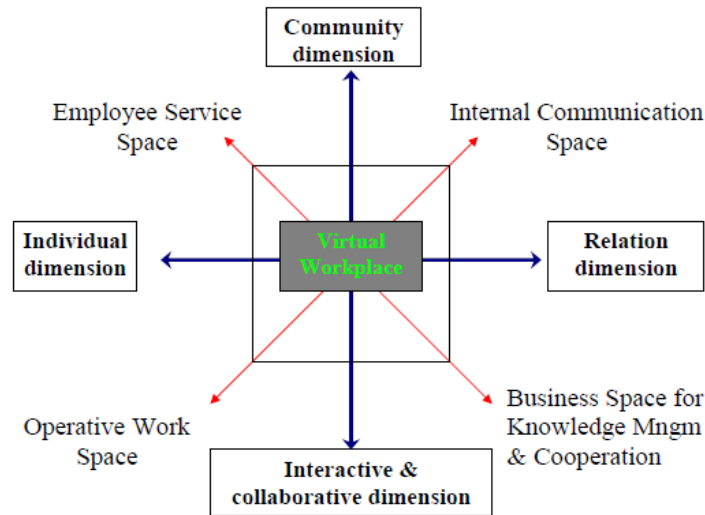


Figure 5.1: The integrated Virtual Workspaces within the dimensions of Community, Relation, Interaction & Collaboration, and Individual.

Often developing an intranet system focuses just on one or a few of these dimensions, whereas it should drive towards the creation of an efficient and integrated platform acting as complete virtual workplace for the community and all members.

At present, often internal matters due to both technical and cultural-organizational difficulties slow down the intranet evolution process towards the constitution of such virtual workplace. In fact, for instance, problems tackled concern technical integration of applications with different web interfaces; or the possibility to access information profiles tailored according to different roles; or individual rivalry and reciprocal distrusts that hinder from sharing information and knowledge.

In this way, it often happens that just one or some of these dimensions evolve and improve over the time, favouring the creation of compound and blended intranet models that reflect different visions and interpretations about the intranet role within the communities of adoption. Different intranet models, based on implementation and use of specific functionalities, relate to different objectives and goals of communities, often also disclosing weakness, breakdown or shortcomings of the internal organization. Therefore, carefully analyzing even little shortages of an intranet system can help to understand critical aspects of that community organization, and to identify which changes and contributions can improve the overall management both of the intranet and the community.

Within this perspective, the following chapters illustrate the analysis of the ALaRI intranet model along with its particular evolution, characterized by the development of two specific dimensions concerning the sharing of the knowledge as support of cooperative and learning practices and the individual operative work space oriented to

the individual professional growth. Thus, such analysis will allow shedding light on the peculiar role the intranet plays at ALaRI as well as disclosing some internal organizational problems of the institute.

5.3. Cognitive and social implications into software design

A web based advanced information system, such as an intranet, is a complex artefact with cognitive and social characteristics. As cognitive artefact, it consists of hardware and software that allow the execution of operations for which it has been developed; as social artefact, it allows through the interface direct interactions *with* the user and *among* the users.

Developing technologies should require cooperation from different professionals, including not only technical experts or software engineers, but also marketing and communication experts, graphic designers, content editors; and all these persons need to work side by side, negotiating agreements throughout all the life-cycle of the project, from the initial elicitation of the users' and system requirements - functional and non-functional³⁵ (Chung, 2000) -, along with product design and specifications, until the building of mock-ups or prototypes to validate the system before the release.

Still, the cooperation among different disciplines entails practical and serious difficulties, such as objective problems of communication. Starting from the use of own professional jargons or disagreement about priorities, "interdisciplinary misunderstanding" can arise and lead to harbouring reciprocal suspicion. The risk is that niche communities of specialists become estranged from one another as well as from giving the awaiting answers to larger communities of users (Scott, 1999). Therefore, this problem requires focusing on professional knowledge sharing as base on which devising interactive systems. The complex field includes collaboration of experts with different competences, but with common basic knowledge, to manage all the life-cycle of the technology, from the phase of design, to the phases of test and assessment, until the release and maintenance.

Such openness provides a good arena for finding out suitable answers to queries framed in a particular work environment, but it implies a deep respect for values and cultural traditions of the various fields of competences. As Agostini, De Michelis, and Susani (2000:230) have well tested, "the cooperation gives rise to a mutual learning process, crossing boundaries that separate different cultures and contaminating them. But

³⁵ The difference between *functional* and *non-functional requirements* is that functional requirements describe the behavioural aspects of the system, i.e. the desired functionalities, operation and data the system should provide, such as the descriptions of services and features of the system; whereas, non-functional requirements describe the non-behavioural aspects, i.e. the general properties and the quality attributes of the system, such as usability, security, trustworthiness, ergonomics, flexibility, reliability, or scalability (Chung, 2000).

cooperation is much more difficult and demanding than simple exchanging ideas at meetings and conferences, because it requires acceptance of other viewpoints, careful listening to the partners' proposals together with serious and lasting agreements about determinant choices with respect to the outcomes of the design process".

Another crucial aspect of such heterogeneous work team regards the user's participation and contribution. In fact, too often the user's point of view is overlooked, as work is based exclusively on experts' and professionals' competences. Benefits and drawbacks of the user's collaboration have been far and wide reported in much scientific literature³⁶. Here below, some considerations illustrate the principles of the users' participation in technology developing, well-known as *participatory design*.

The concept of *participatory design*³⁷ can be basically summarized within the maxim "to design *with* the end users" rather than "*for*". Members of the Scandinavian Participatory Design movement (Carroll, 2003) argued that the requirements for the technology should be developed directly from within and around the work situation of the technology's users. Particular emphasis was on involving the workers in the design process, letting their voices heard with respect to workplace management and development, giving relevance to the flexibility of the work activities and considering the work an accomplished rather than a mechanical matter.

Therefore, *participatory design*, making the users the centre of attention, aims at building feelings of competence, mastery, and predictability (Schneiderman, 2005), where the increasing of the success rate of the technology much more depends on the collaboration between experts and users (Pontiggia, 1997).

Considerations on the users' active participation in the design process reveal controversial issues, presenting arguments in favour but also against.

Favourable arguments consider that:

- more users' involvement brings more accurate information about tasks and opportunity for users to influence design decisions, properly gathering users' requirements;
- in turn, users can better understand technical difficulties during the design and development phases;

³⁶ For instance, I refer to Winograd & Flores (1990); Nonaka & Takeuchi (1995); Pontiggia (1997); Norman (1998); Bodker & Gronboek (1998); Laurel (1999); Winograd (2000); Dieng (et al. 2000); Carroll (2003); Engeström (2004), and Schneiderman (2005).

³⁷ The concept of *participatory design* develops in Scandinavia countries, originating from the case of Norwegian company *The Iron and Metal Workers Union* at the beginning of the '70 years. It was decided to make a technological reorganisation of the company and all the working personal was invited to take part in this operation in a critical way, suggesting the own comments or perplexities to the professional computer scientists, who were introducing computers and automatic systems. The total involvement of the user, from the beginning of the project, not limiting only to final product test phase, is called *participatory design*. Born into architectural and urban field, the *participatory design* aimed at well knowing needs and wishes of those persons who would have directly lived and used the designed spaces (houses and cities), interacting with them.

- minimization of latent conflicts is made possible due to the capacity of explicitly showing divergent opinions;
- greater sense of ownership and control on the own activity contents becomes feasible, consequently leading to more likely social acceptance of the product;
- users can feel more comfortable about easiness and usefulness of the product: acceptance and use depend on individual perception about learning and adaptation and the relationship between user and designer can make it easier throughout a reciprocal and widespread learning (Nonaka & Takeuchi, 1995).
- as a consequence, it is more likely to build a product of success, and
- the sense of participation in successful implementation may increase the overall user's acceptance of the final product.

Unfavourable arguments to be taken into account concern risks about:

- high cost, due to the extensive user involvement, in terms of both time and resources;
- difficult management of conflicts and leadership;
- difficult coordination among users' and designers' availability that may lengthen the implementation process;
- difficulty in finding suitable solutions that can satisfy all persons taking part;
- compromising design and technical features performance to satisfy incompetent participants;
- manipulative behaviours and asymmetric powers among the parts that could prevent from sound confrontation;
- generating antagonism from persons who are not involved or whose suggestions are rejected.

Therefore, a careful selection of users is recommended to build successful participatory design experience, emphasizing the seriousness of the project, and recognizing the selected persons as preferential communication channel to the larger profile of users that they represent. Then, it is up to the project leader's sensitivity decides the right level of user involvement.

Even if many questions remain open on this approach³⁸, organizational policies and individual preferences seem to acquire more importance than technical issues in governing the success of an interactive system. Such cooperative approach aims to establish a design process wherein both users and designers participate actively and creatively based on their different qualifications, opening for mutual learning, even when

³⁸ For instance, open questions include whether homogeneous or diverse groups are more successful; how to tailor processes for small and large groups; how to balance decision-making control between users and designers (Schneiderman, 2005).

breakdowns (Winograd & Flores, 1990) or focus shifts³⁹ occur during the cooperative design (Bodker & Gronboek, 1996). In fact, considering how and why the object or focus of a certain actor changes during a breakdown situation, it can be useful to understand users', but also designers', behaviour and work practices, and consequently to have influences on design and implementation changes.

Soliciting user participation should ensure that all concerns are made sufficiently explicit to avoid counterproductive efforts and resistance to change.

Just considering the ALaRI experience, a strong improvement of the intranet application occurred when a MAS student, having taken his diploma, became a PhD student, member of the ALaRI staff, and was in charge of carrying on the intranet implementation and maintenance. From his previous status of user, as ALaRI student, he also became intranet designer and developer, and thus he was able to better understand the importance and the contribution of users' involvement.

Supporting the participatory design vision, the human-centred design model emphasizes how an efficient and effective use of the technology may be hindered by not understanding users' reasons and cognitive models developed during their individual experiences (Pontiggia, 1997). Further, careful attention to the user model from the early stages of software development leads to reducing development time and costs, generating fewer problems and having lower maintenance charge over the software lifetime (Schneiderman, 2005).

Within this perspective, Norman (1998) proposed a human-centred design model⁴⁰ which integrates three complementary areas of action: technology, marketing and user experience (i.e., the user's ability to manage the product). While technology remains the base on which building solidity and robustness, the marketing analysis aims at providing information on users' needs in a particular social environment, bridging the gap between new technological ideas and their compatibility with the users' demands and their evolving requirements. While, the user experience includes all aspects of user's interaction with the product: how it is perceived, learned and used, and, most important, the requirements that the product fulfils. Such approach emphasizes the importance of i) developing user conceptual (or mental) models that represent her world-knowledge; ii)

³⁹ Breakdowns can occur at two levels. The first one is related to the use process, when the work is interrupted by something, such as when the tool behaves differently from what was anticipated. The second level is related to the in-session modification, when the fluent conduction of the design activity is interrupted due to *focus shifts*, for instance when user loses interest, shifting her/his focus deliberately during the session. Also in this latter circumstance, it is important to recognize the focus shift as element of opening for learning. It may occur a focus shift due to lack of training, and thus, it will be handled by further training programs for future users.

⁴⁰ Since 1980s a field has been developing where cognitive psychology, computer science and ergonomics converge: this is the Human Computer Interaction (HCI). From this moment on, research focuses on improving ergonomics systems ease to use and the quality of human-machine interaction. The attention is rising towards a *participatory* design, with semiotic, humanistic, cognitive, social and linguistic features.

using cognitive theories to build understandable interfaces for information and data display; and iii) evaluating final products also in terms of aesthetics features.

The human-centered design process starts from observing and analyzing user's needs and behaviours; while the pure engineering and technological functionalities (software and hardware coding and design) are placed at the end. Figure 5.2 shows the contextual design model adopted by a design enterprise (<http://www.incontextenterprises.com>) and reflecting the Norman's view.

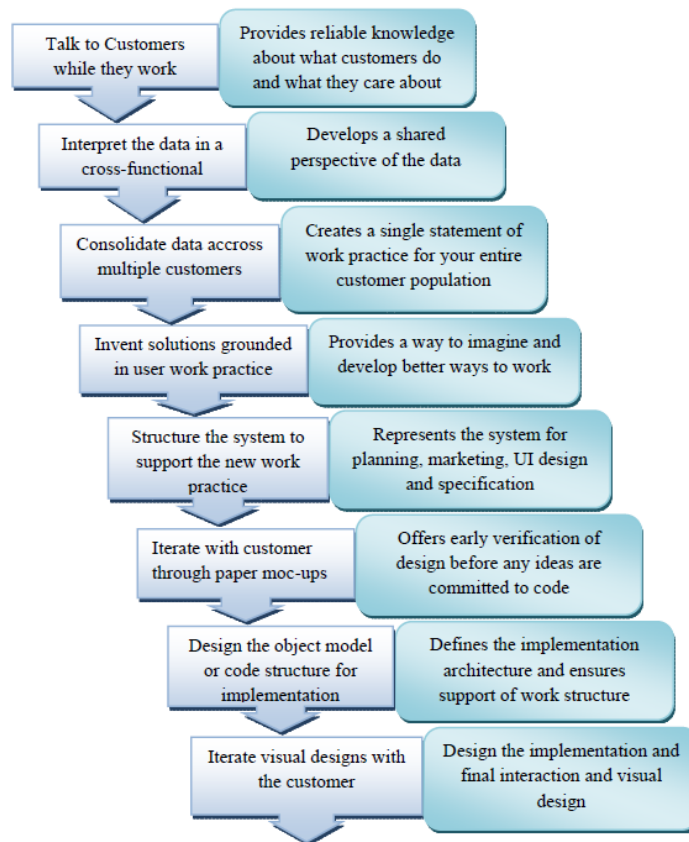


Figure 5.2 The development process, starting from user's needs, consists of seven stages: at the fifth stage, the user interface design is placed; while, only at the seventh and last stage there is the software coding and hardware construction.

The constructions of mental models captures intuitions about the way users come to understand, but also misunderstand, the devices they use (Carroll, 2003). On this subject, Cooper (2007) suggests that the user conceptual model does not need to know the software implementation model (i.e., the model illustrating how the software actually

works)⁴¹ to use the technology. But the user model aims at creating a cognitive framework powerful enough to cover the user's interaction with the software. However, the complexity of software applications entails a discrepancy between implementation and user conceptual models. Therefore, it is up to the designer's ability and competence to choose a representation of the software operation, independently of how it really works. What the designer offers as explanation to the user is the designer's (or represented) model, which is an aspect of software over which the designer has great control (Figure 5.3). In software design, a program's represented model should be quite different from its implementation model, eliminating needless complexity from the interface and matching as closely as possible the user's mental model, thus making it easier for him/her to learn how the system itself works.

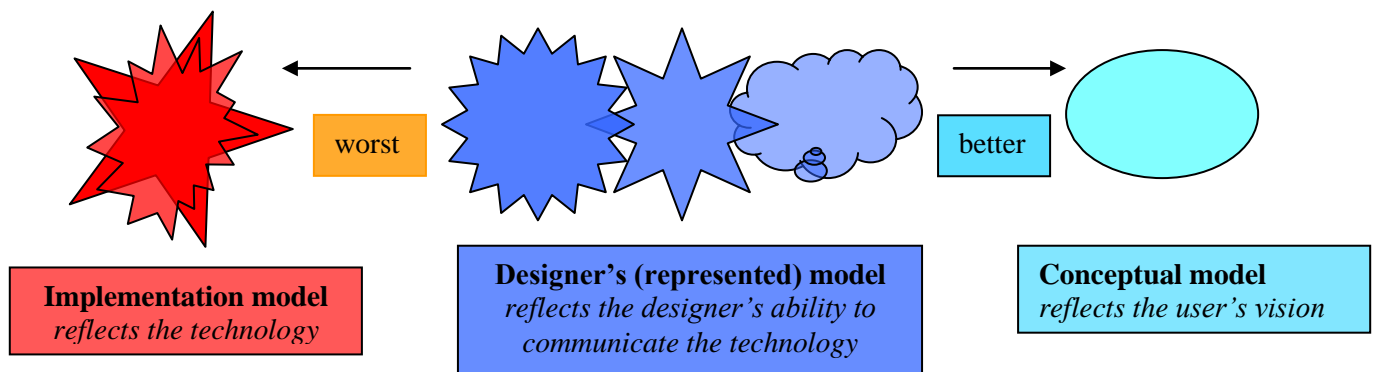


Figure 5.3: Graphic representation of the steps from implementation (software) model to user's conceptual model.

Providing the user with a consistent and appropriate conceptual model, any device (as interface), whether mechanical or electronic, is required to fulfil principles of:

- visibility and mapping⁴² (i.e., spatial and conceptual correspondences between controls, showing clear and explicit meanings, and resulting actions);
- affordance⁴³ (i.e., possible uses and limits of use - Norman, 1988);
- feedback (i.e., information about the achieved result).

⁴¹ Software-enabled product has algorithms and modules of code that communicate each other. This work representation has been called *system* or *implementation model*, because it describes the complex inner system details of how a program is implemented in code (Cooper, 2007).

⁴² The principle of mapping provides a relation between in-put and out-put actions, between the system status and the visible results.

⁴³ The concept of *affordance* encompasses the set of natural bounds and bents/invitations provided by an artefact. The natural bents suggest the range of possible uses; whereas the bounds restrict the possible alternative uses. The combined clever design and practice of both allow the end user to know what to do even in a new/unexpected situation.

The principle of visibility and mapping strongly depends on designer's skills and sensitivity, which should provide user with a valid conceptual model that allows her/him to execute the necessary actions and to achieve evident results within a coherent system. Further, the designer should always design according to principles of reversibility of the error. Providing users with tools for informative feedback and for easily error handling entails a further step towards a full awareness of the human-centred design model.

The concept of affordance, introduced by Gibson (1977, 1979)⁴⁴, was then re-used and re-addressed by Norman (1986, 1988, 1992, 1998) towards a social-technical perspective, perceiving the design as social activity and the designer's *sensitivity* as prevalent in the representation of user's conceptual model. In this perspective, the *affordances* of a technical device can be socially constructed (Carroll, 2003), avoiding canards and false impressions on system interface that can fool users who do not find natural connection between what they see on the interface or screen and what lies behind it (Cooper, 2007).

The feedback of an action characterizes the level of communication of a technology. More silent and invisible is the "behaviour" of an electronic device, more complex and difficult it becomes to understand as it works. The feedback of a technology is crucial to check execution processes, to detect and to correct possible errors, and to maintain the supervision. In this sense, Norman (1988) spoke about "gulf of execution" and "gulf of evaluation", highlighting, on the one hand, the distance between intentions and possible actions; and, on the other hand, the possibility of evaluating the result of an action, according to a multilayered structure of the seven stages of the action (Figure 5.4). Usually, the execution presupposes the constitution of a goal and, consequently, the intention to act in order to reach it through a sequence of planned actions that need to be physically executed. In turn, what has been executed is then evaluated, comparing what really happened in the world with what we wished to happen, with respect to the perception and the interpretation of the world status.

⁴⁴ The theory of affordances was born according to an ecological psychology (Gibson, 1979). Gibson claimed that what persons directly perceive is not simply the layout and shape of objects in space, but rather the possibility for actions, which he called *affordances*.

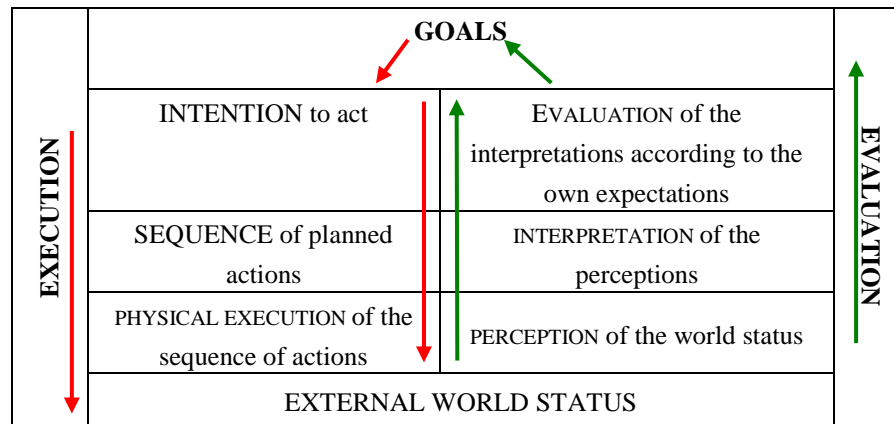


Figure 5.4. Representation of the seven stages of the action (adapted from Norman, 1988).

In every day life, and especially dealing with the technology, there are different *gulfs* dividing mental status from the physical one: the difficulty consists in gathering the relations between intentions and interpretations on the one hand, and actions and physical world status on the other hand. Such *gulfs* present quite a few problems for the users. Dealing with a system, it is worth considering how much such system allows the user to execute specific actions (or tasks), without extra efforts, asking: do the actions the system allows to execute correspond to those actions the user intended to execute?

The difference between the user's intention and the possible actions (by means of the system) represents the *gulf of execution*.

Then, the *gulf of evaluation* reflects the effort required to interpret the physical status of the system, considering how much it corresponds to the user's expectations and intentions. Therefore, the question is: does the system provide a physical representation that can be directly perceived and interpreted according to the user's intentions and expectations? Such gulf is small when the system offers clear information about its status, when it is easy to understand and it corresponds to the idea that the user has about the system.

The worth of this multilayered structure of actions consists of providing a basic list of very simple questions, as represented in Figure 5.5., which should be placed at the beginning of a good design and drive it to minimize the *gulf of execution* and the *gulf of evaluation*.

<div>EXECUTION</div> <div></div>	How much is it easy:		
	Determine the use of the technology?		
	Explain which actions are possible?	Report if the technology status is as wished?	
	Determine the relationship between intention and physical action?	Determine the relationship between technology status and interpretation of it?	
	Execute the action?	Report which is the technology status?	
	World status		
<div></div>			<div>EVALUATION</div> <div></div>

Figure 5.5. Representation of the basic questions that should be placed during the design phase to minimize the gulf of execution and the gulf of evaluation of a technology (adapted from Norman, 1988).

Finally, the relationship between user and technology can be expressed by the *feeling of directness* which consists of two elements: *distance* and *engagement*. The term *distance* indicates the difference or separation between user's intention and action that the interface allows to execute.

The term *engagement* refers to the user's involvement, and it depends on the continuous representation of the object of interest, when the user is totally concentrated in his/her activity.

In turn, the *directness* can be semantic (i.e., belonging to the meaning) or articular (i.e., belonging to what it means). When it is semantic, it refers to the language of the interface and to the difficulty in the meaning understanding, which acts during the phase intention-action, and interpretation- evaluation. When it is articular, it refers to the form, which occurs in the phase sequence-execution, and perception-interpretation. The more the meaning is close and similar to what it means (i.e., the form), the more the comprehension is intuitive, as it happens in the onomatopoeia.

6. Case Study

6.1. The ALaRI Intranet

In ALaRI the decision to build an intranet system was supported by the Scientific Committee who entrusted its development to internal persons in order to realize an information system suitable to the peculiar learning environment. The building started during the year 2003.

My purpose is now to present the intranet from the technical point of view, briefly describing its main services and functionalities. Then, a detailed analysis on the approach adopted during its design and development will follow, with the aim of underlining both the critical issues (problems occurred and tackled risks) about the management of this project and the effects on its usability and adoption.

6.1.1. Description of the intranet application and its principal services

The ALaRI intranet is an advanced information system, created to support virtual workspaces, with the aim of enhancing collaborative processes in the management of complex projects among social actors geographically dispersed, but belonging to the same community. The platform consists of a web-based remote application accessible from the ALaRI web site at <http://www.ALaRI.ch/intranet>. It was designed using a high-level modeling language for website structure, called WebML (Ceri et al., 2000), and then deployed using a WebML design tool and an automatic code generator, WebRatio⁴⁵.

Through this application, the platform consists of:

- a data model representing the entity-relationship diagram of the used platform database (Figure 6.1);
- an hypertext navigational model describing how the web pages are linked together and the content structure of such pages (an example in Figure 6.2); and
- a presentation model used to define the web page layout positioning its contents and graphical presentation (an example in Figure 6.3).

⁴⁵ WebRatio is a product from WebModels, a company established in 2001 as a spin-off of Politecnico di Milano, more information at <http://www.webratio.com>

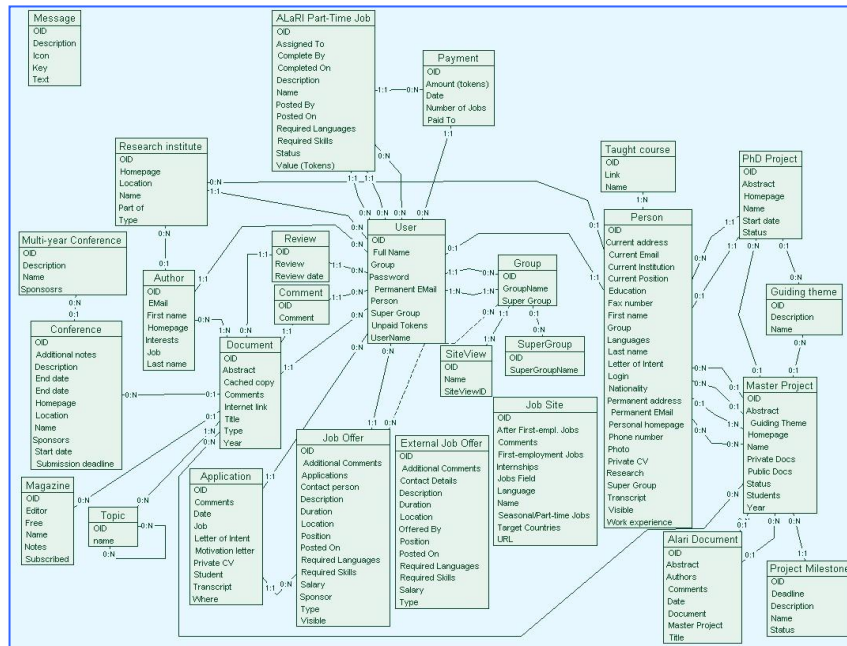


Figure 6.1: The ALaRI intranet entity-relationship diagram (here, as with the data handled during the first intranet release in 2004). It represents the definition of the data structure handled by the portal that resides in a set of database tables.

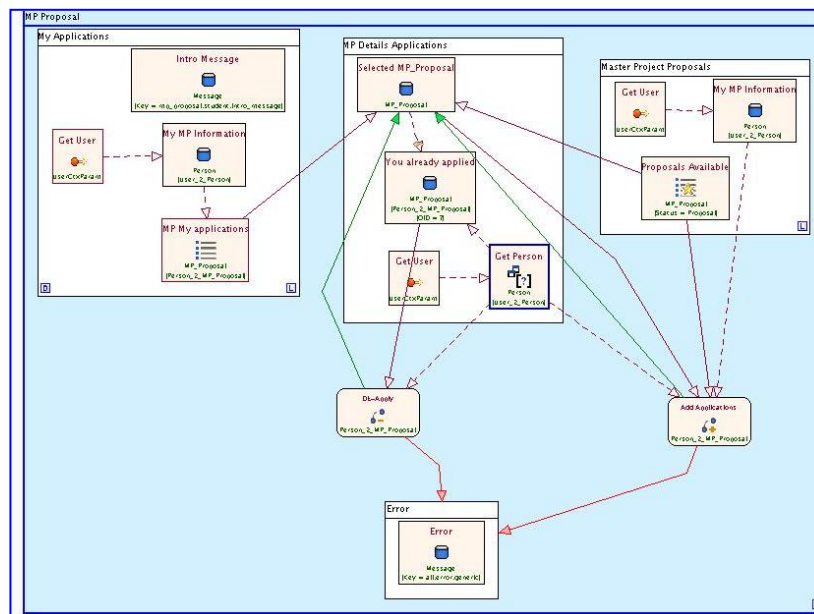


Figure 6.2: It represents an example of the hypertext navigational model of the ALaRI intranet, using WebML, and which then results as HTML rendering on the user's interface (see Figure 6.3). Such a high-level description makes it possible to easily maintain consistency among the hundreds of pages that currently make up the site.

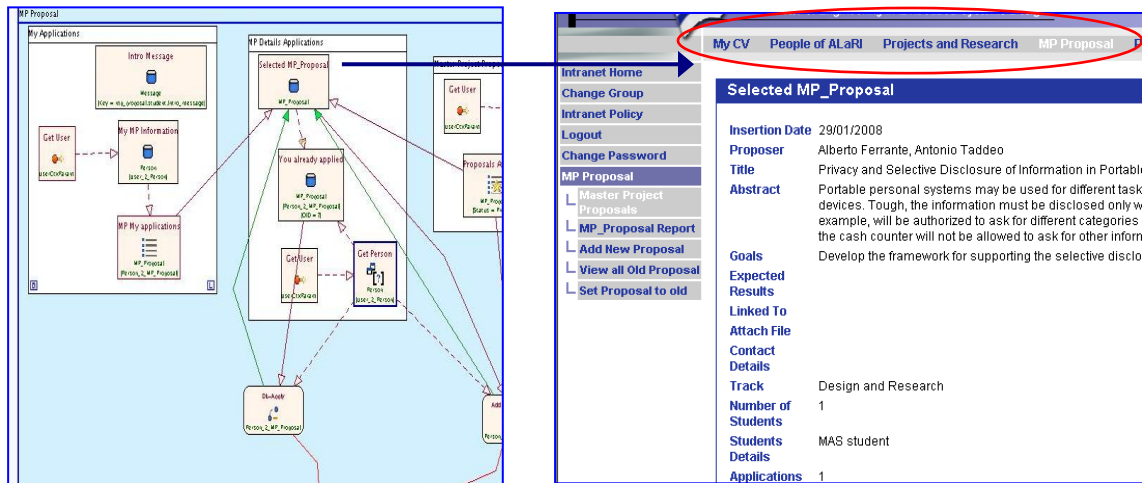


Figure 6.3: WebML to HTML Conversion Example on the ALaRI intranet

Such a web application designed with WebML is divided into site-views, which represent a particular, filtered view of the underlying data structures, organized into pages and areas. Areas are collections of related pages, visible as in most websites above the main portion of the pages. In Figure 6.3 the areas are highlighted in the upper portion of the page, whereas the sub-areas within the current area are on the leftmost portion of the page (Negri & Bondi, 2004).

The ALaRI platform development can be divided in two main periods. The first one occurred within the EU project ANTITESYS (2002-2004)⁴⁶; while the second was within the EU project COOPER (2005-2007)⁴⁷. Actually, the platform is fully operative, even if its implementation is still ongoing with the improvement of some functionality and new services.

During the first phase, the study of the scenario requirements led to implementing a platform supporting some fundamental services with the aim of better managing the organization of administrative and teaching activities, especially supporting the remote tutoring before and after the lessons in presence, and the development of the master projects, providing the team members geographically dispersed (sponsors, academic supervisors, and students) with the possibility to interact remotely on a common platform. Figure 6.4 represents the life cycle of the first ALARI master program (Master

⁴⁶ ANTITESYS (IST 2001 – 34370) – ALaRI was Scientific Coordinator 2002 – 2004: Training in ESD. More information available at <http://antitesys.alari.ch>

⁴⁷ COOPER (IST 2004 - 027073) – ALaRI was Partner 2005 – 2007: Collaborative E-learning. More information available at <http://cooper-project.org>

of Advanced Studies in ESD) and the involved actors on which base the first intranet implementation started.

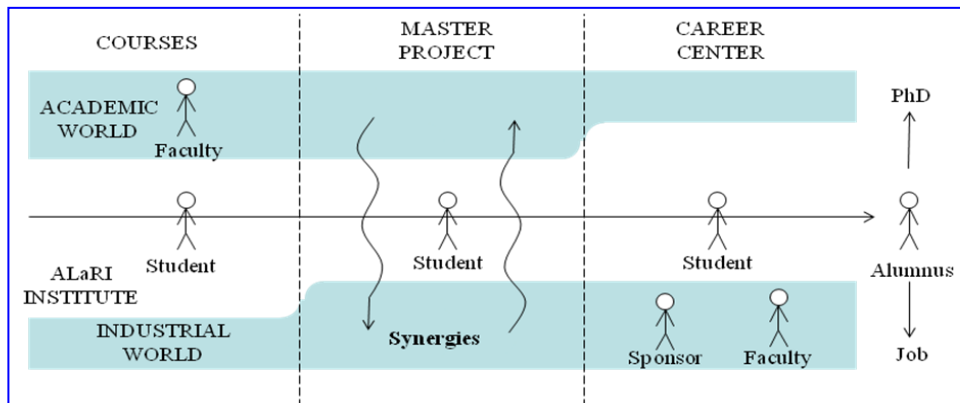


Figure 6.4 – ALaRI Master Program Lifecycle and Actors Involved.

The first intranet implementation presented services that can be roughly grouped in the following macro-area:

- *People Directory* providing general public information about the ALaRI people, where each member is required to manage and update his/her personal profile, such as a public *cv* (filling in standard form) including contacts and personal links accessible by other community members.

- *Courses* supporting remote tutoring and local teaching, where lecturers and students can interact in an asynchronous way. For instance, lecturers can upload from remote the teaching material in electronic format; while students can consult it during, before (for preparation) and after (for assignment) the course; then, each student has visibility on the own learning page where they can personalize their plan of studies, choosing elective courses of their interest, and where lecturers can assign credits and marks after the evaluation of students' exam.

- *Master Project* allows team members to follow the development of their own master research projects from remote. The Master Project area is characterized by a milestone/report interaction model where supervisors can set milestones and students respond uploading the respective documents, keeping private sensitive information with respect to the affiliation to the project. Whereas other actors, not involved in the same affiliation, can only access the public documents of the project that usually consist of the final report and of the final master thesis.

- *Knowledge Repository* is useful to collect and keep the company know-how, taking advantage of the knowledge sharing, quickly retrieving and re-using the stored static documents, such as policies, master theses, and final project results. Here, for instance,

students can access public documents of previous projects for acquiring interesting information, or can upload other interesting materials.

- *Career Center* providing placement for students after their graduation. Here lecturers, industrial collaborators, sponsors and alumni can post job offers or see *curricula* and letters of intent uploaded by students; while students can browse and apply for the job posted.

Further, other areas, dedicated to the staff members and students, provide useful functionality for managing extra-learning activities. For instance, the *Part-time job*, where staff members post some on campus part-time jobs and students can apply for them, offering their collaboration to the staff and receiving from the institute little remuneration to cover basic leaving expenses during their stay away from the family; or the *Templates*, an area accessible only by the staff, collecting templates and official documents of the institute, divided for category.

In order to access the intranet, it is necessary to accept the online *Policy* appearing the first time one enters, that explains rules and conditions of intranet use. While, a *Help Index* is always online, acting as a sort of electronic manual that illustrates the activities each user profiles can perform.

Among the ALaRI actors, only the staff members and the Scientific Committee have access to all intranet areas and documents (private or public) since they supervise the various research projects and generally have the control on, or are informed about, all the ongoing research and learning activities. The intranet access is granted, for a few years, also to the “alumni” – the ALaRI former (graduated) students – who can be generally interested in accessing the most recent public documents or their former master projects. Further, they can also keep visible their *curricula* and browse the job offers, or in turn they can post jobs from their new work positions. Finally a limited access can be given to *guests*: external persons who may be interested in ALaRI research activity and may want to investigate opportunities within the ALaRI institute, offering in turn internships or other forms of collaborations, and thus becoming industrial collaborator or even ALaRI sponsors.

The originality of this first solution consisted in integrating heterogeneous services into a unique platform, with *multi-directional navigational* patterns, but limited by an *advanced data filtering* system based on user type and status, thus users have different views of data and services with respect to their profiles, to guarantees the security of the uploaded information (Negri & Bondi, 2004).

Subsequently, in the second phase, more attention was devoted to managing the remote cooperation processes for tutoring the master research projects development, since initially the service only partially covered the various phases of the project-centred learning approach. Therefore, within the COOPER project, a further detailed study was carried out, comparing also similar scenarios both in academic and industrial environment, focusing on the definition of a reference framework for the team

management processes (Ceri et al., 2006). In particular, there were defined the principal project teamwork processes occurring during the project-life cycle (Ceri et al., 2007). They consisted in three main phases, namely: the pre-project phase concerning the evaluation of project proposal and the assignment to the team; the project development phase consisting of producing expected results through deliverables according to fixed milestones; and the post project phase involving evaluation of final results and their dissemination. Through these studies, it was possible to improve the management of the remote cooperation for the master research project on the ALaRI platform (Salvioni & Taddeo, 2007). For instance, it was developed a service concerning the pre-project phase. Thanks to this service it is now possible to upload and make visible all the proposed projects to the staff and Scientific Committee. Then, Scientific Committee chooses which projects to approve. Once approved, the projects are formally assigned to the master students (also considering their spontaneous applications) and to the supervisors, and thus shaping the work-team.

Further, improvements were also on the area dedicated to the knowledge repository, adding features that allow the user i) *uploading* documents, characterized with metadata such as name, abstract, representative keywords, authors and also personal comments, in a common shared repository; ii) *searching* the repository for documents already uploaded by other users; iii) *organizing* all the interesting documents into private virtual folders that represents a particular view on the whole repository; iv) *building* the own project bibliography by moving project-related documents into a special bibliography folder shared with other team members, collecting selected documents through links to the main repository, adding new ones, or suggesting some to others.

The peculiar worth of such knowledge repository consists of providing multi-directional navigation capabilities among authors, documents and folders. For instance, the user might start browsing the knowledge repository, find one interesting document, get details on it; see its owner, or its authors profiles; move on to the related projects; get reports about those projects, see which professor supervised them, and so on.

Referring to the description in chapter 5 about the four main dimensions that can evolve (all together or individually) on an intranet platform and lead to developing a (more or less integrated and efficient) virtual workplace, the ALaRI intranet presents a clear orientation towards the development of those areas devoted to support the interactions of remote cooperative work along with the knowledge sharing and the creation of own virtual operative spaces. Yet, such configuration also reveals a basic contradiction since it does not encompass any particular attention to develop those basic internal communication services that usually are starting point for the creation of an intranet system, representing the first element of cohesion of a virtual community.

Modulated from the business system and adapted to an academic and learning scenario but with strong connections with the industrial world, the following Figure 6.5 aims at representing the peculiar evolution of the ALaRI intranet. The grey area

highlights towards which dimension the ALaRI services have been developed: in spite of the traditional intranet systems, born as top-down and one-way communication portals, the ALaRI platform was thought to constitute a virtual workplace, but disregarding any form of social communication.

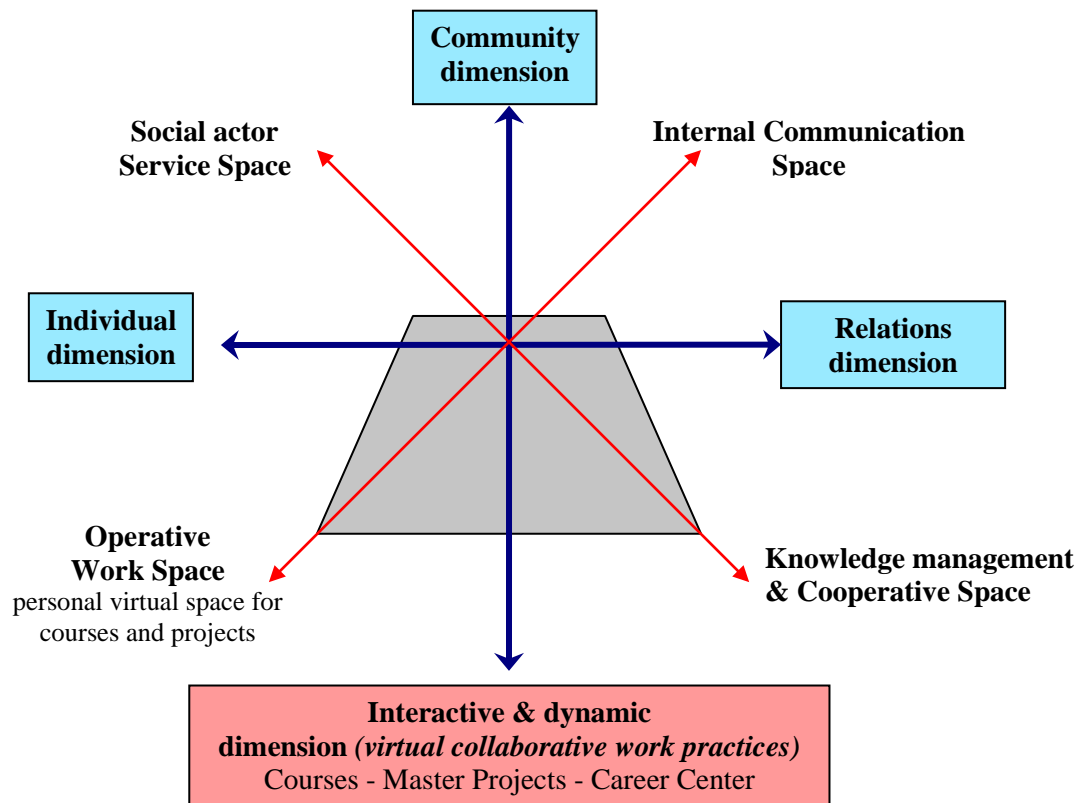


Figure 6.5: The main dimension of development of the ALaRI intranet platform.

In my opinion, this fact has entailed great repercussion on social and cultural value of the ALaRI intranet within its community, since the ALaRI members were required to cooperate together on a virtual space but without having shaped any co-shared meaning about the technological system on and through which they had to base their cooperation. On the contrary, first of all, an intranet, even if very simple and incomplete, should act as community portal for the communication and be socially recognized by all the actors.

6.1.2. Development process: which problems

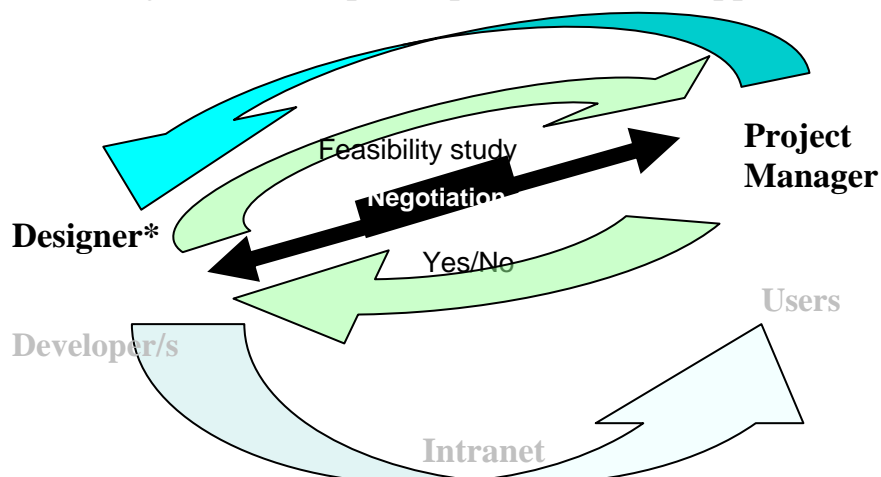
Having illustrated the general intranet framework and its main services, it is time now to focus on how and which actors involved in the intranet project have worked (more or less) together, considering their approach both during the first phases of design

and development, and during the following phases of maintenance and improvements of the provided services.

Since the beginning, the good will of building a useful technology for the community did not lack. But the procedures of development reveal some shortages at organizational and cultural level that finally affect the use of such a platform.

Initially, in 2003, there were only two internal persons in charge of the intranet development: a PhD student belonging to the ALaRI staff (let's call him DAVID), working as designer, and the ALaRI program manager (let's call him PAUL), also working as manager of the intranet project. As previously mentioned, both of them could devote only part of their time to the intranet project, and often they spent this time during evening hours or when they could cut out some time during other commitments. During their first meetings, David and Paul planned together the main technical work to be performed, presenting the various issues, that, once discussed and shared, allowed David to go on with the intranet development (based on the WebRatio technology, provided according to university agreement), showing step by step the results achieved to Paul, who in turn evaluated the outcomes. In this way the intranet project was entirely and strictly managed by these two persons, without following any specific process model, but through informal meetings and talks, which constituted the feasibility study, including the definition of the intranet requirements and specifications in compliance with the investigation of the users' task, and the following design of the software system in accordance with such requirements (Figure 6.6).

First design and development phase: technical approach



*The requirements analysis was based on few informal and remote contacts with sporadic end users

Figure 6.6: Representation of the technical and self-making approach in the intranet building.

During this first phase, if on the one hand great attention was paid to develop the intranet technical functionality, on the other hand less attention was devoted to assess the impact of quality, including activities that involved interactions with the end users. But, the peculiar software application designed for a very specific learning environment and optimized for a particular platform required a careful analysis of the work practices, interacting directly with the social actors to elicit their requirements. The designer David, relying on his personal knowledge of the ALaRI environment and work practices, having identified the main *stakeholders* (i.e., the users' profiles) and their activities, defined the principal tasks that the intranet system had to support, developing specific solutions. In the meantime, to get confirmation of the user requirements, he sent three different pre-defined surveys via e-mail, about some tasks he envisioned providing on the intranet, to some sample potential end users belonging to three different profiles (students, lecturers, sponsors). Specifically, the surveys, conducted in 2003 (enclosed in Annex), concerned three different short lists including recommended tasks in compliance with each user profile. Each of the few users interviewed by email was invited to look at the lists, to tick the tasks of interest, and to forward any additional suggestions by email. Then, the outcomes of the surveys were discussed only among the designer and the program manager; whereas the users were not more involved in the platform development.

As a consequence, design, building and implementation of the first intranet services were born from David's creativity, becoming his own experimentation, but without considering any difficulties of use and of management of these services on behalf of the end users. Moreover, the auto-reference risked to hinder from finding new interesting and better solutions that instead can arise from the comparison with best practices, acting as *stimulus* to get new ideas for the intranet services.

Further, at the end of this first development phase, clear project documentation (considering documents describing the requirement analysis and the requirement specifications, test practices and fault detection) was lacking, while just a partial user manual for staff members (in electronic format) was produced. In addition, this electronic manual was written, as part time job, by an ALaRI master student who had to describe tasks and functionalities that staff members could perform on the intranet but that he could not absolutely know inside out.

Basing on this approach, the first intranet version was delivered without performing any beta test or review of the system with other peers (Jazayeri, 2002). Moreover, it was deployed with the purpose of implement further required functionality, as necessary, in increments. Finally, the release of the platform occurred during the beginning of 2004, simply informing the ALaRI social actors by email messages, and providing them with the first temporary passwords to access the intranet system and with few lines explaining its use.

The procedure adopted for the development of the first intranet version, besides showing the lack of a defined quality process (as, for instance, defined by the standard Capability Maturity Model - Jazayeri, 2002), had quite a few repercussions on the phases of use and maintenance. Further, one should consider that subsequently David handed over the intranet development to a new ALaRI staff member also studying as PhD student and who previously was an ALaRI MAS student.

Here, some elements of analysis follow about the principal shortcomings of such management. Starting from some considerations for eliciting the user requirements, it is clear that an approach oriented to the object of the work rather than to the user (Laurel, 1999; Norman, 1998; Winograd 2000; Dieng, 2000) led to focusing the attention on the single work tasks rather than on the interactions among the actors involved in the different work activities. Consequently, the focus shifted on how the single users could interact *with* the technical platform, rather than grasping how to make efficient situated workflows *through* the platform. This fact produced as side effect an evident distance between the real needs and the system functionality (Dieng et al., 2000).

In a certain way, the designer's behaviour is justified by an evident lack of available time along with the urgency of delivering as soon as possible the information system. Still, such behaviour is symptomatic of pursuing very individual rather than social designing practices (Zuccheromaglio & Alby, 2005). In fact, moulded within the traditional engineering approaches, the designer did not consider it necessary to have any direct interaction with the end users, while he interacted frequently only with the ALaRI program manager stressing on developing technical services very soon rather than on evaluating how the stakeholders could make use of these services to support their work practices. Thus, initially it was the individual designer's technical view that led the intranet project. In fact, the designer firmly believed that his personal experiences of the ALaRI work environment were complete, totally exhaustive and not partial. Further, he took for granted that his personal view reflected the other social actors' ones, since almost all⁴⁸ (with very few exceptions) come from the Information Communication Technology (ICT) or engineering field, and have technical and scientific educational background. As a consequence, not considering carefully the differences between the various profiles and their work practices led to taking a narrow view of the users' scenarios, and to releasing an own personal rendering of the intranet system. On the contrary, a "professional vision", such the designer's one, should base on and feed on cognitive processes, not private or internal, neither invisible nor silent, but socially distributed, and jointly co-developed, taking part in the community professional and cultural life (Hutchins, 2001).

⁴⁸ And namely: the students attending the master's programs; the lecturers and the industrial experts who pursue technical vocational training; the staff members who were also former ALaRI students.

Further, David's full awareness about his own ability in using the intranet functionality, showing confidence in performing all operations, led him to underestimating the product usability (with consequent troubles of use as illustrated in section 6.2). But the designer can never represent the typical end user since he has acquired too many information and competences on the product he is working. And obviously, whoever is going to use the product for the first time lacks such competences.

After the first intranet release (beginning of 2004), a master student attending the second year of the Master of Science in ESD supported the designer, as collaborator for the intranet implementations and maintenance. This student (let's call him FOREST), after a brief introduction about the graphic WebRatio development tool, took up the intranet implementation, as ALaRI part time job, acting as intranet co-developer. Forest had to get accustomed to the software environment with the help of the available WebRatio user manual, trying out examples. David helped him through a learning phase by sorting out coming doubts during meetings, discussions and assignments finalized via e-mails that aimed at getting comfortable about how the various features of the tool could be utilized. For instance, Forest learnt how to link files and to merge pictures into the page; how to implement scrolling feature in order to view a list of files; or to implement search features; to create entities and relationships; to set up layout design, style sheet, and so on.

Having elaborated the basic design concepts of the ALaRI intranet using WebRatio tool, Forest's job consisted of developing new site views with more functionality; fixing bugs in the existing design if there were any; and meeting with David to think about ways of improving the design, installing updates and new features.

Usually, Forest communicated with David by emails wherein details of the task were clearly typed with the necessary information. If a doubt arose, then a physical meeting could be arranged at ALaRI depending on their mutual availability. Generally, physical meetings helped to clear up doubts regarding some units in the software tool or on the task assigned, and David always provided Forest with effective examples. Then, if necessary, during the meetings David checked tasks assigned to Forest, once completed. Further, comparing the requirements with what had been designed, they tried to improve both the design and the following interface. The dominant worry was that of making possible to incorporate changes in future implementation if required. The time spent on meetings could vary depending on the purpose: if the meeting was for new assignment, or checking the work done, it usually took more than one hour. And thus, usually they held meetings in late afternoon, or also in the evening, after the dinner, since they had the possibility to concentrate on the work without any interruption from outside.

Most problems found with any procedure to be developed were due to time constraints, especially at the beginning when Forest was not yet able to finish the assignments on time. This was because of two principal reasons: one derived from his condition of novice, and the other was relative to the documentation of the first

WebRatio tool because the manual was not properly documented and not many examples were available (whereas, the successive version WebRatio.4 offered better documentation). Therefore, in front of such problems, Forest was initially so frustrated as to plan to quit his part time job, but thanks to David's assistance, he succeeded in overcoming the technical problems with the WebRatio tool. In fact, Forest did not hesitate to contact David, asking for his help for even small doubts, and, in turn, David was always very available to explain and tackle together any difficulty (enclosed in Annex the Forest's evidence).

This framework of collaboration between David and Forest emphasizes some peculiar aspects of the intranet development process at ALaRI. As it will be clear also with the second designer, the work practices (including the organization of meetings) around the intranet development are mainly unstructured, very flexible, and at any time can be reoriented or changed. Such design practices are also defined by Suchman (1997) as *design in use* but especially referring to troubleshooting situations, in opposition to *professional design*, seen as planned and structured activity. Instead, in ALaRI such condition of *design in use* proves to be the everyday situation for the intranet development. As a consequence, times of realization or modifications of any features keeping the whole platform consistent become considerably long.

Such approach stems also from an organizational (and cultural) condition of the community which often tries to tackle and run many and different commitments in parallel, but with limited personnel resources and almost always under considerable temporal pressure. Within this perspective, therefore, it seems better to proceed to resolve imminent or unexpected problems of the system when they appear, but running the risk of losing consistency on the whole platform, rather than spending more time to analyse in depth root causes and perform wider modifications for a complete resolution.

Notwithstanding evident problems of organization of the activities, the work environment is characterized by a very friendly social climate. In particular, the above mentioned collaboration among the PhD student, acting as intranet designer, and the master student, acting as designer's assistant and developer, reflects the good relationships among staff members and master students who together not only co-share new experiences of work but especially build the community meaning that Wenger (1998) recognizes in the dimensions of *joint enterprise*, *mutual engagement*, and *shared repertoire*. Further, this collaboration reveals a condition of good will and commitment to learn new work tools, spending a lot of time to deeply understand basic technical structures, even if these have not any relevance to the master studies (that is typical of young and curious persons who have more spare time to do experimentations). Such condition is also meaningful of a general predisposition and commitment towards the adoption of the intranet platform on behalf of students and staff members, in spite of any possible initial difficulty of use (that, instead, led to discouraging the other users after some first attempts).

Such collaboration has allowed producing graphic representations of the intranet system which were necessary in order to have symbolic spaces of the system on which cooperate and share further implementations of the platform, thus moving towards a more articulate vision of the design activity (Zuccheromaglio & Alby, 2005).

Subsequently, since autumn 2005, another PhD student, let's call him DANTE, took over from David's intranet activity (while the previous master student, Forest, left ALaRI institute, once finished his master course). Obviously, also for Dante the intranet constituted an extra job activity, besides his research studies and commitments at ALaRI institute. Therefore, also Dante had to learn the WebRatio tool for designing and implementing the ALaRI intranet. His responsibility concerned the maintenance and the improvement of the intranet functionalities, also adding new interesting and useful services (as performed during the COOPER project, when the ALaRI intranet acted as user case). The first difficulty tackled by Dante was about taking over the intranet project. It took about four months (from October/November 2005 until February/March 2006), because the intranet maintenance has been always considered not a principal duty of the institute but an extra and part-time job to be developed in parallel with other activities.

Handing over the intranet project required that Dante and David met together to discuss and share changes or implementations to perform on the system, making use of schematic drawings on paper, or in front of entity-relationship diagrams or hypertext navigational models of the intranet services on the pc monitor. During their first meetings, they worked in parallel, but they had to pay particular attention to not work on the WebRatio platform at the same time from different work positions. In fact, this would have compromised their activity. Only with the introduction of the *Concurrent Versioning System* (CVS)⁴⁹, effected in March 2006 thanks to Dante, it was possible to work at the same time on the same platform from different work position. In the meantime any modifications could be performed only by one designer or developer at a time. Before the introduction of the CVS, the possibility of monitoring and tracing the ongoing design activity depended mostly on the person in charge of the system development and on his/her goodwill. Therefore, complete and clear documentation of any phase of development or implementation was missing, making it difficult a detailed delivery. As a consequence, it was not easy to coordinate the phases of development during the actors' turnover. Further, it prevented from keeping an organizational memory of such practices of design, an aspect that, instead, is particularly useful in an environment with a frequent turnover (Zuccheromaglio & Alby, 2005). In fact, for

⁴⁹ The *Concurrent Versioning System* is a filing mechanism that allows keeping traceability of the modifications of the various files versions that set an intranet or web site over the time. This mechanism also shows the differences among the various versions, thus allowing a transparent and clear access to the evolution of the technical system.

instance, the work developed on the intranet system based on the WebRatio.2 technology was missed, once there was the migration from this system to the advanced WebRatio.4.

Then, in comparison to David's approach, Dante perceived the necessity to achieve better interactions with the end users, especially students; probably, because also Dante, before acting as intranet designer, was a master student using the intranet. He sent emails to the students each time a new feature or service was realized. Usually he gave students visibility and access to the new service, and asked them to test the use and to provide him with feedback. Further, maybe the physical closeness and the very small gap of age among staff members and master students led to paying particular attention to develop and improve intranet services shared by both groups (enclosed in Annex some evidence from Dante's emails).

Since the spring 2006, another person entered the ALaRI staff, let's call him FRANZ, working with Dante for the intranet maintenance and acting as developer. In addition, a new master student, let's call him ERIK, supported Franz in his intranet activity, from October 2006 to July 2008. Franz, having a different educational background with respect to the other staff members (he couples communication and technical competences, while almost all come from the ICT or engineering field), appeared at once more sensitive to creating an interactive design, involving both technicians and end users. He not only sent users (belonging to staff and student profiles) requests of suggestions and feedback by email, but also he tried to speak directly with the users in order to deeply understand their demands and to negotiate together new ways of representing the tasks on the intranet.

Further, since September 2006, a brief formal intranet training session has been presented to all new students at the beginning of the ALaRI master's academic year, introducing the intranet services and how use them. ALaRI students are thus informed about the intranet utility, and immediately provided with a user account to access it.

Up to now various intranet areas have been improved, such as the course area under the lecturers' and students' views, or the master projects proposal area, labelled "MP_Proposal", where Scientific Director, program manager, sponsors, tutors, and students interact together, in order to propose, select, assign and approve projects to master students. New features have been added, such as links on individual virtual repository, suggesting them to other members; always with the aim of involving more and more ALaRI actors.

At present, the intranet maintenance is entrusted to Dante; while Franz, in February 2009, due to lack of budget resources, left the institute and his activity on the intranet. In the meantime, Dante posted part-time jobs on the intranet looking for two willing master students to train about the case tool WebRatio and to become able to develop new portions of web application and solve incoming bugs. Therefore, once again problems of efficient intranet maintenance come back!

From the analysis of the process of the ALaRI intranet development, it stands out that what really lacked since the beginning was the “boundary work” (as defined in Engeström, 1999; Zuccheromaglio & Alby, 2005), through which creating the intranet platform. This approach would have also favoured a mutual learning process, allowing exchanging both technical visions about the intranet design among peers (i.e., among persons well informed about the technology in use), and different perspectives among technicians and users of the system around the introduction of services that affect new ways of working (e.g., the remotely mark assignment for the lecturers; the selection of elective courses or the application of part-time jobs for the students; the possibility to browse the students’ curricula and to post job positions for the industrial collaborators, and so on). Due to the peculiar ALaRI social environment and the work conditions, this approach would have experimented what is defined *seductive design*⁵⁰ (De Michelis et al., 2000) to create technical systems as close as possible to users’ needs and expectations.

Just recently, in the last three years, ALaRI has dedicated growing attention to the intranet system and its users, also in terms of staff, creating a work team more flexible, open and permeable to new collaborative suggestions. However, the intranet is still considered a non-strategic system, especially by faculty members and industrial or academic collaborators, who have difficulties in using it during their collaboration with ALaRI; while they keep interacting by emails only with the program manager.

Too long and fragmented development process inevitably affected not only the efficiency but also the graphic visualization of tasks and services on the interface, with obvious repercussions on time of adoption. As a matter of fact, while, on the one hand, the increasing collaboration between intranet designers and master students has led to spreading the intranet functionalities at least among the ALaRI youngest and closest (for work place and age) persons; on the other hand, other social actors are still not used to work on the intranet, and, in the worst case, they have not even tried to access it.

Besides some technical difficulties due to usability issues (as illustrated in section 6.2) and the peculiar web developing tool (that required deep understanding of the technology), the intranet project has been characterized by evident critical factors at cultural, organizational and social level.

At cultural level, first the prevailing *technical* approach along with a dominant conceptual model of the designer (defined by Cooper, 1999, *homo logicus* in opposition

⁵⁰ The *seductive design* is described as “the integration of well-known design approaches, rooted in industrial design and in participatory design, and their evolution. In *seductive design* three distinct autonomous processes develop their cycles in parallel and are driven, respectively, by users, by “design”, and by technology. The three cycles intertwine and intersect frequently to compare result and fine tune the process.” Its value consists of constantly providing a mutual enrichment to these three cycles, generating learning process where concept scenarios embody progressively real innovative technology, and converge towards the understanding of users’ practices, creating occasions for communication among the actors. (De Michelis, in Dieng, 2000, pp.230-235).

to the user called *homo sapiens*) during the development led to concentrating more on verification activity, as regard to the system consistency with its specifications according to dependability properties⁵¹, than on validation activity, considering the users' point of view. Further, a missed plan of quality process prevented from improving the long-term quality into the overall intranet project. In particular, a validation phase was lacking in checking discrepancies between actual needs and system specifications as the first designer laid out. The aim of validation is that of revealing possible failures during the development process before releasing the product, making sure to meet end-user expectations. In fact, validation checks between specifications and final product are primarily checks of decisions that are left open in the specification phase, such as details of user interface or product features (Pezzè & Young, 2008). Then, poor attention to represent the intranet interface, also in terms of aesthetics features, led to noticing and discovering usability difficulties only late, when actors did not use the intranet as expected (or better, planned). That is also what compromised interactions and cooperation among the actors on the platform. In addition, at higher and more abstract level, attention was missing to recognize the social meaning of the intranet for the community, leading to underestimating the phases of promotion and release, and thus creating quite a few difficulties in making the ALaRI actors aware both of individual advantages and community benefits in using the intranet. Finally, data maintenance and updating on the intranet, such as personal information or educational materials, were overlooked. Due to also organizational problems, both intranet technicians and social actors lacked not only time but especially consciousness about checking own personal data or business documents (e.g., staff members should check administrative data and details about part-time job or master projects; students should upload their profiles, curricula vitae, and reports of projects; lecturers should provide course materials and assign marks to the students in due time, etc.).

At organizational level, the necessity of creating, developing and implementing an *ad hoc* tailored platform as soon as possible, to reduce e-mailing exchanging while enhancing asynchronous interactions on the platform, crashed into a number of requests for re-designing the system and modifying requirements previously defined, because of new educational activities of the institute and organizational changing. For instance, the increasing number of ALaRI members due to the introduction of the Master of Science program since September 2004 (that means new students, new lecturers, new courses, etc.) entailed as necessary to create new accesses with different competences and workflows on the intranet platform, and thus making the intranet project more complex. Not disregarding, then, problems of under manning and staff turnover. In fact, not only few persons have worked on the platform but also they have changed over the time,

⁵¹ Dependability properties include correctness, reliability, robustness, and safety (Pezzè & Young, 2008)

making it necessary to hand over intermediate products that needed to be implemented. Therefore, such unstructured and irregular development of the intranet has, in turn, opened problems about tool traceability (i.e., the possibility to document each phase of the intranet building).

At social level, the intranet is characterized as “home made” platform, created by young persons who often are at their first experience as intranet designers and developers. Moreover, even if only partially engaged in this project, nevertheless they were required to learn, and to work on, a web design tool before unknown. Finally, ALaRI actors have different levels of engagement and involvement into the community, according to their roles and work position, and thus they have developed different levels of knowledge, use, and sharing of the ALaRI institutional context, and consequently also of the adopted technology.

Last but not least, it is worth remembering that the intranet was totally internally developed for two main reasons. The first one is because the platform was born as ALaRI Institute research project, funded by European Union, with the collaboration of other European partners, but “unfortunately” all coming from technical educational background (and so contributing to emphasize technical rather than “human” aspects of the system). Then, the second reason is due to the necessity of internally managing a tool increasing the application step by step, according to the institute and actors’ possible requests. Thus, for these reasons, the intranet development was not given outside.

Considering such problems helps to clarify that availability and utility of the intranet are conditions necessary but not sufficient to guarantee its adoption and a suitable level of use. In fact, for a proper use, it is crucial to reach a critical mass of users allowing the full exploitation of the technical system, providing individual users as well as the whole community with benefits. Within this perspective, usability issues cover a strategic aspect, revealing to be at least as significant as the engineering aspect. In particular, usability, contributing to make it easier to learn characteristics of the tool, can heavily sway the behaviour of those actors less available or less willing to learn new practices of work, especially when such practices are limited to a specific community and to a particular work environment. Therefore, section 6.2 explains how some disregarded usability aspects of the ALaRI intranet have concurred to slow down and to obstruct the process of adoption, not having been tackled and settled in time.

6.2. Usability Analysis

6.2.1. *What usability consists of: definitions and methods of evaluation*

The usability of a software application can be considered as part of its non-functional requirements (Chung, 2000), covering since the '80 years an increasing importance due to the spread of technical artefacts among a great variety of potential non-expert users

(Scalisi, 2001). In the specific, in order to define what usability consists of, I report two important definitions: one provided by Nielsen (1993) and the other by ISO/CD 9241-11 (International Standard Organization/Computer Display)⁵².

According to Nielsen's definition, the usability of a system, such as an intranet, is a crucial component of its acceptability, aiming at satisfying users' needs and requirements, according to social and practical aspects. In particular, utility and usability of the system characterize its practical aspect, where the first element refers to the real ability of the system to perform the operations for which it was built; while the latter considers the quality of the required interactions for performing such operations. Therefore, usability becomes a key concept in the relationships among user *and* technology, and, as a consequence, it has influence also on the interactions among users *through* the technology. On this basis, the usability of a system consists of five elements, namely: i) the easiness of learning its use (i.e., the time required by a user to reach a good level of interaction with the system); ii) the efficiency during its use (assuring high level of performance and reliability); iii) the easiness of remembering the interface controls (i.e., how performing an operation through devices or icons on the interface); iv) the security and the robustness to the error (minimizing the probability of failures and allowing simple operations to repair errors); v) the user's satisfaction (a subjective dimension evaluating the user's pleasure and comfort interacting with the system). The value of such elements for measuring the system usability depends on the kind of system and on its target of use. For instance, a system designed for experts who need particular performance may require a greater effort to learn its use than a system designed for persons who just need to perform simple operations, using it not regularly, and who require very intuitive and easy to remember devices of control.

The ISO/CD defines the usability as "the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments". Here *effectiveness* refers to the level of accuracy and completeness with which the users can achieve their goals; while *efficiency* measures the relation between effectiveness and expended resources (in terms of money and time) to reach the goal; and finally *satisfaction* refers to the users' freedom from discomfort and their positive attitudes towards the use of the product (as the last element in Nielsen). Within this definition, particular importance is given to the *context of use* that refers to some peculiar users' features, to their work practices, to the hardware and software and to the environment of adoption.

In order to evaluate the usability of web based information systems, two basic approaches, with different variants, are usually followed: the inspection method (or expert review) and user-based method (or user-testing) (Nielsen, 1994; Matera et al.,

⁵² ISO 9241-11 point 3.1- Ergonomic requirements for office work with visual display – Guidance on usability

2002). These methods complement each other, since the former provides systematic and analytic insights in the application, while the latter may validate (or invalidate) the results of the inspection with real users.

During the inspection, one or more experts examine usability-related aspects of a user interface, performing critical tasks to detect breakdowns. Such method offers advantages and drawbacks. In fact, on the one hand the reliability and the accuracy of the results widely depend on the inspector's skills and on the individual know-how, thus resulting quite subjective⁵³. On the other hand, this method does not require any special equipment, except expert evaluators who, generally, in a limited amount of time can detect a wide range of usability problems and possible faults of a complex system. What has serious impact on the learning procedures and times of adoption on behalf of the end users. Ideally, the inspection should be performed at various stages of the product development (when a prototype is available or even early in design), but generally it occurs only after its deployment due to low cost (Bolchini et al., 2003).

Then, on the basis of the inspection results and the identification of the critical tasks, it is possible to proceed with user testing, recruiting a sample of potential users and assigning them a set of tasks. The users are observed while they interact with the application in order to verify the difficulties met and how the system answers. Thus, the user testing results being complementary to the inspection, uncovering problems previously overlooked, or validating inspection results (confirming or getting them worse), or invalidating them. Further, it allows capturing the overall user perception of the application, having “fresh eyes” during the application use.

Generally, testing with real users assures a more objective evaluation. However, there are some drawbacks, such as the difficulty of properly selecting correct user samples and of adequately training them to manage advanced functions of a website (Matera et al., 2002); or the difficulty of reproducing in a limited amount of time the actual usage situation, since observed groups can be affected by observation alone (the so called *hawthorn effect*, in Roethlisberger & Dickson, 1939). Thus, failures in creating real-life situations may lead to “artificial” conclusions rather than realistic results. Further, user testing requires considerable efforts in terms of human resources, time and cost. However, it allows evaluating quickly the “look and feel” of the interface, verifying at “real-time” the reactions of the users (Triacca et al., 2004).

Both methods of inspections and user-testing are alternatively based on two techniques: heuristic-driven evaluation and task-driven (or scenario-based) evaluation. Essentially, heuristic-driven evaluation provides checklists and usability principles (e.g., consistency, reliability, status visibility, etc.) against which the quality of the website is assessed (Nielsen, 1999). During inspection, heuristics guide the expert to explore the

⁵³ Nielsen, during a research for heuristic evaluations (Nielsen & Molich, 1990), showed that an expert can detect on average about the 35% of the usability problems of a system, and that the ideal number of evaluators, considering the relation between costs and benefits, is about five persons.

site and check compliance with usability principles. In user testing, heuristic questionnaires guide structured interviews with users who are required to comment their experience with the website.

Task-driven evaluation aims at assessing usability by trying to complete specific actions on the website. During the inspection, the provided tasks describe potential goals or sequences of actions that users might want to accomplish on the application. Then, in user testing, users are required to accomplish pre-defined tasks. Tasks are also employed in walkthrough and other structured inspection techniques (Rosson & Carroll, 2002; and Brinck, Gergle & Wood, 2002). The test is based on scenarios of use through which user should complete tasks that the application should fully support. Further, such evaluation takes into consideration users' complaints letting them free to think aloud, providing particular impressions but also suggestions in an open way. Choosing between possible scenarios of evaluation should focus on specific aspects relevant to the application's purpose, to the different stakeholders' profiles, to the most frequently used services, to "new" and innovative or even "highly publicized" features, and it should also consider how usability problems, previously detected during the inspection, are serious (Kuniasvsky, 2003).

Usually heuristics and task-driven techniques are adopted in alternative and separately, thus losing the opportunity to obtain a more comprehensive evaluation. Moreover, they are not reuse-oriented, in the sense that they have not been defined to be effectively reused. In fact, most of usability techniques are proprietary methods or expert-dependent techniques, thus they can be difficult for less-experienced evaluators who do not have the necessary conceptual tools to gain appreciable results. This matter opens the problem of reusing usability knowledge and practices that also other persons, such as designers and project teams, can successfully apply (Triacca et al., 2004).

Following this usability framework, as regards to the analysis of the ALaRI intranet, I decided to make use of the MiLE⁵⁴ web usability method (Bolchini et al., 2003; Triacca et al., 2004), combining it with some Nielsen's advices about how to conduct usability evaluations on intranets (Nielsen, 2003). The MiLE method has the advantage of presenting a healthy balance between heuristic evaluation and task-driven techniques that can be applied both to inspections and user testing analysis. Further, this method provided me with a reusable set of evaluation tools, including the identification of *user profiles* (potential target types) and their relative *goals* within (macro or specific) *scenarios* of use (Carroll, 2002), the definition of *tasks* (abstract or concrete) to perform, and a set of *usability attributes* based on specific heuristics to analytically assess the different web application aspects (such as information structure, navigation, layout, etc.). Moreover, the usability analysis of the ALaRI intranet allowed me to easily overcome many of the users testing drawbacks. In the specific, it was possible:

⁵⁴ MiLE: Milano-Lugano Evaluation

- to properly define the user's profiles and the activities they can perform on the system, since ALaRI actors belong to a specific community and can be grouped in well-defined user's profiles according to their roles, while the services on the intranet were created *ad hoc* to improve their activities and interactions;
- to properly select correct user samples and their relevant task scenarios, since real users for each target profile were interviewed and tested on using services and on performing tasks designed and built for their specific profile within the specific ALaRI environment;
- to reproduce actual usage situation without entailing any problem of discomfort or embarrassment, since the actors already knew my role and my activity in ALaRI, thus avoiding drawing "artificial" conclusions;
- to test the actors focusing on specific scenarios of interest, both reproducing workflow conditions (*alpha testing*) and during work activity at real-time (*beta testing*) – not just considering "surface-oriented" features of the graphical interface;
- to not waste time or effort in user testing since the achieved results were material both improving the use of the intranet and contributing my research study.

Within this perspective, I can confirm the validity of the investigation interviewing the users and collecting realistic results for the usability evaluation of the intranet.

Having introduced the concept of usability and the principal techniques of evaluation, here follow some considerations about usability analyses of the ALaRI intranet together with the main outcomes.

6.2.2. *Usability evaluation of the ALaRI intranet*

A first usability test was conducted only when the intranet application was already running, exactly in July 2004, about six months after its release, with the purpose of understanding why the intranet did not meet the expected results. In fact, in comparison with the offered services, it was very little used: only some staff members and some master students, after a brief training, used some services of the platform; while other actors not only did not use it, but in the worst case they did not even know the existence of it. Therefore, two external experts were called to investigate the main intranet usability problems. These experts interviewed just few ALaRI intranet actors, and only representative of students' user profile. The experts conducted a task-driven analysis within defined scenarios of use, and detected three main issues concerning: i) a poor knowledge of the intranet services; ii) missing details of displayed information; and iii) problems of intranet design and navigation. In the specific, the first issue showed that students knew just some functionalities with respect to all which were present on the intranet, and they used just a part of these. The second issue highlighted that there were incomplete or not updated information in some scenarios of use which did not allow the user to get a clear and correct view of the task to perform. In particular, this issue is

strongly connected to the joint use of the intranet as collaborative system among different actors. In fact, to work properly and to obtain common benefits, each user should carefully fill in data and upload information that are necessary to other users to successfully complete their tasks. The third issue about the intranet design and navigation shed light on problems of the interface architecture regarding the lack of:

- coherent graphic lay-out, since same information are represented in different way getting the user confused and disoriented;
- devices supporting the navigation and the task execution, such as the presence of buttons to confirm the task execution and that are bound to their effective use;
- clear feedback of error or confirmation;
- visible information guiding to properly perform the tasks.

The result was that most users abandoned the application and gave up completing their tasks. Further, students especially made use of services on the part-time job area, while those functionalities devoted to the master research project and to the management of the courses were most disregarded since information on the intranet missed (enclosed in Annex the report of the usability analysis conducted by external experts in 2004).

The gap between the platform release (beginning 2004) and the first usability analysis (summer 2004) surely increased some difficulties of use, while usability test should rather occur before the product release. Moreover, this first usability analysis was performed only interviewing a very small number of users and, in addition, belonging to a unique profile (i.e., student), and thus it provided a partial analysis of the intranet usability issues.

Successively, to get a comprehensive view of the intranet usability *status*, I investigated more in depth the system, involving all the user profiles and their main scenarios of use. Two distinctive analyses, in two different periods, presented the twofold purpose of verifying the real *status* of use and of checking the basic problems to tackle. The first evaluation was conducted in December 2004 (Salvioni, 2005 and 2006 - enclosed in Annex the report of the usability analysis conducted in December 2004); while, the second evaluation was performed during a wider period ranging from November 2006 until April 2007 (Salvioni, 2007 - enclosed in Annex some interviews conducted in 2007 for a new usability analysis). The gathered results were reported to the intranet project manager and designer, providing some suggestions both at technical level (i.e., about new requirements for specific interventions of re-designing), and at social level, underlining the necessity of promoting the use of the intranet to the whole community.

The MiLE guidelines provided me with the conceptual tools to execute the intranet evaluations. Further, the use of specific heuristics, while performing scenarios, facilitated the definition of the problems and enhanced the communication of the issues to the designers. At first, I conducted an inspection analysis that led to focusing on

design aspects of contents, navigation quality, interface design (including semiotics, cognitive and graphic elements), and technology performance, in order to discover specific problems of the application. Then, the analysis was completed by a second inspection focusing on user-experience aspects and putting myself in the user's shoes by means of *visioning* techniques (Cato, 2001) according to different profiles, typical scenarios of use and specific goals. This second inspection, through the execution of practical and concrete tasks, allowed verifying the troubles previously found. Finally, I carried out the user test interviewing different users belonging to the various profiles and collecting their complaining. The interviews were very useful not only to check the previous results but also to uncover other usability problems not previously considered during my inspections. Moreover, they provided me with interesting suggestions, focusing the attention on the most important actions to do for improving the intranet services.

Here below, first I illustrate intranet technical dysfunctions discovered during the inspection analyses (also reporting implemented modifications as examples of improvement from the previous analysis status). Then, I refer about some considerations from the interviews with the users, underlining their most frequent complaining and their keen suggestions.

Considering the design aspects, the first analysis regards the quality of the contents on the basis of heuristics about texts accuracy and currency, content objectivity, authority (i.e., the competence of the intranet texts authors) and conciseness of the information on the web page, all elements that reflect the efficacy of the communication. While there is not any particular problem regarding content accuracy, content objectivity and authority, providing suitable descriptions in accordance with each page matter; instead, there are some problems about currency and conciseness of the displayed information. These problems on the one hand stem directly from the users' involvement, and on the other hand depend on how some pieces of information are structured and arranged. Moreover, such issue deals also with cognitive aspects; whereas, getting all members used to check their data on the intranet is still a difficult attempt, especially considering that time and human resources devoted to the intranet maintenance are short. For instance, it happens that some ALaRI actors forget to keep up-dated personal data on people directory, such as emails, current position, or the public *curricula*. Then, students and lecturers do not revise information on the courses area, such as course's enrolment or educational materials, and thus preventing from having lists updated of students attending a given course, or from consulting learning documents in time for the lesson.

Through the navigation quality, the aim is to analyze the available paths to reach specific information and the connections among the various contents of the online pages, according to heuristics of landmarks, segmentation, orientation clues, accessibility, presence of introduction list, and backward navigation. Entering the intranet, clear and well-evident landmarks on the main top menu show the access to the principal areas. As

regards the segmentation, the goal is to verify whether it is clear the relationship among information segmented in different pages but regarding the same topic, and how the navigation between these pages works. This aspect is particularly important since the ALaRI intranet offers many topics (e.g., people, projects, proposals, courses, part-time jobs, library, repository, etc.) divided in macro-areas which, in turn, consist of sub-areas describing specific details of the principal topic. Generally, the topics are clearly divided by type into sub-areas, but sometimes it is not clear where the paths of a selected area drive you, with the risk of compromising the linearity of the navigation. As a consequence the time spent to reach the information of interest results too long and articulate, discouraging the user from getting it. This problem derive from different elements, among which orientation clues not immediately visible or understandable for a new user, such as the very long top menu bar that is necessary to scroll at length on the right to reach the end; or the list of sub-menu links placed on the left and divided in many sub-topics. Further, when a topic is too segmented, understanding how the navigation between the different pages works is not very intuitive. For instance, on [Projects and Research](#) area (from the staff intranet view), there are eight sub-areas: *My Project*, *My Former Project*, *Master Projects*, *Main Projects*, *Guiding Themes*, *Projects Search*, *All Documents*, *Projects & People* - often overlapping same information (e.g., information on *Master Projects* and on *Main Projects* return on *Projects & People*; or information on *Guiding Themes* are present also on *Projects Search*).

The same matter was on the part-time job area (previously [ALaRI Job](#), now called [PT_Jobs](#)) which presented eight sub-areas, as reported in Figure 6.7.

Assigned Jobs of Mine

Complete By Name	Assigned To	Value (Tokens)
15/01/2005 Alari documents	Kaveripakam Sathish Chandra Kumar	4.0 Details De
15/01/2005 photocopy lecture and working for U.B	Singirikonda Suresh	6.0 Details De
11/01/2005 electrictor of apartment	Fabbri Fabio	1.0 Details De
10/01/2005 email to candidates of Alari master	Prasad Rishi	3.0 Details De
06/01/2005 assitant	Sankaranarayanan Karthik	3.0 Details De
copy document for Umberto	Kapoor Payal	1.0 Details De
mailing list-USI	Mirjalili Seyyd Hasan	5.0 Details De
mailing list-USI	Barakov Tihomir	5.0 Details De

Other Assigned Jobs

Complete By Name	Posted By	Assigned To
▶ 31/01/2005 press release (alari)	Salvioni Carola	Finardi Davide
▶ 12/01/2005 USI placement contact	Salvioni Carola	Fabbri Fabio
▶ 17/12/2004 ANTITESYS	Bondi Umberto	Rivard Philippe
▶ 17/12/2004 coordination (UB) assistant	Bondi Umberto	Xu Liufang
▶ 17/12/2004 coorporate model	Bondi Umberto	Baqhdasaryan Yelena

Figure 6.7. The former part-time job area.

Later on, changes on part-time job area reduced the segmentation to four sub-areas (Figure 6.8), thus simplifying not only the navigation around this topic but also the on-line management of this particular activity of collaboration between the ALaRI staff and the master students.

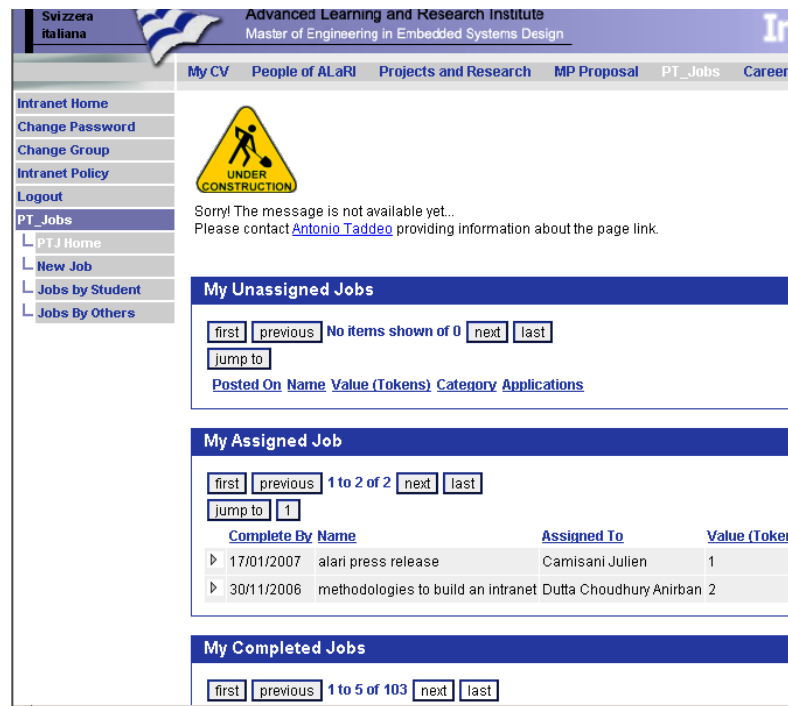


Figure 6.8. The current part-time job area

Easily accessing all pages relative to the same topic in a few clicks is an accessibility matter. Some difficulties are still present on *Guiding Themes* page (sub-area of [Projects and Research](#)), that groups together the principal research topics (*HW/SW for Advanced Applications; IPSEC; Low Power; Pervasive Computing; Security and Communications; Security for Mobile Systems; System Level Design*) and the relative public documents. In this section, reaching the public documents currently requires five clicks, whereas this path could be reduced to two clicks. In fact, choosing a Guiding theme and clicking on it, the names of the projects (*Master* or *Main*) related to the selected theme appear with their *status* (completed or ongoing) and the year. Close to this information, a column labelled *Homepage* is left empty (Figure 6.9). But here it would be possible to enclose the relative project document adding an icon with the link, and change the name of the column with the label *Document*. On the contrary, actually you have to click other three times before reaching the document of your interest.

Guiding Theme

Name Pervasive Computing
Description Pervasive Computing represents the latest frontier in computer development and deployment. The vision is that of a huge number of tiny computer devices that seamlessly disappear into the real world and into everyday's life.

Name	Status	Year	Homepage
▶ A LightWeight Secure IP for pervasive applications on embedded systems	Completed	2002-2003	
▶ Impact of Routing Protocols on Reliability in Wireless Sensor Networks	Completed	2002-2003	
▶ Implementation and Power Optimization of a Bluetooth Universal Remote Controller	Completed	2003-2004	
▶ Performance analysis of power-constrained communication with Bluetooth	Completed	2002-2003	
▶ Power Optimization of a Bluetooth Ad-Hoc Network	Ongoing	2003-2004	
▶ Security evaluation of Bluetooth and 802.11	Completed	2002-2003	

Name	Status	Start date	Homepage
▶ Wireless Protocols Power Optimization for Pervasive Computing	Ongoing	01/03/2003	

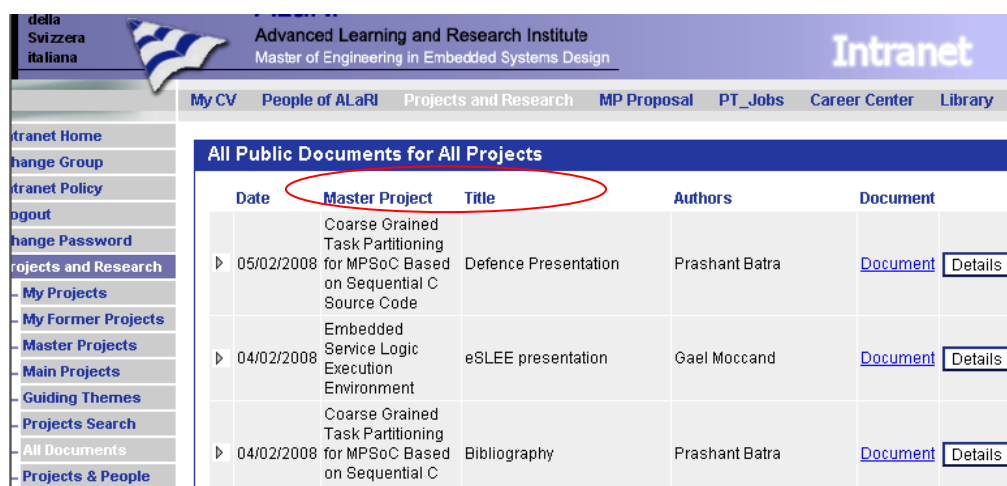
Figure 6.9: selected Guiding Theme and relative titles of projects.

Then, introduction lists should facilitate the navigation making clear the strategy used to organize specific topics. But this is not so clear in [All Documents](#) (sub-area of [Projects and Research](#)), where there is a very long list with all public (and private, on staff members view) documents. In this page documents relating to the research projects are simply listed by chronological order, whereas it would be more useful to have projects by alphabetic order from which access the relative documents, or to have a drop down box in order to search documents by author or by project title. Finally, backward buttons are not present, while there is only the back functionality of the browser.

The analysis of the interface design considers semiotic, cognitive, and graphic aspects of the intranet. The semiotic aspect focuses on the clarity of the messages, evaluating if the meanings are well understandable, with respect to the string of characters (i.e., the expectation to reach a particular content starting from the meaning of a label), to the terms used for titles, headings or keywords (that should synthesize the contents to which they refer), and to the interaction images (i.e., the meaning of any non-textual sign or symbol used for navigation purpose). On the ALaRI intranet, problems of semiotics regard the choice of label names, with the risk of letting the user lose confidence in the site. In fact, labels as *ReSearch*, *Master Projects* and *Main Projects* make not clear and intuitive the contents they cover. The label *ReSearch* points to the whole ALaRI documents repository, where it is possible not only search all the present documents (e.g., scientific papers, theses, electronic books, etc.), but also add new ones, or suggest references to other intranet users, and create individual virtual library. Further, the *ReSearch* label has a name very similar to *Projects and Research* label, which instead points to only projects documents. My suggestion is to rename the too generic *ReSearch* label replacing it with a name that can sound like *Scientific Repository*; while

Projects and Research label could be simplified in *Research Projects* or *Projects Doc.* Then, some confusion come from other two labels, namely *Master Projects* and *Main Projects* (in *Projects and Research* sub-area) which point respectively the first one to the students' master projects (developed or on-going in ALaRI institute), and the second to the ALaRI research projects (i.e., those national or European projects in which ALaRI is involved as university institute). Therefore, it would be better to offer more evident clues of the different topics they cover, for instance modifying the two labels in *Student_Master_Projects* and *ALaRI_Projects*.

Going on, misleading headings appear, such as *Master Project* and *Title* on *All Documents* sub-area (Figure 6.10). In fact, *Master Project* would indicate the title of the project to which the document refers but including both master students' and ALaRI projects; and *Title* would indicate the type of document (e.g., a presentation, a report, a draft, a bibliography, etc.). But, in my opinion, these headings do not provide a clear view, and it would be better to change them respectively with the following *Project Title* and *Document Type*.



Date	Master Project	Title	Authors	Document
05/02/2008	Coarse Grained Task Partitioning for MPSoC Based on Sequential C Source Code	Defence Presentation	Prashant Batra	Document Details
04/02/2008	Embedded Service Logic Execution Environment	eSLEE presentation	Gael Moccand	Document Details
04/02/2008	Coarse Grained Task Partitioning for MPSoC Based on Sequential C Source Code	Bibliography	Prashant Batra	Document Details

Figure 6.10: on *All Documents* sub-area, the highlighted headings *Master Project* and *Title* are quite misleading labels.

A final example is given by the ambiguous title *Getting Started* that appears on the homepage (Figure 6.11). In fact, clicking on it the user is addressed to the [Help Index](#) area; whereas the link *Help Index* is already present on the top menu area. Perhaps, leaving the same title *Help Index* also on the homepage would make it clearer to the user where the click drives.

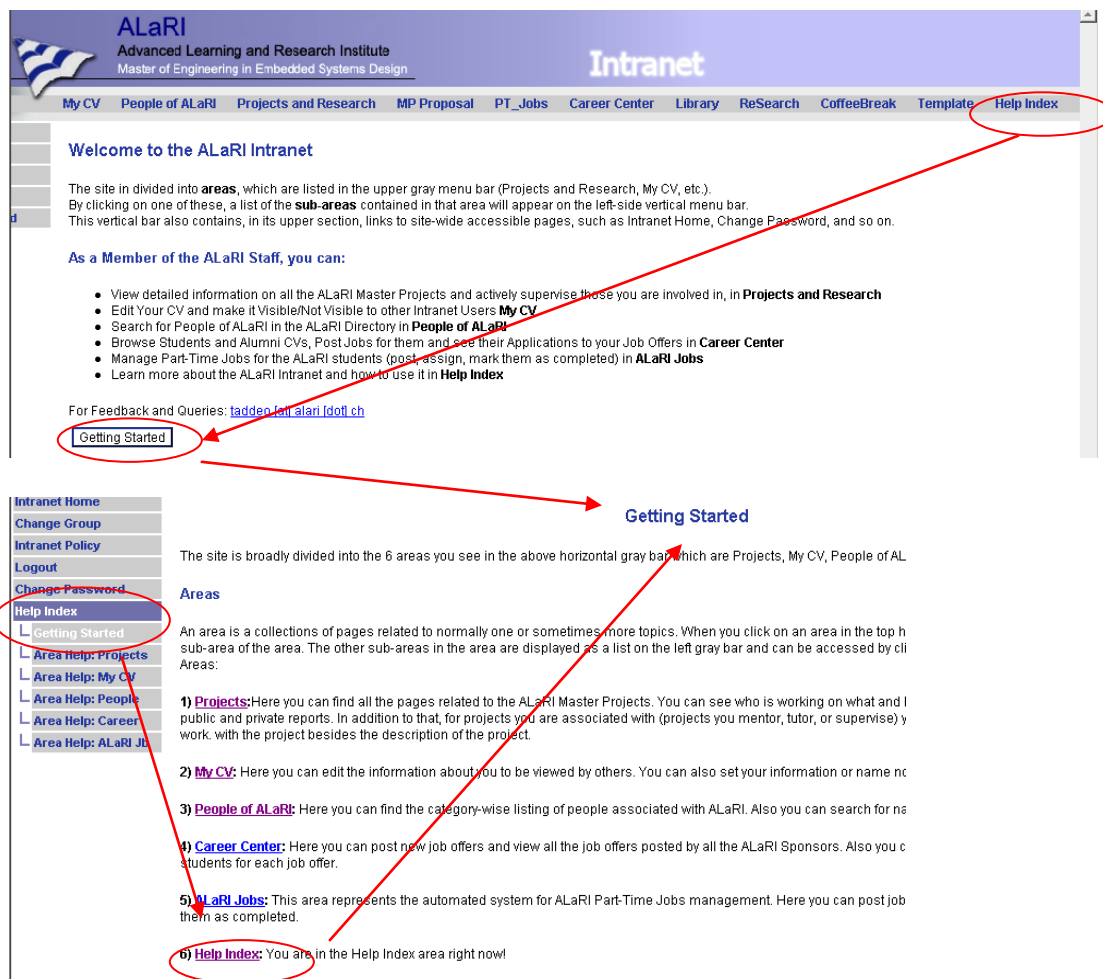


Figure 6.11: the *Getting Started* link corresponds to the **Help Index** sub-area

Other problems stem from the lack of conventional and intuitive symbols, as instead we are used to recognize on web pages as interaction images. For instance, on the ALaRI intranet little light-blue triangles in little white squares sometimes act as click buttons and sometimes not. For instance, in course area, clicking on the triangle near *Courses Browser* you can browse – and select – the courses; or in *Template* area, you can select students clicking on the triangles near their names to visualize their token status. On the contrary, always in course area, on page *Course Resources* or *Course Information*, or in *Projects and Research* area, any little triangles do not act anymore as buttons links. Unfortunately they are not conventional signs, and it is not intuitive to recognize when they act as links.

Then, the cognitive aspect evaluates both the user's cognitive effort reading the intranet page (in case of redundant or overloading, but also lack of, information), and the user's understanding about the information architecture, i.e., meaning and structure

about how information objects are classified or separated; and the general site map. As regards the information arrangement for consultation, some pages presented very long lists of elements to scroll, mixing also different types of documents, and thus risking producing confusion. For instance, on [People of ALaRI](#) area (people directory) there were very long lists of all ALaRI actors' names (current and former); or, on [Projects and Research](#) area, the projects were listed all together both those already developed and those on-going; or on [Library](#) area there was a long list of mixed documents (books, presentations, articles, etc.), not divided by subject or type of text, or by author. Therefore, some improvements, implemented later on, aimed at categorizing different elements, and at making it easier to find specific information through the use of *search* masks (what is also highly recommended to increase the intranet usability, Nielsen, 2003). For instance, on [People of ALaRI](#) the lists of names were grouped and subdivided according to specific categories (Figure 6.12) with the possibility of selecting and seeing specific groups.

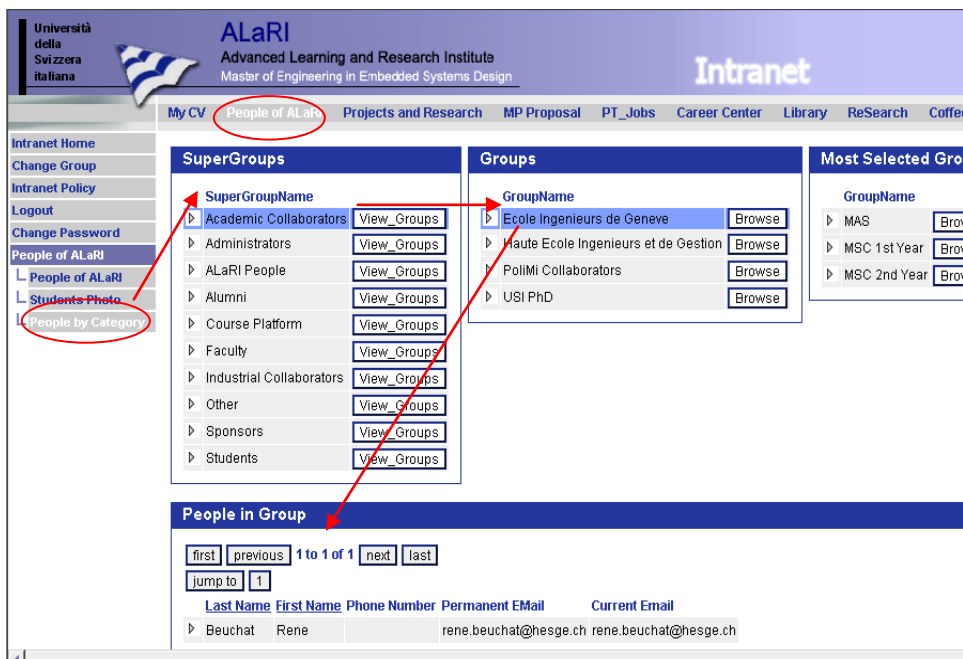


Figure 6.12: from the macro area *People of ALaRI*, the sub-area *People by Category*, with *SuperGroups*, *Groups*, and list of names in *People in Group*.

Further, the loading of new documents was bound to fill in specific details that contribute to better organize data and information.

In other cases, a not suitable disposition of the search masks, instead, makes pages as *Projects Search* (sub-area of *Projects and Research*) and *ReSearch* too complex, since much information result in being crowded. For instance, on *Projects Search* there are

three different search masks: the one is for the Master Projects, the second for the Main Projects, and the third for the Guiding themes (Figure 6.13). But all these have same problems of information architecture. In fact, below the mask *Search Guiding Themes* (that addresses to the specific chosen Guiding theme), there is already the list of the Guiding Themes with the relative links. Then, the other two masks present search criteria quite difficult, such as remember project by name or by abstract; whereas it would sound better to fill in *keywords* or *author* name. Moreover, it would be more useful to reduce the number of masks and to have for instance two levels of search, such as “simple search” and “advanced search”.

Universit  della Svizzera italiana

ALaRI
Advanced Learning and Research Institute
Master of Engineering in Embedded Systems Design

Intranet

My CV People of ALaRI Projects and Research MP Proposal PT_Jobs Career Center Library ReSearch

Intranet Home
Change Group
Intranet Policy
Logout
Change Password
Projects and Research
My Projects
My Former Projects
Master Projects
Main Projects
Guiding Themes
Projects Search
All Documents
Projects & People

Search Master Projects by...

Name
Abstract
Year (e.g. 2001-2002)
Status
Search

Search Main Projects by...

Name & Abstract
Search

Search Guiding themes by...

Name & Description
Search

List of guiding themes

Guiding Theme Name	
HW/SW for Advanced Applications	Guiding Theme De
IPSEC	Guiding Theme De
Low Power	Guiding Theme De
Pervasive Computing	Guiding Theme De
Security and Communications	Guiding Theme De
Security for Mobile Systems	Guiding Theme De
System Level Design	Guiding Theme De

Figure 6.13: Projects Search page with the relative search masks.

On *ReSearch* sub-area the problem is quite similar. At present there are five masks: three for searching documents and two that allow adding new virtual folders or performing several operations on already existing individual virtual folder/s. In such case, the research criteria are too fragmented according to both different locations (whole repository or MyWorkspace) and owner of the document (MyDocs or others). Further, it would be better to split in two different pages masks for documents search and masks for creating individual virtual folder, considering also that a page to create new document (and just labelled *New Document*) already exists.

In part-time jobs area (*PT_Jobs*), on the contrary, the lack of detailed information describing some part-time jobs was resolved making it compulsory to fill in specific boxes (e.g., description of the job, deadline, token given, etc.) in order to post and upload with success the job on the intranet. In this way, students applying jobs can get complete and exhaustive information to choose jobs of interest.

Concerning the mental map of the site, in ALaRI case, the actors are supported by having access to own specific navigation paths with respect to each profile, and thus just finding those areas, services, and functionalities useful for the own status and position, e.g., the lecturer's intranet view presents different information arrangement and contents from the student's one. That certainly allows each user profile to have clear overview of the own site map; while having the complete mental map of the site would be very complex to figure out (what is then problem for the person in charge of the intranet administration).

Within the graphic aspect, features to consider regard the graphic design (e.g., font size, colours, font type, icons, and the graphic elements) and the layout of the intranet pages (i.e., the spatial distribution of the graphic elements). On ALaRI intranet, there are very few icons and images with respect to the text which is sometimes even too long; while the page layout is very squared and stiff. This is mainly due to technical tool constraints that limit the interface to reproduce only square or rectangular areas.

Finally, technology aspects reveal troubles about clear feedback messages both for errors and confirmation. In fact, it would be useful to provide feedback on errors using natural language, not a code, and thus showing what the error consists of (Norman, 1988). This holds also for messages confirming the successful completion of operations (for instance, the correct uploading of a document). An error feedback in natural language can also help the user to understand how to proceed in order to repair it.

Other technical problems come from closing a document once it is open, since this operation requires going back by using the back functionality of the browser (as highlighted in Figure 6.14), otherwise, clicking on the close window icon, you are moved out of the platform.

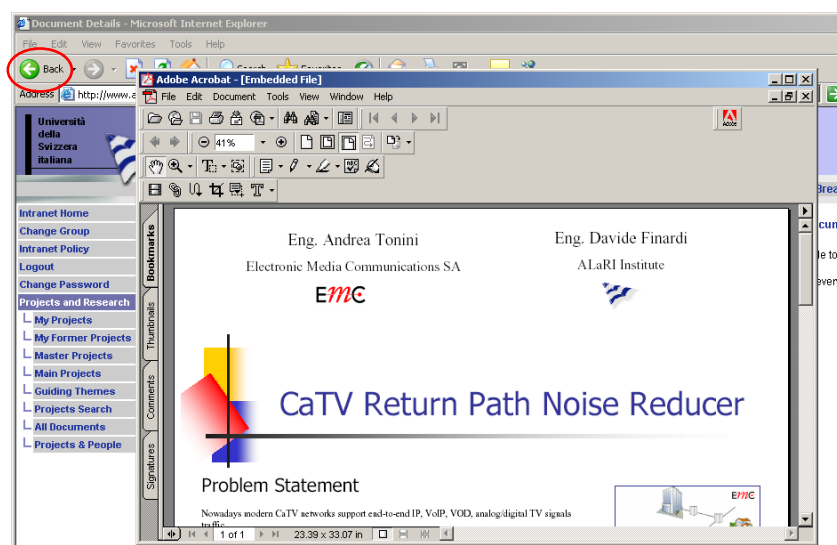


Figure 6.14: Closing the pdf document requires clicking on the highlighted back button; on the contrary, you will be log out.

In addition, there were some constraints especially concerning the first version of the web technology. In particular, the adoption of a particular software tool with an owner language⁵⁵ made it difficult to find human resources available to learn how it worked. When using not open software, reselling such work experience in other professional contexts becomes more difficult. Further, clear and complete software tutorials were missing that showed which operations could be implemented, how to build them, and the expected results, i.e., how these operations resulted visible on the interface. For instance, Forest (the first master student developer) reported that personally met problems in WebRatio tool mainly due to the manual not properly documented and lacking of examples. Therefore, he had to contact David (the first intranet designer) even for small doubts. While, the successive version of the software tool (WebRatio.4) presented a better documentation.

In users' interviews, conducted in 2005 and 2007, most complaints helped me to confirm problems found out during the inspection analyses, namely regarding the content updating (in particular for the course's area), and semiotic, cognitive and technological aspects (e.g., misleading labels, not categorized documents, lack of feedback in natural language, and some technical drawbacks that hinder from completing tasks and activities) that compromised also the navigation quality. Further, users suggested some services to be improved, such as search systems (what has been mainly implemented in the last two years, especially for the project documents), and new elements to be added, such as, in the area devoted to the project management, name of persons involved or of project leader/s to contact in case the project is of particular interest; or the possibility to add in *Career Center* area a section dedicated to summer internships; or in *Library* area a form to send requests of new books acquisition. Further, on course area, lecturers offered very useful suggestions, such as adding the possibility to supervise the reports of the exams as it already happens for the supervision of master project reports: in this way professors can provide directly students with feedback remotely, keeping privacy status. Then, they advised implementing forum-board discussion to cover common question and answer threads, and mailing lists including students attending the lecturer's course and faculty colleagues to contact quickly. What would improve also the contacts among ALaRI faculty members who do not always know each other personally. Then, students helped to discover and fix some bugs that compromised the course area use, such as registering for a course, accessing educational materials and the own updated private transcript.

⁵⁵ The WebRatio technology is based on WebML language, which is not very used even if it is a standard language.

Further, interviewed actors recommended as best way to promote the use of the intranet to create online video-tutorials that show through simulations how the main functionalities work (such as, uploading teaching material, assigning marks, searching project documents, and so on). This solution allows learning quickly the use of some services without reading carefully the online manual. However, they all agree that a few but clear and well written rules of use are necessary. As regards this issue, Schneiderman (2005) confirms that online manuals, help or tutorials are typically ignored, but also that these resources can be profitable to bridge the gap between what users know and what they need to know, so online manuals should always be present within the system interface. What is more, speaking directly with the actors it helped to clarify some priorities. For instance, reminding log-in and passwords was initially perceived by the intranet manager as problem for the users. Instead, the interviewed actors confirmed that it does not constitute any trouble or discomfort, but, on the contrary, they consider necessary having own log-in and passwords to manage the different access levels and to guarantee security and protection of sensitive data. Lecturers, in particular, would prefer receiving a yearly reminder of their accounts so as not to forget access details.

Generally, the interviewed actors told about complaints compatible with respect to the results from the inspection analysis, since they met same difficulties on the application, and complementary with respect to own site views. There were no complaints colliding with others' demands; while, most actors, especially lecturers and collaborators, noticed that a strategic plan was missing to promote the intranet knowledge and use, and thus also revealing their willing to interact together, once the intranet awareness rise.

Concluding the analysis, usability evaluations over the time are necessary to assess on the one hand the effectiveness and the efficiency of the intranet services and on the other hand the satisfaction and the level of use of all the potential users. In particular, the ALaRI intranet usability emphasizes (and confirms) two main issues. The first one concerns technical and interface problems that can be tackled and resolved following the analysis outcomes and taking care of the intranet maintenance; while the second issue underlines the importance of providing the intranet system with strategic social relevance, promoting and communicating its use at community level to reach a complete and full adoption. These issues are tightly intertwined and require exploiting suitable resources to get working advantages and social benefits from such application. Therefore, more attention, in terms of time and human resources, towards the intranet means:

- at technical level, customizing the users' interface, according to the different requirements of user's profiles - what is also known as *versioning* in economics field (Shapiro & Varian, 2001) – and implementing the changes in compliance with the usability outcomes;

- at communicative level, spreading and reminding services and accesses on the intranet to all potential users, especially because most of the ALaRI actors works remotely and needs quick and easy refreshing of use;
- at social level, involving actively the different actors and the collaborative work on the platform, for instance monitoring the development of research projects on the intranet and publicly rewarding the best project development, or stressing the management of “virtual classroom” by making some tasks easy on the platform (e.g., assigning marks, checking students attending the courses, etc.), without disregarding to require users’ feedback and to invite them to send spontaneous considerations;
- at cultural level, enhancing the interactions among ALaRI technicians (designers, developers) and ALaRI actors to improve services of the system and to reinforce the shared meaning as regards the support of educational and research programs.

7. The Communicative Circuit

7.1. Communicative impact on the life-cycle of the intranet

The ALaRI intranet case study is particularly interesting since it involves all the real actors in the activity system. In particular, the analysis of the working practices offers a quite comprehensive view on which communicative interactions occurred during the technology life-cycle: from the feasibility study to the release, from the use to the maintenance, also including the collection of feedback.

Therefore, within this study, it was possible to define and to represent a peculiar communicative circuit (Figure 7.1), from which considering the impact of the communication on the life-cycle of the product, with respect to the processes of designing, developing, use, and feedback.

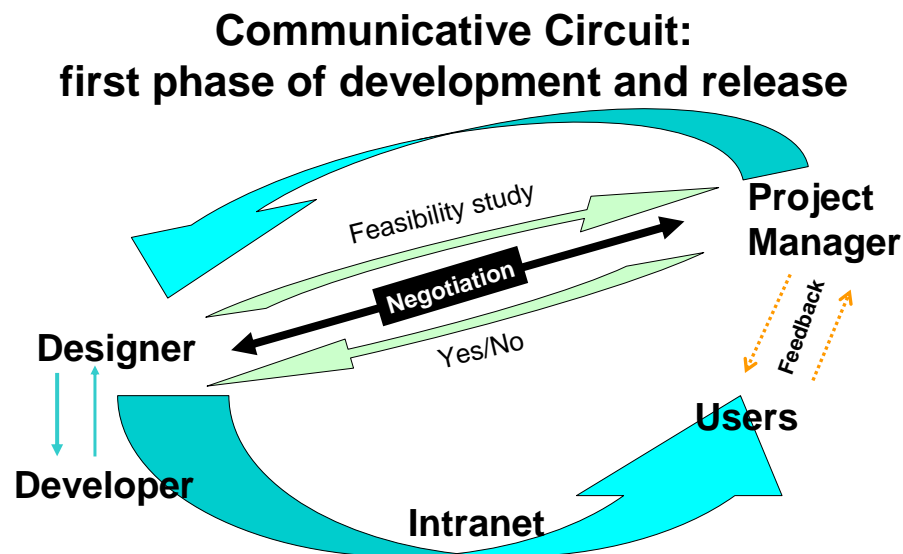


Figure 7.1 Communicative circuit of the ALaRI intranet life-cycle

From the beginning, communicative interactions occurred only between the first designer (David) and the project manager (Paul) in a bi-directional and circular way, constituting a sort of technical communication loop, as it appears in the upper portion of Figure 7.1. In this phase, a confrontation stage with a sample of end users lacked. In fact, some users received only few lines describing the functionalities to implement, but no prototype or mock-up of the realized solution was then presented. In this way, the designer concentrated on requirements specifications emphasizing his own proposed solution, but without co-sharing it with anybody else, except the project manager.

During the development phase, more interactions occurred between the designer and the developer, but always without directly involving users, or requiring external supervisions by other persons about the ongoing work.

Further, preference relationships between a representative of the staff members (as designer) and a representative of the students (as developer) led to paying more attention towards those tasks oriented to enhance the collaboration on the platform between staff and students, for instance on part-time job area and on library area. On the contrary, the lack of meetings and interactions between designer and other ALaRI members, such as lecturers or industrial collaborators, led to implementing functionalities that should be shared by all actors (e.g., remote working on research area and remote tutoring on *course* area) but that are developed just according to the exclusive designer's perspective without investigating and comparing other points of view.

Finally the intranet was simply released and "presented" to the social actors, who, in turn, exchanged informal and non-structured communications about intranet matters with the project manager, speaking with him *de visu*, by phone calls, or through emails, but without using the platform (this is also because, as showed in previous chapter 6, the intranet was not devised as internal formal communication platform, but at once as virtual support for remote management on research projects and on educational activities).

This circuit shows an awkward communicative gap between technicians of the system (designer, developer and project manager) and the social actors as potential users. Such gap had a number of repercussions on the intranet use, both at usability level (as previously illustrated in chapter 6) and, especially, at community level, since co-shared meanings to adopt and use the technology were not recognized. In fact, introduced with the aim of changing (and improving) the workflows management, the intranet was devised as innovative information system for the whole ALaRI community; but strong and clear messages at community level about its strategic meaning and use were missed. As also Schneiderman (2005) underlines, formal communications are necessary to reduce confusion and explain organizational implications of design decisions. Therefore, affecting also the organization of the work practices, more efforts in the cultural promotion of the intranet use would have been of paramount importance, and it would have driven the ALaRI actors to understand, accept and recognize the worth of the intranet even before its release.

Assessing an ideal exchange of virtual interactions on the intranet and comparing it with the interactions really occurring can provide a further evidence of the achieved results compared to those expected. Figure 7.2 shows how on the intranet the remote management of working activities through virtual interactions should prevail on the interactions in presence that in turn should be limited to physical meetings, as between students and lecturers during class lessons. In this sense, for instance, the faculty should manage most educational activities through the *course* area interacting with the students

as well as the ALaRI staff. While industrial and academic collaborators involved in research projects should be able to follow the development of the projects on research projects area, checking milestones and reports, and interacting with students and tutors giving guidelines and suggestions. Then, taking advantages of students' competences as recognized through their educational results and the *curricula* uploaded, internships or job offers should be posted on career area. In such case, when a master student applies for a job position, the promoter receives an automatic email of notification on his/her email box. Therefore, the promoter can check the student/s' application on the intranet and evaluate whether the student's profile matches the job requirements.

Ideal interactions on the intranet

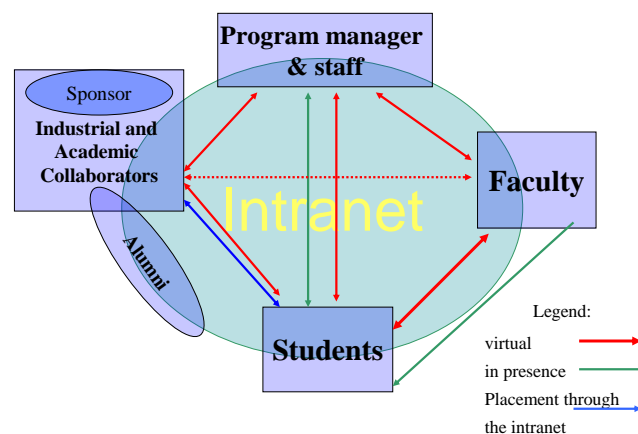
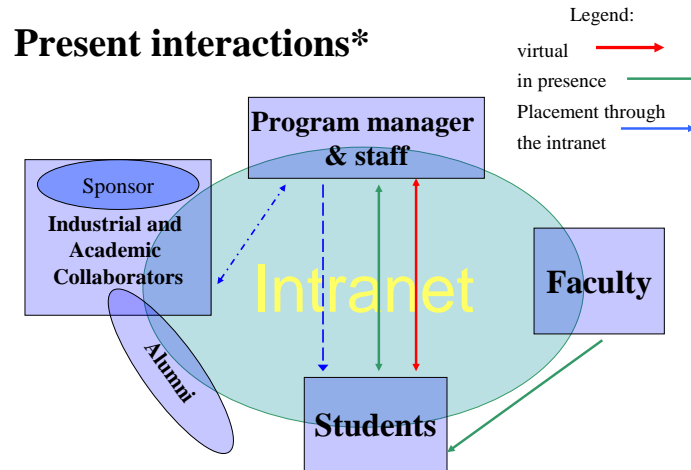


Figure 7.2 Ideal exchanges of virtual interactions on the intranet

Unfortunately, at present the real status of the interactions on the intranet is still less rich than it was expected. As represented in Figure 7.3, only the interactions between staff and students strive to manage remote working on the intranet and to collect community know-how for knowledge sharing, even burdening with other actors' tasks and thus taking charge of extra work. In fact, usually, the other actors do not interact on the intranet at all, but they make use of different devices (e.g., phone and emails) to accomplish remote working and collaboration.



*e-mails and phone calls replace the workflows on the intranet

Figure 7.3. Current status of the interactions on the intranet.

For instance, Faculty members are used to send by emails learning materials to a student acting as teacher assistant, who, then, uploads the materials on the intranet. At the same way, lecturers send emails to the program manager with the final marks to be assigned to the students. Also dealing with placement offers, usually the collaborators contact by phone calls or emails the program manager, who, in turn, takes care of posting the offered open positions. Then, the project and research area is mainly managed by students and tutors who take care of uploading projects reports and results, tracing on the platform the ongoing research.

7.2. Relevance of the feedback process

Systematic requests and analysis of users' feedback are crucial for understanding the real difficulties of use and for improving critical functionalities. Requiring and analysing feedback needs the ability of building collaborative interactions with and among persons pursuing different objectives, such as the different user's profiles, the developer or the designer, and the project manager. During such interactions, actors' roles can even change as when user emphasizes errors of the system, but also with the risk of irritating other actors.

In ALaRI case, once the intranet was released, nobody promoted any requests of feedback. Just the project manager collected sporadic and occasional comments that, then, were simply reported to and quickly discussed with the intranet designer on duty (Figure 7.4). In turn, designer (working alone or with a master student as assistant developer) tried to fix the reported problems on the intranet. But such a situation has several drawbacks, since i) the involved persons simply "speak", using only oral

language, and without writing and collecting in a structured way both problems encountered and modifications to be implemented; ii) reporting problems from one actor to another, going through various steps before finding any solution, runs the risk of losing details of information that can even compromise to implement the right solution; and, finally, iii) no trace remains about what has been changed, how, and why.

Only from 2006, the second designer Dante and his assistant Franz tried to directly involve the actors, asking them to send feedback through a new service on the intranet called “Request Managing” endowed also with predefined categories to better address complaints or suggestions. All staff members (including the designer) could read the requests, and then reply to the sender with explanations or discuss the problems in order to evaluate, under project manager’s supervision, necessary modifications to be realized (Fig. 7.4). Although this service was worth improving, it was surely a quite interesting idea and offered the advantage of keeping traces of the various requests and monitoring the intranet changes. On the contrary, drawbacks were that i) there was not anybody formally in charge of checking and answering the coming requests; and ii) the usefulness of the service depended on spontaneous feedback on behalf of the users.

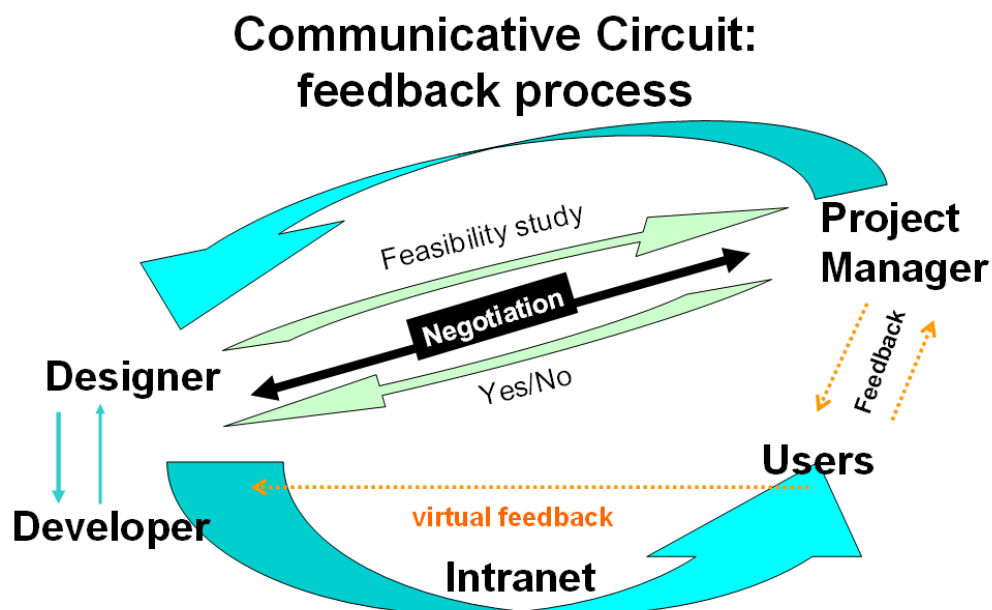


Figure 7.4. The implemented feedback process for the ALaRI intranet

Unfortunately this service was not further improved due to lack of resources, and at the end it was removed. However, with the second intranet designer more efforts were to solicit the actors’ involvement and their feedback, and directly informing them as new solutions were online. Still, much work requires a comprehensive vision of the problem and strategic decisions to involve all community members. In fact, actors interviewed

between autumn 2006 and spring 2007 did not even know main functionalities of the intranet, revealing considerable gap about the provided intranet services because of the lack of coordination in promoting and maintaining the intranet knowledge. For instance, lecturers were surprised at discovering the *course* area, giving comments as the following:

Lecturer: "... I was never informed of this existence There is a communication problem ...Ahaa, interesting .. (little laugh)" –.

Then, after exploring the *course* area, lecturers showed interest in using its functionalities, like uploading learning material, browsing lists of students attending courses, directly assigning final marks. What lecturers generally request is making more intuitive these functionalities, and checking data to be updated, as for the lists of students attending the courses.

What stems from the analysis of the interviews is that there is a great availability both to use the intranet and to collaborate for improving its functionalities, but it requires awareness of the strategic role the intranet can play. This also includes defining accurate feedback processes that cannot be only left to spontaneous and free users' initiatives, but they should be managed by a person in charge of collecting and analysing them, and thus monitoring the intranet status. Therefore, such operation requires making clear divisions about roles and competences for the intranet governance, and individuating the person in charge of managing the intranet maintenance, also planning a community involvement. That means: reporting the current state-of-the-art of the intranet use, according to the various profiles and their relative activities (usability evaluation plan), promoting feedback and interviews, collecting and assessing incoming complaints and suggestions, discussing outcomes and possible changes with designer and project manager, checking how the implemented modifications work both alone and in relations with other services, before putting them online, and especially customizing the communication according to each social actors' profile. This last aspect about a *customized communication* is particularly important to draw the actors' attention to the intranet use. General communications with indistinct spreading of the provided services would not produce any considerable effect. In this sense it is also necessary to identify a suitable time of communication for each profile. For instance, students can be aware of the intranet during the welcome day in September, before program's courses starting; while each lecturer can receive a personal email one week before his/her course at ALaRI, so that he/she can have the possibility to refresh own data and tasks on the intranet, and in case to ask for any detail in time before the beginning of the course; and finally, collaborators involved in research projects can receive intranet information as soon as the research team is defined and the project assigned. Then, there should be mandatory that the actors execute specific tasks on the platform, as specified when they read and accept the intranet policies. For example, lecturers should directly upload their teaching materials and assign marks remotely; students should register to the elective courses of their

programs and apply to research projects of their interest; and research teams should take care of collecting all documents relevant to their projects in virtual folders shared by team members, distinguishing private materials from the public ones.

In my opinion, a new procedure to check the intranet status and to require feedback needs to be introduced, as proposed in Figure 7.5. The main differences with respect to the current situation concern:

- the presence of a formal person responsible of checking and assessing the intranet use and its maintenance at community level;
- the proactive request of structured and systemic feedback along with intranet usability evaluations tailored on each user's profile and involving all the ALaRI actors;
- the possibility to send spontaneous comments, requests, or suggestions from the intranet platform, but addressing them to the person in charge of the intranet assessment;
- planning meetings among designer, developer and responsible of the intranet maintenance to discuss and analyse intranet status and collected feedback with respect to possible modifications to be performed.

In particular, the proposed solution emphasizes the process of “customization” of the communication, including the feedback request: since there are different users' profiles, each with the own site view and specific workflows, it is necessary to tailor feedback forms evaluating real needs and requirements, as well as the different working activity on the system.

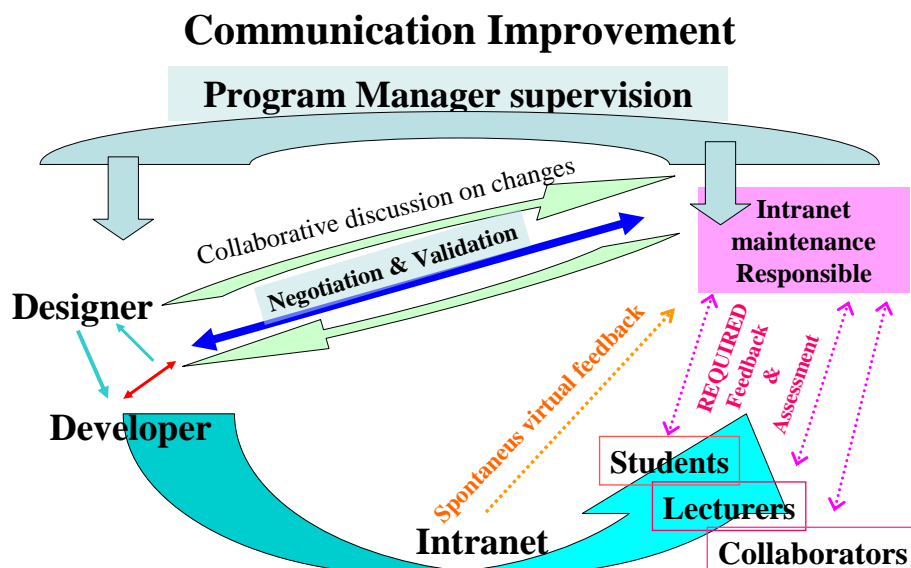


Figure 7.5. Suggested procedure to manage and evaluate the intranet status.

As a consequence, this procedure entails to open a new work position covered by the intranet maintenance responsible, who, together with the designer, will directly refer about the intranet status to the ALaRI program manager. In this way, the program manager will be free from every single intranet troubles concerning both technical and usability aspects but he will keep the overall supervision on the intranet as strategic system for the ALaRI community. Further, suggestions and improvement requests about the intranet services will be collected and categorized, while changes and new implemented solutions on the platform will be traced. The purpose is to monitor the intranet evolution over the time as well as its level of use, evaluating both the actors' participation in the knowledge co-construction and sharing and the effects on the community know-how.

7.3. Argumentative analysis from significant communicative interactions

The analysis of the communicative interactions allows evaluating ongoing practices, making use of the same actors' categories of interpretation (Zuccheromaglio, 2005). In this study, the communicative interactions are considered at pragmatic level as expression of social joined actions, useful not only to better understand the working organization and the actors' relationships, but also, as object of study, they offer further materials to investigate the communication effects on the development and use of the technology. Sometimes, misunderstandings coming from different background, asymmetries of knowledge (Heritage, 1992 and 1997), missing shared premises or meanings can hinder from reaching suitable solutions during the talk among the participants. Therefore, the value of the analysis relies in revealing how the critical relationships *human-technology* is often symptomatic of both latent and explicit difficulties in the *human-human* communicative interaction. In particular, during working activities base on talk – what also Middleton (1996) defines as *talking work* – such as team meetings or interactions between designer and customer, or designer and user -, the communication not only acts as vocal tool of coordination and reflection, but also becomes the basic structure of specific professional activities (Piccini, 2006; Cantoni & Piccini, 2004). For instance, the designer should define the technology requirements during the joined activity with the customer or the user, with the aim of understanding needs and demands (explicit but also implicit), and then translating them into efficient system features for the final users.

Analysing significant excerpts of talk within a well-defined institutional context has a double aim. On the one hand the focus is on showing details of language use related to specific activities; on the other hand, it would also shed light on possible “distortions” in relation both to various aspects of the institution's functioning and to the ways the speakers show their orientation to such institutional situations and requirements (Have, 2007). In this sense, Heritage proposes to look at three main features of institutional

talk⁵⁶ that show distinctly evidence of institutional orientations in talk at work. Namely, the first considers that institutional interaction normally involves the participants in specific goal orientations which are tied to their institution relevant identities (as, in this case, intranet designers or technicians, customer or manager of the intranet, and users). The second feature is that institutional interaction involves special constraints on what will be treated as allowable contributions to the business at hand. Finally, the institutional talk is associated with inferential frameworks and procedures that are particular to specific institutional contexts (Drew & Heritage 1992:22; Heritage, 1997:163-164; Heritage, 2004:106). Therefore, institutional interactions should be associated both with the ontology and the *deontology* of the institutional context, and thus contributing to address type and goal of dialogue to mould sound institutional talk.

From the argumentative point of view, the hierarchy of the purposes within a professional context should determine the process of decision making both at individual and organization level. Within this perspective, the analysis of communicative interactions can reveal the presence of critical factors, affecting not only the organizational context, but also social and cultural approaches of the community members; what, in turn, can have repercussion on procedures of development and use of the technology, as in this case study.

Having previously defined the institutional context along with its ontology and mission (i.e., promoting education and research through innovative learning approaches, as described in chapter 4), now the focus is on whether and how observed and recorded argumentative dynamics comply with and fit in with the work activities in which specific participants' institutional identities are engaged.

In such institute, as well as usually in company or in financial environment, the argumentative interactions most concern future activities or future events (whereas, for instance, in legal field, argumentation is most used referring to past events). In ALaRI, examples of recorded argumentations regard discussions during meetings about the intranet feasibility study, or modifications to implement with respect to costs and benefits, or evaluations between alternative solutions to chose and to integrate. Such meetings consist of discussions among technicians and experts, or between these and the manager of the intranet, or even with the final user to evaluate usability issues and possible improvements of the interface (i.e., trying to match the user's requirements with the product ones). Such types of talk mainly concern negotiations – to reach the agreement of a reasonable settlement -, information seeking – to exchange information and points of viewing to make a decision-, and deliberations – to decide how to set up an activity through a joint action that requires a choice among several alternatives (Walton, 2005). Often, in real conversations, these types of dialogue are mixed together, and

⁵⁶ Drew and Heritage (1992:3-4) underline that “the institutionality of an interaction is not determined by its setting. Rather interaction is institutional insofar as participants' institutional or professional identities are somehow made relevant to the work activities in which they are engaged.”

exactly analysing the dialectical shifts from one type to another is possible to evaluate the soundness of the argumentations. Moreover, the institutional context of interaction and the type of dialogue adopted define specific dynamics of *commitment* that each actor should engage in respecting. The definition of the goal of the dialogue covers particular importance in the conversation analysis, especially considering institutional talk and talk at work, leading also to evaluating the soundness of the argumentative interaction.

Here below considerations deriving from the analysis of excerpts of talk aim at illustrating the resources the actors deploy as examples of both sound argumentation and derailment from the primary purpose of the dialogue. In particular, two examples of derailment show, in a first case, a sort of manipulation on behalf of one speaker (a developer) who wants to enforce his own vision but with the risk of turning from the primary mission of the interaction and of the activity; and, in another case, the deceptively apparent reasonableness of the various moves but that leave incomplete the resolution process of the standpoints at issues. In this particular case, the analysis dwells on two excerpts of talk occurring in two distinctive periods of time but dealing with the same primary matter. Here it is peculiar that in both cases sound argumentations seem to be ongoing, in the sense that participants, step by step, collaborate to clear misunderstanding and to bridge knowledge gap. Nonetheless, the primary purpose of the argumentation is reached neither during the first talk, nor during the second one. In fact, due to the necessity of specifying a number of different and single details, speakers *simply lose sight of the overall goal*. In the specific, the derailment consists of the dialectical shift from one type of conversation to another due to the lack of pieces of information that hinder from concluding negotiations and thus from achieving clear deliberations about how set up a specific activity (i.e., the development and implementation of an intranet area). The proof is that same problems return in the second excerpt, yet again presenting distortions, although as unintentional fallacies, about moulding a sound discussion.

It is important to underline that within the ALaRI professional context possible – and even common –, but often unintentional, manipulations can occur, due to tacit or implicit introductory statements, leading to misunderstandings, whereas it is unlikely that, in this context, intentional fallacies happen during open reasoning or discussions.

7.3.1. *Interaction among intranet technicians*

The first dialogue concerns an observed and recorded talk between intranet technicians occurred in October 2005: David, the first designer, speaks with Dante, the second designer, about changes and improvements to be implemented on the intranet part-time job and career areas. In a certain sense, as first intranet designer, David is the “father” of the intranet, because not only he first conceived the intranet architecture, the requirements, the structure, and the services to be supported, but he also implemented the first intranet development. Therefore, he feels proud of his work and he appears to be

attached to his “creation”. But this time, David needs to co-share the state-of-the-art of the intranet with Dante, who has learnt about WebRatio technology and is going to take David’s place in the intranet management. Therefore, now David cannot take decisions alone but he has to compare his ideas with Dante’s suggestions, and come to an agreement about how and which features modify in order to make the user’ view simpler, while keeping consistent the background database and the entity relationships diagram.

David and Dante know each other since one year and their relationships bases on good friendship and esteem. They share common educational background and culture, also coming from the same university. During their talk, as the interaction develops, it is evident how the very fast speed of the discursive construction is based on a wide repertoire of tacit but co-shared knowledge, where during the about fifteen minutes of registration, they agree reciprocally 30 times, repeating 14 times “**exact** (*esat t o*)”; 12 times “**yes, yes, yes** (*si, si, si*)”; 3 times “**no, no, sure** (*no, no, cert o*)”; 1 time “**ok**”, in order to evaluate the current situation, to investigate alternatives, and to reach a common agreement about how going on. Starting from co-shared premises they enlarge the common ground through *presuppositional accommodation*, introducing new information that are explained and negotiated, until constituting new forms of knowledge, co-constructed and co-shared, to plan and implement the required modifications on the intranet platform. Further, the very recurrent use of deictic forms – as for instance, when they speak about the token assignment: “... **I like this here..; .. this one stems from this ..; .. these here ..,.. you work with that ..**” -

“...a me questa qui piace; ..questo qua deriva da quest o.; questi qua .., tu lavori con quello..” - couples with *gaze windows* (Zucchermaglio & Alby, 2005) that alternate among the two designers and the computer screen, where the objects of analysis, as in question, are represented. In fact, most of the interactions are mediated by technology components (features and architecture of the intranet): designers look towards the computer screen, faces and gestures of the hands, especially the fingers, point as focus of attention to the intranet representation which is at the same time mediator of and embedding the designers’ activity. Silent moments show that the speakers look together at the computer screen. On the contrary, looking at the speaker becomes the exception, and usually it is functional to build a repertoire of shared knowledge. Reciprocal glances only occur at the end of an interactive reasoning in order to verify the understanding of the speaker; or in case of uncertainty, when a concept is not clear. For instance, during the talk, it happens that, after Dante’s speech, David says:

David: ... **ok, so no, I did not understand what you are saying** ..

David: ...ok, ..qui ndi no, non ho capito cosa di ci ..

Dante turns towards David, looks at him, and then turns back to the computer screen pointing with his finger to what he is explaining to David, extensively exploiting deixis and often transferring technical English words in Italian, as the following example:

excerpt 1

Dante: we have to do this instead of derived .. as fee. .. Look, here you can test. ...Here you can post jobs; here you can assign jobs .. This can be seen as ..; this here, if we can add here... Therefore, I would leave in this way, and in this way it should work...

Dante: dobbiamo fare questa qua invece che derivata .. come fee ... Guarda, qui puoi testare. ...Qui hai i job dove puoi postarli; qui hai i job dove puoi assegnarli.. Questo si può vedere come ..; questo qua, se aggiungeremo qui ... Quindi, io lo lascerò così, e così dovrebbe andare...

This fact underlines two important issues: one is that the two speakers really want to cooperate for the intranet improvement, and therefore they need to build mutual understandings and inter-subjectivity, basing on very clear premises, and when necessary they have not hesitation to ask explanations; the other concerns the total availability to make clear what is not so. Dante couples his explanations with a sort of demonstration on the screen, going from a concept to another with speed and agility, but always repeating his ideas and explaining why he makes a choice rather than another, in order to achieve a clear and co-shared understanding.

Further, it is worth analysing also how the talk bases on very sound shifting which includes exchanging points of view and negotiations to finally deliberate about how to settle the new tokens calculation on the intranet part-time job area. Always looking at the screen, David suggests three possible solutions, and then asks Dante what he thinks about them. Dante answers what he prefers, explaining why that is the best choice according to his opinion. David pays a great attention to follow Dante's reasoning, and every so often he nods in silence. When Dante finishes, David repeats the concept, emphasizing what he has understood, co-sharing with Dante the various steps until the final point.

The talk shows in-built procedures for its maintenance as a mechanism of social action and interaction which is locally determined (Heritage, 2006). Therefore, it was possible to move from previous levels of common ground towards new issues on which consensus has been finally achieved. In this way, the two designers were also able to rebuild, through their communicative interaction, the link – the point of connection – between design, feature, and interface mediation – what often is not-connected dealing with the representation of working complex systems (Zuccheromaglio & Alby, 2005).

7.3.2. *Interaction between developer and user*

When communicative interactions occur among actors with different roles and work positions (and having different background), pursuing a soundness talk can become more difficult. The risk is that the talk overbalances to the detriment of the primary purpose of the dialogue. Generally, the argumentative dynamics aim at granting new awareness to unaware stakeholder but it should occur in compliance with the primary purpose of the dialogue (and, at upper level, of the organization). In fact, when a stakeholder is engaged in pursuing an activity, s/he should act considering not only her/his own interests or commitments, but especially the benefits for the community. The *agency relation* emphasizes the roles the different stakeholders cover, cooperating or interacting together (Rigotti, 2005). In the inter-action, usually, one individual (principal) entrusts some decision-making authority to another individual (agent), with the aim of achieving a specific result. The *agency relation* supposes that the agent has got specific knowledge (that the principal does not, in terms of expertise or times); whereas, the principal delegates a specific commission to the agent. At the basis of such relation, a reciprocal confidence becomes necessary. On the contrary, conflicts of interest might be generated when each stakeholder tries to pursue just the own interests.

During the analysis of the second talk, a derailment from the above mentioned concept of agency relation clearly stands out, leading to distortions and incomprehension that hinder from developing a sound argumentation. In this case, there are two ALaRI staff members, but covering different roles and work positions, and having different commitments: Franz is acting as designer assistant (i.e., the agent), while Hugh is the administrative person acting as user of the intranet (i.e., the principal). The reported excerpt illustrates open conflicts as regards the position of intranet landmarks and orientation clues that should allow user to easily recognize and understand how topics are divided and presented. The record of this excerpt occurred in October 2006 and it is particularly interesting because of two main reasons. First, it captures a natural confrontation stage between designer/agent and user/principal, what is not so easy to pick up in spontaneous talk, since such participants meet very seldom in ALaRI and this was the only meeting I observed (and registered) between designer and user. Second, besides the argumentative analysis, it causes the development of self-awareness providing the actors with new points of view which can help to open new ways of meeting the intranet and user's requirements.

The two staff members meet together to check and evaluate the *status* of Hugh's administrative view on the intranet. Their talk lasts a little more than half an hour (40'). During this time, Franz reviews tasks and activities with Hugh, according to his personal profile, sharing together problems and reaching an agreement about possible solutions. While Hugh freely expresses his opinions, Franz takes note of Hugh's complaints and remarks, and thus developing a sound institutional talk. For instance, Hugh needs to find quickly the students' date of birth to complete some administrative and educational

forms, but, although there is on each student's profile the box space for the date of birth, it often remains empty. Hugh asks if it is his matter to fill in the students' date of birth, but Franz answers that it is up to each student to fill in the boxes with their personal data on their own profiles. And thus they decide to make mandatory to fill in these boxes. (Again, such problem emphasizes how clear and accurate rules about using the intranet lack as yet. Users do not still know exactly which tasks they should perform on the intranet, and especially they are not aware of how much cooperation the remote and virtual workflows require among all social actors to bring off successful interactions on the platform).

Then, Hugh shows some problems on token assignment area; Franz and Hugh think together a new and more intuitive way of representing the token management. Later on a new table will be implemented, providing Hugh with a solution suitable to his demands. Moreover, Hugh suggests further details that should be present on his view and would be useful both to motivate him to use the intranet and to improve his activity.

After about twenty-five minutes of collaborative interaction, the conflict issue comes to the point, when the two participants speak about the *Template* link position. *Template* is the page dedicated to the collection of several documents for administrative purpose that can be useful both for staff members and the administrative person of ALaRI. In the administrative site view, the *Template* link was positioned on left menu since it consists of one page only; while areas, having topic divided in more pages, present the links on top menu. The core problem was that for Hugh it was natural to find the link to *Template* page on the top menu, since it constitutes an independent virtual work-page, and he looked for it on the top menu instinctively; whereas for Franz the link had to stay on left menu, thus respecting the formal "area-page" scheme. But if this structure appears clear and logical to Franz, it is not the same to Hugh. Below I report a significant excerpt of this final talk between Hugh and Franz.

excerpt 2

(H: Where is *Templ at e*?)

H: Why is this *Templ at e* not here? – *poi nt i ng t o t he t op m enu bar*

F: Because it is a page, and not an area (0.3) it is a page there

H: I am not sure, I do not know -

F: yes (.) instead yes, because it has no sense to put (*to create*) a single area and a single page: *Templ at e* is a single page (.) it has no sense to enclose it in an area

H: ok, but, (0.2) that is, if I am used to see the menu from here -

F: (.) but you have to (.), ok, the problem is that you are used because you see the previous ones there, but once you get used to put it here, (.) it has not, (.) I cannot, that is it has not sense

to put it there, (.) it has not sense.

H: but to me it is handy if the group is above, (0.2) I would put it, I do not know, I would put it here at the top (*pointing to the top menu bar*), (.) because it is as it were a title – *Salary* (*on top menu*) is as it were a title, while *Payment Histories* (*on left menu*) are the sub-titles, the same for the *Template*, (.) at least, I think it so

F: *Template* does not have sub-titles, it is a single page

H: eh, but you have to insert it in a page – or do you think to put it (*leave it*) there alone?

F: it is already in a page

cs:(*towards Hugh*) *it is a page that he put on left, but you, as me, do not notice it, since you are used to see the menu at the top -*

H: yes, I do not see it

at this point my intervention aims at mediating the ongoing conflict: I explain to Franz the necessity to change the link position to get a better visibility of the Template page

F: well then also this one (.) we change it, ok (.) good, good, good

[Italian recorded version]

[H: Dov' è *Template*?]

H: Perché questo *Template* non è qua?

F: Perché è una pagina, e non un'area

F: è una pagina lì

H: Non sono sicuro, non so ...

F: sì, ... invece sì, perché non ha senso mettere un'area e una pagina sola: è una pagina sola *Template*, ... non ha senso metterla in un'area

H: ok, però, .. cioè, se io sono abituato a vedere i campi da qua

F: .. ma devi ..., il problema è che tu sei abituato perché prima erano lì, ma una volta che ti abitui a metterlo qua, ... non ha, ... non posso, cioè non ha senso metterlo lì, .. non ha senso.

H: ma a me fa comodo avere in alto il gruppo, ... io lo metterei, non so, io lo metterei qua sopra, ... perché è come se fosse un titolo – *Salary* è come se fosse un titolo, mentre *Payment Histories* sono i sotto-titoli, stessa cosa per il *Template*, ..almeno, io la vedo così ...

F: *Template* non ha sotto-titoli, è una pagina sola

H: eh, ma devi inserirlo in una pagina – o lo metti lì da solo?

F: è in una pagina già

cs: (*verso Hugh*) .. è una pagina che mette a sinistra, ma tu, come me, che sei abituato a vedere il *menù* in alto non te ne accorgi -

- H: e, sí, non lo vedo ...
 F: ...va bene, all'ora anche questo, ...lo cambiamo, ok, ...bene,
 bene, bene ...

After my intervention to mediate this little conflict, Franz, even if a little bit displeased, comes to agree to the modification of the position of the *Template* link, moving it from the left sub-menu position to the top menu bar.

Before the derailment, the interaction was very fruitful, and Franz and Hugh very well covered the respective roles of agent and principal. But dealing with the layout configuration, Franz was sure to be right, and, implicitly he thought to have to follow precise design rules that entail to visualize single pages on left menu, whereas major areas, including topic that can be divided in sub-topics, are located on top menu.

Franz did not consider that the menu configuration should also comply with the user's requirements. Therefore, even if, from a technical or designing point of view, Franz's reasoning was rational and coherent, from the user's point of view following stiff schemes of design may compromise usability aspects.

This case clearly shows an example of what Heritage defines *asymmetries* of institutional interaction (Drew & Heritage, 1992; Heritage, 1997:164; Heritage, 2004). In particular, here there is an evident asymmetry of interactional and institutional "knowhow" leading to an unequal involvement of the participants, since what for Franz should generally be a routine activity (i.e., checking the consistency of the interface status), for Hugh the fact of playing as user tester is an unusual experience. In this way, the speakers bring asymmetrical experience and reasoning to the encounter. Therefore, such asymmetry entails not balanced capacities to direct the interaction in institutionally desired and relevant ways (whereas, the following excerpts show examples of institutional asymmetry that will be short-lived, since the participants cooperate in bridging knowledge gap). Although Hugh has idea of the purpose of the conversation, he may be unable to grasp the point of a particular action. Hugh does not exactly know what Franz is up to and according to what kind of protocol he is working. For instance, during the interaction, Hugh does not speak directly about "visibility" – he does not know what usability elements consist of technically; he is not a usability expert – but he underlines general habits that make him comfortable with the location of the different elements on his site view. Still, Franz goes on with his thought and takes advantage of Hugh's mistake (as it will be illustrated here on end) without trying to understand his reasons.

At the end, my intervention aims at mediating the conflict and let Franz understand the importance about how the user experiences the intranet interface, rather than affirming the own status and authority as designer who moves from design rules. Figure 7.6 represents, with a basic scheme, the model of argumentation supported by Franz, and what my rebuttal consists of.

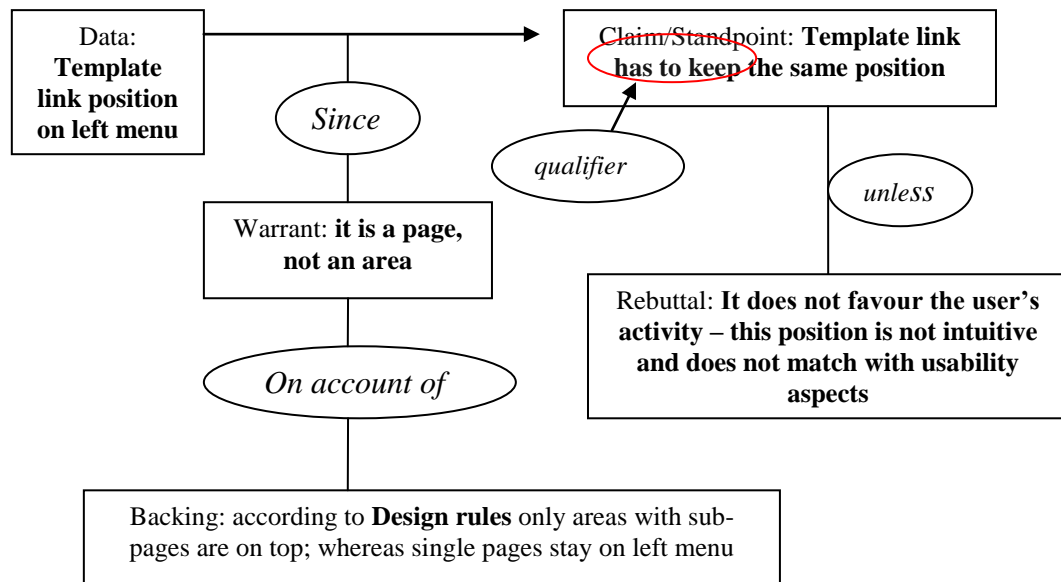


Figure 7.6. Franz's argumentation scheme, according to Toulmin basic scheme.

Analysing in deep the Franz's moves, it is possible to note several elements that can help to better evaluate the derailment of such discussion. First of all, this *type of dialogue* concerns information seeking to deliberate how to improve the user's interaction with and through the intranet interface, according to user's requests. In fact the dialogue is based on use scenarios. Therefore, the *field dependence* to which the question at issue belongs does not depend on a backing concerning the designer's conceptual model (i.e., her/his technical vision); but it would be more appropriate a backing concerning usability reasons (i.e., the effectiveness with which the user can achieve her/his goal). In this dynamics of *commitment*, the designer should act as agent, making every effort to capture and to interpret the user's requirements without forcing him to comply with the intranet technical structure; while the user should act as principal, without being ill at ease in designer's presence, and feeling incapable of understanding the intranet structure. But in this argumentative excerpt Franz fails in his agent role since he does not seem to evaluate the Hugh's trouble, and when Hugh shows some doubts, Franz reacts by keeping firm on his own assertion.

Furthermore, making use of a normative analysis shows both specific ways in which participant's talk is oriented to the role-related asymmetry and the consequences of such orientation for talk in interaction and for the product, object of the talk. Stressing normative rules violated during the interaction aims at underlining how Franz's role and

talk go away from pursuing institutionally desired and relevant goals. Therefore, within the framework of the pragma-dialectical approach, the issue at the *confrontation stage* (i.e., the graphical position of the *Template* link) immediately reveals problems of resolution yet in the *opening stage*, when the two speakers' standpoints clearly show a deficit in the common ground. In fact, during the *argumentation*, the designer considers as element of laziness what instead the user underlines to be his own habit. In addition, the designer refuses any reasonable argumentation about the possibility to find a new position to the link at issue. Therefore, strictly applying normative categories of the critical discussion, the not soundness of the talk seems to stem from the violation of the following:

- *relevance rule (4): a party may defend his standpoint only by advancing argumentation related to that standpoint.* Whereas, to defend his standpoint, Franz criticizes the issue of user's habit as considering it a form of laziness, and pressing Hugh to change his behaviour. No matter, instead, about considering as primary basis the issue of the link position. (*.. the problem is that you are used ... but once that you will get used to put it here*). Franz underlines the "no sense" of positioning the page link in other way, as if he were forced to make impossible things (*I cannot, that is it has not sense*); but he does not give any clear explanation about why it is not possible to change the link position. And thus, he falls in another violation:
- *validity rule (8): the reasoning in the argumentation must be logically valid or must be capable of being made valid by making explicit one or more unexpressed premise.* Whereas, Franz leaves his backing implicit: he seems to recall a sort of "expert's opinion", but without making explicit to Hugh design rules that suggest to locate areas, whose topic can be divided in sub-topics, on top menu; while single page on left menu. Further,
- *usage rule (10): parties must not use any formulations that are insufficiently clear or confusingly ambiguous, and they must interpret the formulations of the other party as carefully and accurately as possible.* Whereas, Franz both uses not clear formulation about his standpoint (see rule 4), and takes advantage of Hugh's inappropriate knowledge. In fact, Hugh makes a mistake when he says: [H: "but you have to insert it in a page"] , since, technically speaking, he does not distinguish between page and area; but Franz profits from Hugh's not clear ideas to reach the conclusion that as page it has to remain on left menu [F: "it is in a page, already]. In a certain sense Franz tries to manipulate Hugh's incomplete knowledge (in design field) to persuade him about his own reason. Therefore, Franz violates also
- *argumentation scheme rule (7): a standpoint may not be regarded as conclusively defended if the defence does not take place by means of an appropriate*

argumentation scheme that is correctly applied. On the other hand, Franz's argumentation scheme does not seem to be appropriate, since he makes use of accommodation⁵⁷ that turns out to be manipulative, preventing the addressee (Hugh) from having a healthy attitude towards decision responding to his very interest.

It is evident that in such an institutional context, the specific work practices and the relevant communicative interactions sketches not formal rules or pre-defined ways of communication; whereas, the observation of deeply situated interactions uncover individual peculiarities of communication. And especially during such institutional talk or professional meeting, it becomes quite difficult, if not impossible, to force individuals to follow normative schemes in order to have a sound dialogue. Still, borrowing Heritage's (2006) considerations on the physician-patient relationship setting, this normative analysis contributes to highlight how designer and user pursue distinct, and sometimes conflicting, agendas during their meeting: in fact while the designer's agenda focuses on technical evaluation, nearly exclusively affirming his status and authority in building the intranet interface; the user's "life-world" agenda concentrates on personal sensibilities, habits, and ways of work. Implementing the technical agenda, designers often suppress the users' concerns, even though they can be important resources for understanding usability issues. Therefore, according to the deontology of such institutional context, communicative conventions, as a sort of not-written communication rules, should be, in any case, taken into consideration to pursue institutional goals through sound argumentative interactions. For instance, attempting to be more reasonable than rational; whereas, in this case, against argumentation conventions, Franz seems to follow arguments stressing rational rather than reasonable issues, not considering the Hugh's perspective that tries to find a solution consistent with his site view. In a cultural perspective, the objective is that of moulding a sort of *community behavioural code*, in compliance with each social actor's identity, that, although not-written, can become observable and tangible in the work practices.

In this situation, at the end, I took part in the talk with the aim of acting as mediator in such little but revealing conflict. My intervention wanted to make Franz aware of the importance of the visibility issue, especially when it becomes functional to locate topics different from others already present on the intranet site view; further which do not appear in any other area or relative pages. In fact, in this case, the segmentation of the *Template* topic lacked, or better the topic in questions did not present any evident orientation clue or landmark to start its navigation. Therefore I tried to argue with Franz about creating a suitable solution for the user, and not only considering stiff design rules.

Shifting the weight of presumption back to the arguer, and pinpointing the critical weakness in the argument, Franz was persuaded about the Hugh's priority to easily find the *Template* link on top menu; whereas it would have been very little visible on left

⁵⁷ the process by which new presuppositions are introduced into the speakers' common ground

menu. At the end, the different of opinion was resolved reaching a joint conclusion: the designer retracted his standpoint at issue, and according to the user's model, he moves the link from left sub-menu to top menu bar, considering *Template* an area with one page only (Figure 7.7).

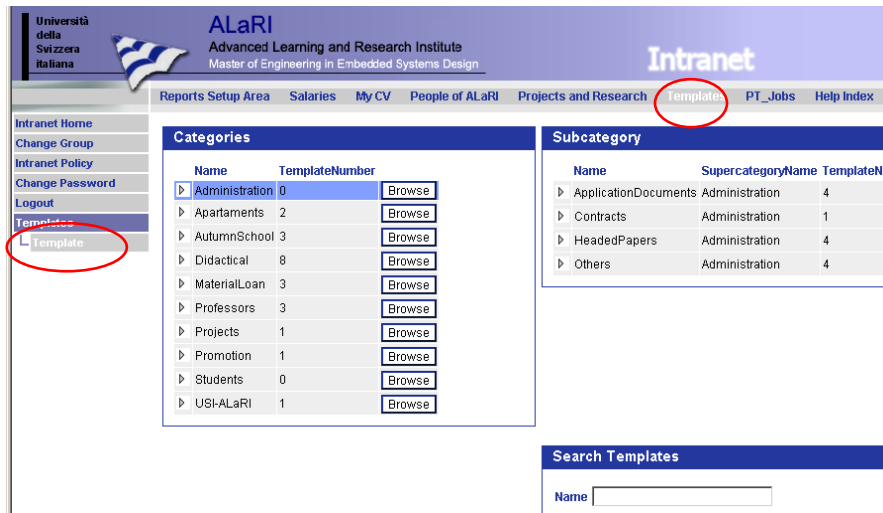


Figure 7.7: Template area in administrative staff view

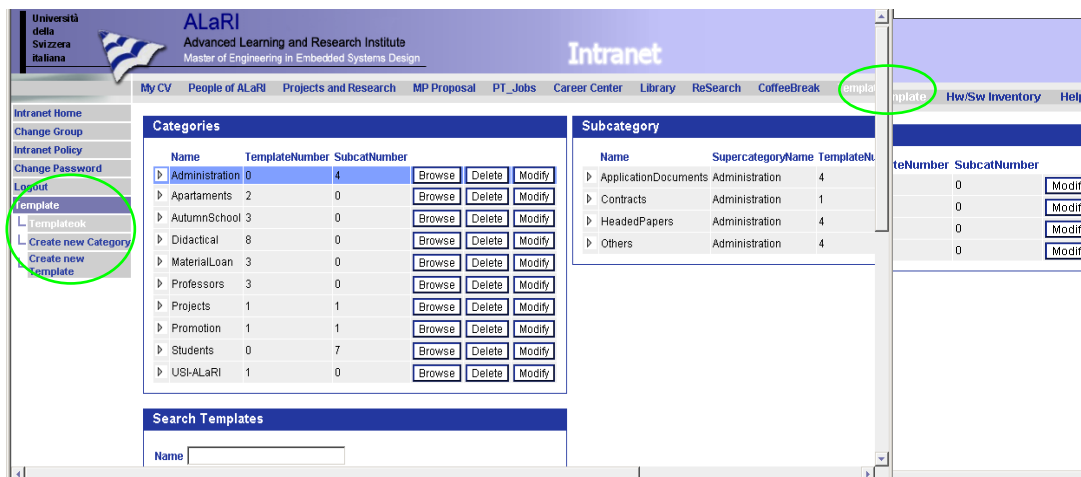


Figure 7.7bis: Template area in ALaRI staff view

7.3.3. Interactions between designer and manager of the intranet

The following excerpts come from institutional interactions that took place within physical meetings and reflect quite well procedures and ways of interaction around the intranet development in this institutional context, thus adding elements of analysis both “reliable” and “valid” in terms of normal social science.

Although the following talk are clearly institutional in that official task-based and role-based activities occur, neither turn-taking procedures nor other aspects of the talk exhibit qualities of formality and uniformity which are, instead, peculiar to other formal institutional settings (such as courtroom or classroom where turn-taking systems are strongly constrained within sharply defined procedures). In fact, in ALaRI, mainly non-formal forms of institutional interactions occur that may approximate conversational modes, involving all the institutional speakers and taking place in a private working context. Accordingly, non-formal institutional interactions present different characteristics of analysis from formal talk, as well as participants' orientation to the institutional task or role of their talk is located in complex non-recursive interactions that may vary in their form and frequency (Drew & Heritage, 1992). The analysis of the following excerpts exhibit features of situated actions and social relations that are characteristic of this particular setting. The sequence organization in opening and closing of meetings, the ways in which information is requested, delivered, and received (information seeking), as well as the procedures of negotiation and deliberation take part in shaping and building interactions whose effects are visible on the working practices and their outcomes (e.g., the technology development and use).

The first excerpt is from a meeting that took place in ALaRI office in October 2005. Here program manager (Paul) and second designer (Dante) met together for about forty minutes in order to speak about several matters. The first issue of the talk (not here reported) is about dissemination activity for an ongoing research project where ALaRI is involved as scientific partner. Then, Dante *ex abrupto* introduces the matter about the ALaRI intranet. In particular, Dante tackles the implementation of the *course* area according to the lecturers' view with the goal of defining services to be provided and of involving Faculty's members in using this area.

excerpt 3

D: Did you think about the lecturers' intranet view? [P: no] the course area?

D: Who is in charge of it? What have we do, how do we do it?

P: well then, course area, which information do you need?

D: you said that lecturers had to use the course area, at least to assign mark

P: right

D: if they do not want to upload documents and prefer to give them to a student, this is already considered [P: yes] therefore they can also avoid using the uploading – but at least the marks task – where they can enter and select marks. At the moment, it is possible to assign just a mark one at a time for each student, but I'm managing that in case a group of students may have the same

mark ... it's about selecting the students choose the mark and press "ok"

P: what do you want, a letter?

D: you said that you had to prepare a sort of contract, once the contract is accepted they had [P: ahh, yes, yes] to use this thing and therefore you wanted to write them an email to inform that from this year there is also this new functionality

P: ah, yes, yes ..now ..when .. is the tool ready?

D: yes, lets say at sixt., at eighty per cent, only lack the adv messages such as if you want to do this you can do in this way, but it is intuitive enough

P: now I think of it this night, because now I have not time, I cannot, tomorrow there is the *Scientific Director*, so you can give the matter ...

D: I show it to the *Scientific Director*

P: You show it to him

D: all right

P: I need also documents, expenses refund and such things that can be downloaded from here

D: that is not a problem

P: policy, marks (.)

D: but you have to provide me with such documents (.)

P: there are already, the Leandro's ones

D: ok, all right, so I can include them among the material to download

P: and then I thought of the policy for lecturers, the Alberto's policy.

D: which is?

P: the one which they have to give you the tool 15 days before and 15 days after – to tell us if we have to remove a tool (.)

D: no, but the documents to download (.) however the policy section is on the intranet (*general part*), the tool goes on the intranet [P: ok - well, since] on course area they have to assign marks, to add slides -

P: but can you create a page for them on there? For all the lecturers, an introduction "*Dear fellow, as ALaRi lecturer you can*" – well policy for the tools [D: yes, yes] and you can download it, because who teaches and goes on course area [D: all right] he looks here, he does not look on another intranet section (0.3) he never clicks two times -

D: yes, ok, well I do also this: policy for tools, documents to download -

P: basically they have [D: I put it also here]: fee to agree on by a contract, [D: yes, but you have to write me these things] yes, yes, agreed (*and Paul is writing....*) [D: ok]: then expenses refund form – this is the administrative section -, then the schedule is ready, then they have to give me [D: the schedule is also within the course area] – perfect -: reference books, textbooks, other material (.), paper -

D: yes, ok, but they can directly add all these documents

P: it is exactly what they have to upload

D: ah, the syllabus

P: then, well, syllabus (0.3) [D: exact], slides, marks ...

(*then the discussion slides along the mark system*)

[Italian recorded version]

D: hai preparato la parte per i docenti della intranet? [P: no] la parte corsi?

D: a chi la facciamo fare? cosa dobbiamo fare, come la dobbiamo fare?

P: allora, parte corsi, che informazioni ti servono da buttare su?

D: tu, quella parte che dicevi che i docenti dovevano usare la piattaforma corsi, quanto meno per mettere i voti

P: esatto

D: se non vogliono fare *upload* dei documenti e vogliono darli a uno studente, questo è già stato previsto [P: sì] quindi possono anche evitare di usarla – però almeno la parte voti - dove loro si collegano e selezionano i voti -

al momento si deve aggiungere un voto singolarmente per ogni studente, ma già sto facendo che magari visto che ci può essere un gruppo di studenti con lo stesso voto .. si tratta di selezionare gli studenti prendere il voto e premere “ok”

P: cosa vuoi una lettera?

D: tu dicevi che dovevi fargli una specie di contratto, quando accettavano il contratto dovevano [P: ah, sí, sí] utilizzare questa cosa e quindi volevi scrivergli anche via email avvisarli che da quest’anno c’era anche questo nuovo strumento ...

P: ah, sí, sí ..adesso ..quando .. lo strumento è pronto?

D: sí, diciamo al sess., all'ottanta per cento, mancano i messaggi pubblicità del tipo se vuoi fare questo puoi fare così, ma è abbastanza intuitivo ...

P: adesso ci penso su stanotte, perché adesso non ce la faccio, domani c'è *Direttore Scientifico*, così gli dai la pratica ...

D: glielo faccio vedere al *Direttore Scientifico*

P: glielo fai vedere

D: va bene

P: mi servono anche i documenti, rimborsi spese e cose simili scaricabili da lì

D: quello non è un problema

P: policy, voti ...

D: però me li devi dare, ...

P: già ci sono, quelli di Leandro

D: ok, va bene, così li metto nel materiale scaricabile

P: e poi pensavo la policy docenti la policy di Alberto

D: qual è?

P: quella che devono darti il tool 15 giorni prima e 15 giorni dopo ..., se dobbiamo togliere un tool di dircelo ...

D: no, ma i documenti scaricabili ... però la parte policy va sulla intranet, il tool va sulla intranet (parte generale) [P: ok, .. allora, si come..] sui corsi devono mettere i voti, aggiungere le slide ...

P: ma ci puoi mettere una pagina per loro lì sopra? Per tutti i docenti, un'introduzione "*Caro Tizio, come docente di ALaRI puoi ..*" allora policy per tool [D: sì, sì] e la scarichi, perché uno va a fare il corso [D: va bene] e guarda lì, non è che va a vedere sulla intranet (da un'altra parte) ...non fa mai due click

D: sí, ok, allora faccio anche questo: policy per i tool, documenti scaricabili

P: fondamentale loro hanno [D: lo replico anche qua]: onorario concordato con contratto, [D: sì, ma questo me lo devi scrivere] - P: sì, sì, d'accordo [D: ok] poi modulo rimborso spese - questa è la parte amministrativa -, poi lo schedule è già a posto, poi devono darmi [D: lo schedule è anche interno all'area corsi / P: perfetto] libri di riferimento, libri di testo, altro materiale., paper ...

D: si va bé, ma questi sono tutti documenti che possono aggiungere

P: è quello che devono mettere

D: ah, il programma del corso

P: ..poi, allora, il programma, syllabus ..[D: esatto], slide, voti ...

The following analysis wants to shed light on specific aspects of this excerpt that characterize social relations, organization, and cultural approaches of this institutional setting and its actors, and namely:

- non-formal interactions with a very conversational language, sometimes conveying English words from the technical professional field in Italian talk;
- very frequent shifting of type of dialogue along with shifting of roles and work positions;
- overlapping different elements and contents of discussion that can entail not only derailments of argumentation but also negative effects on working practices, compromising the intranet development;
- the lack of a strategic vision for the intranet development and adoption (what is evident from the way the intranet issue is formulated and tackled);

All the talk is characterized by a conversational language that often refers to tacit and implicit knowledge and discloses interactional common background among the institutional participants.

The talk about the intranet does not present any formal opening stage at the beginning. Dante introduces *ex abrupto* the matter at issue through direct questions that seem exchange roles between he (the designer) and Paul (the ALaRI program manager who, in turn, should also manage the intranet project). In fact, at first, Dante wants to check if Paul thought about the intranet implementation for the lecturers. Then, Paul takes on his role again and answers Dante with another question, asking what *course* area should consist of and which information Dante needs to implement. Although question-answer sequences are not at all formally organized here, they are often a dominant form within which interaction proceeds. Particularly, such sequences organization aims both at bridging the gap of knowledge *asymmetries* (Heritage, 1997), refreshing the current state-of-the-art of the intranet, and at deliberating how going on with the development. But such information seeking is quite confusing for two main reasons (moreover, it underlines distinctive features of such non-formal interaction). At first, there are significant shifting of roles and work positions among the participants, as when Dante refreshes the current intranet state-of-the-art and suggests what is necessary to do for the course area. Then, different goals mix together: one addressed to define what is necessary to implement on the *course* area, and the other addressed to manage how, in which way and when, lecturers should be aware of using the intranet *course* area. But, in such a way, also distinct types of argumentation overlap.

The overlapping seems to be a characteristic of this talk that still reserves peculiar elements of observation. In fact, when one speaker interrupts the other, it is because of two specific reasons. The first shows a mutual way to confirm awareness or agreement with what one person is saying. The second reveals a shared form of collaboration often adding and summing up information to review and define together what and in which

ways is necessary to go on (such as during the discussion about the data for the lecturers' *course* view). Whereas, within the normative analysis, this is quite strange because, usually, the "interruption" represents a violation of joint management processes. Notwithstanding, in this case, such a violation becomes for the participants the fair product of locally managed and situated interactions.

As hinted above, frequent dialectical shifts from one type of dialogue to another (e.g., from information seeking, to negotiation, and then to deliberation) can bring to argumentative derailments that prevent from reaching specific goals of the dialogue. Possible negative or illicit shifts, although unintentional, can be associated with fallacies and represent a deterioration of the dialogue. In this excerpt, participants start exchanging information but nobody answers the questions the other asks. Dante asks what is necessary implement and how. Paul does not answer but asks which information is needed. Then Dante illustrates two main functionalities he is implementing: the document uploading and the mark assignment. At the end Paul puts a question quite doubtful for the observer (i.e., "P: What do you need, a l e t t e r ?"), while Dante replies with a resolute answer dealing with the procedures to let the Faculty aware about the use of the service. In turn, Paul asks if the service is ready, and then postpones the issue (but which issue: about procedures to inform lecturers or about checking the implemented functionalities?!) later on tonight. The talk goes on summing up which documents are necessary for the lecturers' view, until participants open a negotiation about the policy for the lecturers. At first, Dante does not exactly understand which the policy at issue is, and he insists on maintaining that the *course* area has to be devoted only to specific services, while the other documents have to be uploaded in another area. Paul tries to explain why lecturers need these documents in *course* area, and at the end Dante agrees but underlines that is necessary to send him an email with all such information (request that seems to involve another shift of role). At last, Dante seems to mean that the document uploading activity is due to the lecturers (i.e., "D: yes, ok, but t h e s e a r e a l l d o c u m e n t s t h a t t h e y c a n u p l o a d") and thus he thinks about it is their duty, while Paul's answer seems to underline the necessity to check and control exactly the document uploading activity (i.e., "P: i t i s e x a c t l y w h a t t h e y h a v e t o d o").

Later on, the discussion does not present a real closing stage, while it simply fades, shifting the attention towards details concerning the system of marks⁵⁸. At the end, the participants do not come to a decision pinpointing how the lecturers' site view should be presented: they collect some information and agree in very general terms about what the area should include, but not in which way data and contents should be organized and presented. Moreover, the two speakers do not discuss anymore about how Faculty's

⁵⁸ They end speaking about range and granularity of the marks system: for instance at the beginning the range was from 1 (worst mark) to 5 (best mark) with 0.25 of granularity, then the system adopted based on range between 1 and 10 with 0.5 of granularity.

members should be informed to use the provided services. In this perspective, referring to strictly normative categories, the talk violates the *argumentation scheme rule* (rule 7: *a standpoint may not be regarded as conclusively defended if the defence does not take place by means of an appropriate argumentation scheme that is correctly applied*) of the critical discussion in the pragma-dialectical approach. In fact, due to continuous shifting, participants do not conclude the standpoints at issue, and thus lose – and postpone to undefined date – important goals of the talk.

With respect to social and cultural aspects, the excerpt well highlights how the intranet system is not considered a strategic instrument for the management of the ALaRI activity. In fact, any plan of designing has not been defined carefully organizing what and how the comprehensive structure should provide. The assessment of what has been already implemented is postponed to “night thoughts” (“P: ... now I cannot, I will think about it this night ...”), letting to the Scientific Director a general supervision (“P: ... tomorrow there will be the Director so you can show him the matter ...”). Further, problems of designing and promotion of the *course* area overlap, mixing up on the one hand services to be provided and tasks that lecturers should perform, and on the other hand procedures of adoption to become it effective. In particular, a communication strategy is missing, while the promotion of the system is once again entrusted to the program manager, along with all the other ALaRI activities.

A final remark concerns usability issues which are clearly underestimated. According to the designer’s perspective, the lecturers’ intranet application is intuitive in any case, even if specific messages lack to explain objective and use of the services. The designer is persuaded that it is easy to understand and further explications are useless. Such a conviction leads to underestimating the procedures of adoption of a new technology, and, in some way, to overestimating the end user, thinking that the user is completely available to understand and use the provided services without any constraint. Moreover, Dante takes for granted that policies already present on the platform are read by the users, while Paul stresses on the necessity to point out the lecturers’ policy directly on the *course* area and make it as clear as possible to explain the provided services.

As a consequence, such approach will affect both the implementation of the functionalities along with the usability of the services and the adoption on behalf of the Faculty’s members. As proof of the fact, the following excerpt, recorded during a talk one year and half later (in February 2007), offers a sample of problems tackled on the course area developed for lecturers. Project manager (Paul) and assistant designer (Franz) meet together to define which macro-areas can be of interest. The basic problem is that pages and data are online, but are not used. Why does it happen? Further, at a certain point, Paul considers another matter, shifting the standpoint towards collecting *course* information on a new tool, the wiki platform. Nevertheless, in this way, he does not tackle the problem of structuring and organizing contents and functionalities already

present on the *course* area, but he shifts the attention introducing another element of discussion: the wiki platform, where information about all courses are listed and can be added.

At the end, the talk does not come to a real conclusion: Paul asks Franz for reviewing the *course* area, reorganizing the contents, layout of the pages, and checking if functionalities are running. The outcomes will be then presented to Paul and evaluated. And all finishes in a rush: “P: now I have to rush off”.

excerpt 4

P: definition of the macro-areas of interest – How the course is scheduled – [F: What? Do you mean that we have to re-design it?], not at all, the problem is: there are the pages, there are the data, but the problem is that the course access page must be clear, otherwise they do not enter. the material is already present, just they do not find it ..

..... (omitted)

P: as it is, they do not use it ... too many square boxes on a page

F: there are 4 different units, 5 with the filter

..... (omitted)

P: there is a lot of work to do

P: now on the wiki we are collecting information (0.5) for all courses

F: *Personal area* is useless for the lecturers since there are only administrative document – instead of the *quick link* you can insert here administrative document to download administrative document. You have 2/3 areas ...

P: lecturers' home page must be: access, how your course is scheduled, available resources, tool area, etc., general policy, ... On the contrary, I enter here and there is a terrible mess

..... (omitted)

P: the layout is stiff and heavy

F: we can arrange it in some way

..... (omitted)

P: now I have to rush off -

[Italian recorded version]

P: definizione delle macro aree che interessano – com'è organizzato il corso – [F: cos'è, dobbiamo rifarlo da capo?], noo, il problema è: le pagine ci sono, i dati ci sono, il problema è che la pagina

- con cui entrano deve essere chiara, se no non entrano
 la roba c'è, solo che non la trovano ..
 (omitted)
- P: così com'è non la usano(0.3) troppi riquadri in una pagina
- F: ci sono 4 *unit* diverse, 5 con il filtro
 (omitted) ...
- P: c'è un sacco di lavoro da fare
- P: adesso sul wiki stiamo raccogliendo le info (0.5) per tutti i corsi
- F: il *Personal area* per i prof è inutile perché sono solo *administrative document* – al posto del *quick link* ci metti qua *administrative document* per scaricare *administrative document*. Hai 2 / 3 aree ...
- P: la *home page* dei prof deve essere: entri, come è organizzato il tuo corso, risorse disponibili, un'area *tool*, etc., general *policy*, Viceversa, apro qui e c'è un casino tremendo
 (omitted)
- P: il *layout* è pesante
- F: qualcosa al *layout* si può fare
 (omitted)
- P: adesso devo scappare

One year and half later, the *course* area does not run, or better it is not yet used by lecturers. Why? What is the problem? The excerpt 3 discovered some difficulties in organizing and structuring data and contents during the talk. Now the same problem arises again in excerpt 4 but involving more complications since the way in which the *course* area has been developed proved to be very few clear and intuitive. Data and pages are online but nobody accesses. Paul and Franz realize that there are problems of interface design, such as cognitive difficulties in reading and finding specific data and the present layout does not make easier to understand what the area offers. Therefore, they want to re-think architecture and presentation of the displayed information, since what is implemented is not organized and structured according to a comprehensive view of the course area, thus discouraging from using it. Still, another (recurrent) problem deals with involving lecturers in accessing the course area: they do not use intranet functionalities also because suitable promotion of the new work practices was lacking. Finally, from the argumentation point of view, participants consider various elements of the system that do not run (e.g., *course* contents, layout, *Personal area*, *homepage*, etc.) but none of these is tackled or situated within a concrete framework of collaborative talk to find solution or to evaluate alternative processes of work. Whereas, shifting the

attention on another tool supporting the collection of course information does not help to define contents and links that must be organized on this intranet area.

In most cases, such talks reveal how intranet difficulties (basically suffering lack of human resources and time) mirror organizational, cultural and social problems that affect the whole institutional setting.

In my opinion, the analysis of the argumentative excerpts underlines interesting and quite original aspects.

One aspect regards the interaction among “peers”. In the first case, the two young designers understand each other, getting on very well together. They are able to tackle and to resolve possible doubts or incomprehension with quite easiness. Mainly, this is because of sharing very common cultural and educational background, the same age, and working everyday closely. Nevertheless, in this case, the strict collaboration among peers does not include any hint about testing the final solution with a sample of users in order to check usability issues. Designers simply take for granted that what will be implemented, it will also be used. Therefore, once again, this approach confirms the prevailing designer vision on the user’s one.

A second aspect considers two connected problems: the status of asymmetry of knowledge and the respect of the agency relation. The second excerpt between the two staff members, one as designer and the other as user, shows both specific ways in which participant’s talk is oriented to role-related asymmetries, and the consequences of such orientations for talk in interaction. In fact, when asymmetry of knowledge leads to unequal involvement of participants, it can happen that the prevailing speaker may forget the role s/he covers and her/his principal goal, not only disregarding to develop a sound argumentation, but also compromising the primary purpose of the institutional interaction: in this case, the best interface representation for the best use of the platform.

A third aspect underlines how the ways in which the institutional interactions take shape directly affect the relevant working practices and their outcomes. The excerpts 3 and 4 clearly illustrate as the intranet is not considered a priority and its strategic role is quite underestimated. Further, the fact of not having a strategic vision of the system arises also from the lack of a comprehensive plan of the intranet development. In fact, participants during the meeting concentrate on single details that usually remove from tackling in a comprehensive way the intranet project.

All these aspects of the talk have taken part in shaping and building specific situated actions and working practices in the institutional context, as well as it was observed and analysed in these chapters. Thus, the value of the communicative analysis, as applied in a context for developing technology, consists of providing further elements to understand root causes about problems of development and use.

8. Discussion on the final results

The principal goal of the research was to detect through a “root cause analysis⁵⁹” (Pezzè & Young, 2008) which difficulties during the intranet project have affected procedures of use, especially depending on social, cultural and organizational in-work details. The research based on investigating the life cycle of the technology: from the beginning phase of feasibility study until the phases of delivery and maintenance. Particular emphasis was on the reciprocal dependences and on the correlation factors between the developed technology and the institutional context of adoption, taking into account both complex and dynamic working practices, and specific situated interactions among the social actors of the community. Thus, it made possible, at first, to locate some peculiar causes, and then to suggest countermeasures with the double purpose of improving the current intranet system and of preventing similar errors in similar future projects. The benefits stemming from the research and directly involving the ALaRI intranet concern:

- at social level:
 - making the social actors aware of which specific problems hindered from totally exploiting the intranet functionalities;
- at technical level:
 - improving the usability aspects;
- at organizational level:
 - suggesting a management plan with particular attention to the quality process, allocating suitable human resources according to specific responsibilities (i.e., recognizing roles and tasks) to make the intranet a strategic tool for the whole community;
- at communicative and cultural level:
 - stressing the communication aspects according to a pragmatic dimension, affecting both the sphere of development and promotion of the technology.

8.1. Impact of the research

The main impact of the research on the intranet system consists of shifting the attention towards those human, social, and organizational aspects affecting the life cycle of the technology, starting from the analysis of the macro-structure of the activity. Through the ethnographic approach, it was possible to disclose those local meanings that

⁵⁹ The reasons the fault was not detected and eliminated earlier – process known as “root cause analysis”, suggesting and finding adequate countermeasures.

shape the working activity and in turn those communicative practices particularly concerning the management of the ALaRI intranet project. The study of the social practices addresses activities in their historical and cultural dimensions and captures the creation of individual and collective meanings. Therefore, the identification of practices is valuable also for the research community, because it provides self-awareness and points of view which may open new ways of conceiving and doing things.

On the researcher's side, the study of specific working practices has required accounting for both the macro and the micro structure of the activities in their social context (and, in this sense, studies that empirically survey practices within a community are not easy to find).

The study bases on several theories among which Activity Theory is the kernel one. Such theoretical framework gave me the opportunity to grasp the contradictions of the social system and to investigate the root causes of the poor use of the intranet platform. In particular, the analysis revealed two important factors: on the one hand it emphasized communicative aspects as core problem that may require specific interventions oriented both to communicative practices and to cultural and behavioural models; on the other hand communicative practices around the intranet project felt the effects of the lack of a social and strategic concept of the intranet, and thus possible interventions may be oriented to the social context and to the organization of work inside it. In this sense, the identification of the main contradictions within the ALaRI workplace constituted the principal impact of my research. Further, this may help the ALaRI community to be aware of the interventions to carry on enhancing the intranet use.

Adapting Activity Theory scheme to the case study (Figure 8.1), it is possible to analyse the main contradictions of the working place as regards the intranet system. There are two objects of activity: one concerns the development of the intranet, while the other is about its use to support remote cooperation and management of new workflows. The desired outcome is a technology able to satisfy the community's needs with effectiveness and efficiency. The subject's point of view includes on the one hand persons involved in the technology building and on the other hand the potential users; while the community represents all the social actors of the ALaRI institute. The instruments at disposal consist of all resources, physical – such as technical support (e.g. tutorial, guidelines, help manual, etc.) – and conceptual – such as time constraints and human efforts – that are necessary both to develop and to learn (and use) the platform features. Then, the rules consist of those cultural norms and policies that address the working practices. Finally, the division of labour defines tasks, responsibilities and the actors' social roles within the community (Figure 8.1).

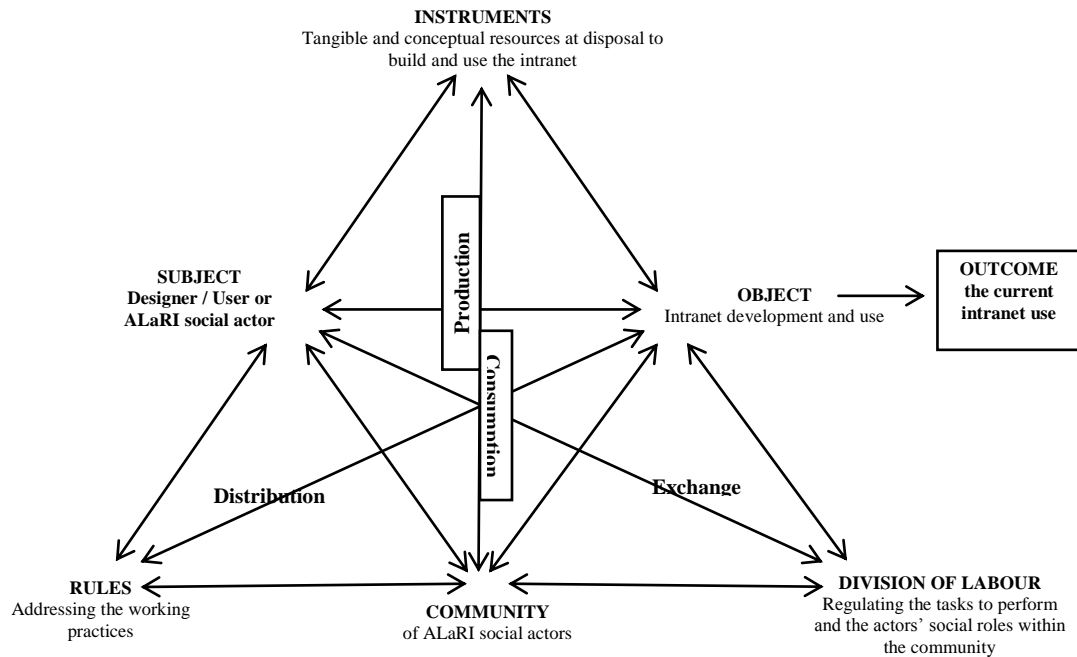


Figure 8.1. Activity Theory scheme adapted to the case study.

Within this scheme, some contradictions stand out both internally each component (corner) and among central components (the corners). In this way, current rules, instruments, division of labour, subjects' activity, and the constitution of the community itself make particularly difficult mediating both the development and the use of the intranet system. For instance, the ALaRI community consists of very different members characterized by high mobility. Some (Faculty, Scientific Committee or Industrial Collaborators) are geographically dispersed and stay at ALaRI for very few time a year; further quite all belong also to other institutions or organizations. Other members (students) are present every day but just for one or two years; while very few persons (staff members) are at the institute until five or six years. Moreover, all they face the problem to shift quickly from an activity to another (e.g., PhD students engage in following research projects, administrative issues for ALaRI, and their research studies; lecturers are required to comply with new policies and work procedures, meeting different students every year for very few time). In such situation, some of them are required to learn peculiar technologies to develop the system; and others to learn new practices of work using new functionalities and interfaces. As a consequence, the need of changing habits and getting used to new workflows can inevitably meet resistances.

Further, time and resources (tutorials and customized documentations) to learn and access the intranet seem to be poor and not clear enough. In addition, the division of labour does not encourage the actors both in developing the intranet and in using it. Reasons can be found in not considering different elements, including a governance plan which can support the intranet management and making the actors aware of the strategic role the intranet should play for the community, and explicit and clear rules which can govern maintenance and use of the platform. Within this perspective, careful and customized communications are not only necessary but cover social and organizational importance for the intranet adoption.

Just such tensions and contradictions represent the starting point to modify internally the status of the activity system, acting as driving forces in the construction of a new object or practice (Seale, 2007). In particular, the introduction and the adoption of the intranet system require the community a not little effort towards new stages of development, evolving methods and working practices. In turn, new practices can rise only through the community's understanding about the reasons that led to building the intranet, socially sharing new forms of meanings. In this sense, belonging to the community consists of negotiating the definition of the own experience as engagement into the intranet recognized as social practice.

As a consequence, the status of change entails opening to new learning processes through which it is possible to evaluate also the level of development of the community itself (Wenger, 1998). In ALaRI, the working environment offers various opportunities to acquire expertise at individual and team level. In my opinion, what is missing concerns the ability to get a comprehensive awareness of the intranet as community social practice. It requires integrating fragments of mutual engagement, joint enterprise and shared repertoire already present in the community but not yet fully merged at a higher common level. Such level of awareness would allow the community to deal with a dynamic repertoire that can be modified and increased, developing the own heritage of expertise, according to processes of mutual constitution (individual and collective).

8.2 Key contributions

The research contribution mainly bases on making use of heterogeneous but intertwining disciplines which, on the one hand, underline the complexity of the problem that can be tackled from various perspectives; and, on the other hand, try to define together an interdisciplinary approach to tackle the investigation of such a composite issue. Innovative elements of the research concern (i) the methodology, (ii) the empirical approach, and (iii) some conceptual and (iv) theoretical issues.

In the specific, at methodological level (i), great emphasis was on three peculiar aspects, tightly intertwined, that include the institutional context, the analysis of communicative interactions, and the ethnographic approach. The workplace is seen not

as generic environment within which formal and recurrent work practices *take place*, but rather as the institutional context, socially and culturally shaped, within which specific interactions *take shape*. Therefore, considering the social actors' professional behaviour, ontology and deontology of the institutional context should contribute to mould their working practices, with special regard to communication goals. In this sense, the analysis of peculiar communicative interactions presents the double purpose of identifying the communicative circuit at the basis of the life cycle of the technology; and of addressing more attention towards the definition of those behavioural models that can promote and enhance sound conversations during institutional interactions (Have, 2007). The study of communicative and argumentative dynamics contributes to grasp different conceptual models that reveal the way the various social actors consider and play their roles within the community. In particular, the communication analysis becomes both mediating artefact through which investigate social processes observing ongoing and situated interactions (and thus avoiding formal descriptions far from daily life), and object of research with the aim of highlighting how critical issues in human-technology relationships are often symptomatic of communicative problems in human-human relationships. Finally, the ethnographic approach discloses social actors' background orientations, individual experiences, roles and objectives in the institutional context of study. It allows exploring complex relationships between technical and cultural aspects, making use of the same interpretative categories of the social actors. The analysis of the data collected bases on qualitative-interpretative approaches, defining "border zones" of observation and selecting documents and materials relevant to the research inquiry around the life-cycle of the technology. Further, the constant interaction with the different social actors allowed reinforcing understandings, interweaving feelings of trust and approval, as well as deeply grasping communicative and working practices (both tacit and explicit).

At empirical level (ii), the research consisted in observing social interactions through real practice perspective as well as studying various phases of the life-cycle of the intranet (from its design to its adoption and use) over more than three years. Moreover, my role within the institutional context gave me the opportunity to take active part in the working practices, exercising a critical observation, and contributing to suggest recommendations for improving the intranet.

At conceptual level (iii), some considerations come from evaluating through inspection and interviews which difficulties of use and why affected the intranet project. In particular, the accent is on social and cultural aspects of development and use, rather than on technological elements. As a matter of fact, difficulties discovered analysing the intranet reflect contradictions internal to the community itself: continuous requests of managing very rapid and unexpected changes into the institutional practices made it hard also to manage the intranet project. The need of matching institutional requirements with continuous changes on the platform made it difficult to keep comprehensive coherence

and integrity over the time on the system, although the intranet was thought to serve new and changeable institutional requirements. Considering the introduction of a quality process can help to plan improvements and to assess changes whereas really necessary. In my opinion, quality factors in the intranet management include reinforcing and monitoring the communicative circuit among the various actors involved in the life-cycle of the technology; appraising valid and sound interactions with respect to profitable behavioural attitudes; and collecting users' feedback both to promote the intranet use and to accurately evaluate the achieved results. Taking into account these factors involves all the ALaRI members, making them aware of being real social actors on whom the intranet success depends. Therefore, defining a formal coordination of the quality process would suggest that there should recognize a "quality agent" acting as a sort of mediator between end users and technicians (designer and/or developer), with the goal of making the intranet an efficient and effective virtual workplace, stressing the actors to share experiences, know-how, and concrete outputs.

At theoretical level (iv), the original approach blending complementary theories aims at gathering a comprehensive view on those not-technical but nevertheless complex problems that can affect the technology dimension, especially when created to support virtual networks for remote human interactions. Each part of the theoretical framework sheds light on specific aspects of the tackled problems. In particular, Activity Theory constitutes the kernel around which the other theories integrate some important contributes. Activity Theory embraces the whole activity system within which the technology is first developed and then used, focusing on the context of human relations, roles, and rules that govern its building and use. In particular, the analysis underlines how it is possible to understand the social meaning of the technology only with respect to who conceive and develop it, and who use it. Then, Situated Action highlights the importance of studying the actors' actual situated activity and their local working practices, in order to understand what can go wrong when they work on and through the intranet platform. Consequently, the study of Situated Action would suggest that designing interactive machines should start from considering not only the users' specific tasks, but especially observing how they accomplish their work practices, through which procedures, making use of their same categories of interpretations. In this sense, the design should consider to

"extend... the access of the machine to the actions and circumstances of the user; .. to make clear to the user the limits on the machine's access to those basic interactional resources; .. to find way of compensating for the machine's lack of access to the user's situation with computationally available alternatives" (Suchman, 1987:181).

The theoretic perspective of Distributed Cognition stresses the investigation on how, and at which level, distributed units are *coordinated*, by analyzing the interactions between single actors, the material environment, instruments and technologies. While, Communities of Practice emphasizes which conceptual elements contribute to shape and

to share the community of practice. In particular, participating in a community is analysed both from the individual point of view and from the collective one. Growth and development of individual identities go with the feeling of belonging to the community on which reciprocal (professional and cultural) enrichment depends. The individual identity, then, melts into the community sphere through the dimensions of mutual engagement, joint enterprise, and shared repertoire. The level at which such dimensions are experienced by the social actors shows the level of development and evolution of such community. Finally, within the frame of Argumentative Theory, the communicative dimension acquires an own importance within the life cycle of the technology. The analysis discovers both a communicative circuit too technical and self-referenced, and, in parallel, the lack of opening and involvement of end users. Further, focusing on specific argumentative interactions brings attention to how some procedures of talk at work developed, pointing out elements of validity and soundness with respect to both the field to which questions at issue belong and the target audience. Discovering possible fallacies or misunderstandings, and understanding which reasons might be cause of derailment, can help to appraise which behaviour patterns, attitudes, or circumstances may compromise the resolution of a problem and the achievement of a common agreement. As Have notes (2007:174), conversation analysis-inspired studies address efforts to make social life “better” in some way, providing suggestions for, or critiques of, the ways in which social life can be organized. In this sense, my study invites technicians and experts involved in the intranet building to reflect on some communicative procedures as well as on behavioural attitudes in order to adopt approaches more end users-centred, recognizing the intranet as strategic tool for the whole community.

The configuration of a quality improvement program is strongly characterized by the identification of human, social, and organizational errors that may cause faults and weakness during the project development and that often remain undetected (Pezzè & Young, 2008). Further, it may suggest new paths for developing innovative interaction studies, taking together the process analysis (including procedures of development, use, and maintenance of the technology) and the microanalysis of interactions, including communication, with the aim of addressing issues of content, context, and meaning that underline aspects of interactivity – the capacity for one part to influence the behaviour of another, or to adjust behaviour in response to another (Heritage, 2006).

Within this perspective, the research aims at questioning about the root causes that hindered from totally exploiting the intranet features, whereas, usually, it is easier to describe the reasons of success rather than thoroughly investigating which elements might have compromised the expected results. At strategic level, underestimating the intranet project has led to failing the creation of value both for the intranet development team and the end users. Therefore, disregarding one part or the other, or determining significant imbalance between the two parts entails a failure, while there should achieve a balance into pursuing value both for the intranet team and the intranet users. A well-

balanced approach requires awareness of which elements of strength and which elements of weakness are within the community; while any suggested recommendation of change should come with recommendation for measuring the impact of change. The construction of a coherent plan that can be monitored, comparing the progress against the plan, steers to reach an adequate level of functionality and quality according to the required level of dependability to release the product (Figure 8.2).

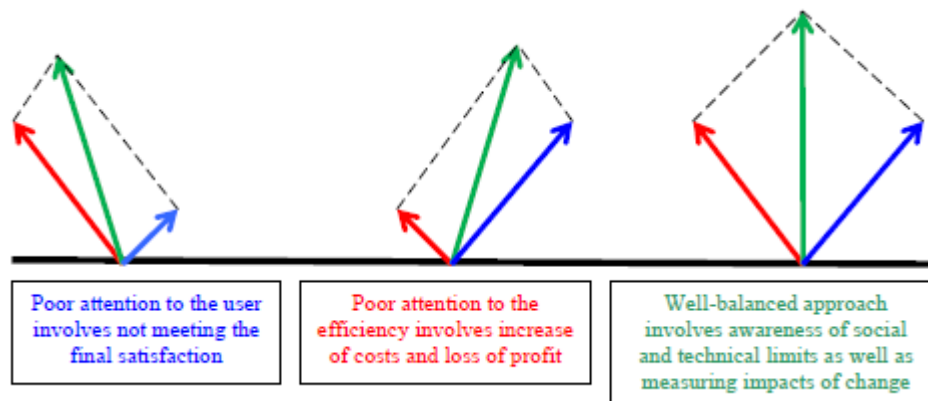


Figure 8.2: The success is achieved through the balance of two seemingly divergent values: profit for the intranet team and satisfaction for the users.

On the contrary, the research shows how disregarding cultural and organizational aspects of the technology with respect to the working context can bring the potential users to ignore technological services at disposal. Theoretical and methodological approaches here employed try to grasp the complex relationship between social and technical issues through an ethnographic perspective that presents empirical outcomes from the study of working practices around development and use of a peculiar technology in a specific institutional setting. In particular, observed interactions disclose how the intranet common meaning is missing among the heterogeneous actors. The professional vision of the technology cannot reside in individual experiences but it requires joint enterprise through confrontation stages that make the project visible and understandable to the whole community. In this sense the design of the technology acquires a social role, involving mutual engagement among different actors, and developing relationship with corresponding working practices.

8.3. Research outlooks

Besides the difficulties of development and adoption of the intranet, the research considers also problems stemming from the remote work. In fact, managing workflows on virtual and shared workspaces requires not only an efficient technology but also developing and maturing the culture of the remote cooperation. Therefore, once provided a suitable system, future outlooks of research may investigate which the most common

resistances are to remote work and in which ways the working context can foster its social actors to overcome them. To support such analysis, once again, the conceptual framework of Activity Theory can help to outline the reference model from which consider the basic components constituting the remote activity system. Figure 8.3 reproduces the model of analysis to better understand how explicit and implicit norms, instruments at disposal and organization of work on virtual platform can affect the actor's remote activity. Some questions arise as, for instance, if horizontal (including tasks assigned) and vertical (including members' power and status) division of labour at virtual community level is still recognizable.

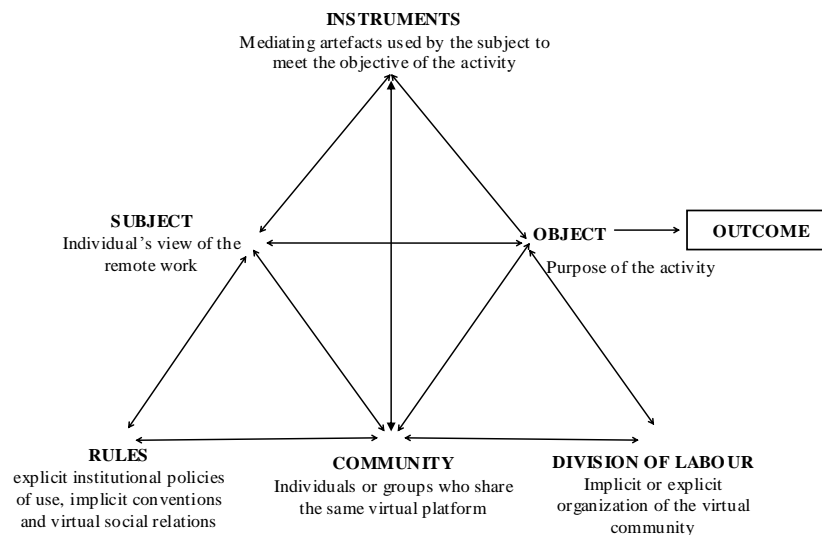


Figure 8.3: model of Activity System to analyse community remote interactions on virtual platform.

Once defined the remote activity framework, reasons of resistance, including habits or cultural experiences, should be compared with possible benefits (such as time and costs saving, exploiting any time and anywhere human willing to take part in the activity system), both in adopting remote tools at community level and in using remote services at individual level. Obviously, each analysis will necessarily require careful tailoring according to each specific situated professional context. Further reflections should include procedures to check and to value how remote activity is performed, both considering individual performance and cooperative interactions. Finally the comparison of different working environments that need or could make use of remote work can lead to better understanding drawbacks and benefits of such work procedure, evaluating which improvements are necessary and at which level, and how in professional contexts and especially in the social life its adoption could bring particular advantages.

Another point of the research that is worth analysing concerns the study of talk at work in technology field, involving managers of technological projects, technicians

(designers and/or developers), customers, and potential users, with the aim of investigating how talk (more or less sound) can have repercussions on the phases of requirements analysis, development, release, and use. In particular, the creation of a communicative reference grid may suggest to classify which types of dialogues are most used, how argumentations are carried on, whether there are peculiar argumentative rules or schemes to follow, which strategic manoeuvres can be introduced and the fallacies most recurring. Moreover, the growing consideration on negotiation and problem solving practices concerning business products becomes a further incentive to focus on communicative and cultural aspects strictly joined to the human relational dimension and strongly affecting the technology market.

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Annex

Conventions and list of pseudonyms used

All names of ALaRI members as mentioned in the discussion are pseudonyms. Occasionally, also gender has been modified.

- the manager of the intranet project (ALaRI program manager): PAUL
- the first intranet designer (staff member and PhD student 2002-2005): DAVID
- the person helping the first designer as developer (ALaRI master student 2004): FOREST
- the second intranet designer (staff member and PhD student, former ALaRI master student, 2004-2008): DANTE
- the person helping the second designer as both designer and developer (staff member 2006-2008): FRANZ
- another person collaborating as developer with Franz (ALaRI master student 2006-2008): ERIK
- the user speaking with Franz and whose conversation was analyzed: HUGH

To make it possible to identify the actors here presented with the ones in the PhD dissertation, also the names coming in emails, reports, or evidences have been modified according to the pseudonyms used (as above reported). New names have been changed with fantasy names.

Survey conducted in 2003

During the winter period 2002/2003 David sent by emails to some potential user profiles (Faculty, Sponsor, Students, and Alumni) the features the intranet was planned to include, informing about the work in progress and asking them some suggestions.

Faculty survey: form & emails

Dear Faculty members,

We are currently working on the Intranet for AlaRI. Following are some of the features we plan to include for faculty members visiting AlaRI. We would appreciate any additional suggestions you might have.

Regards,

AlaRI Website Development Team

Course WebPages	Upload course slides (Faculty members) Post Exercises (Faculty members) Post Projects (Faculty members) Submit projects/exercises (Students) Upload Tools
Bulletin board for Discussions on web	Post question in discussion Reply to specific question Start new discussion
Career placement center	Sponsors/ Faculty members register Sponsors post job description/ Faculty posts research assistantship positions Sponsors/ faculty update job description Upload CV (current/ graduated students) Upload Cover Letter (Students) Students submit CV/ cover letters
Project Database	Upload article/ research paper into shared resources View articles in shared resources

From Faculty members, David received the following emails.

1.

From: Peter Marwedel [Peter.Marwedel@udo.edu]

Sent: lunedì, 23. dicembre 2002 20:55

To: David

Subject: RE: ALaRI Intranet suggestions

> -----Original Message-----

> From: Balasubramanian Prasad [mailto:balasubramanian@alari.ch] (ndr. Alari student)

> Sent: Wednesday, December 11, 2002 2:24 PM

> To: David

> Subject: ALaRI Intranet suggestions

>

>> Dear Faculty members,

>>

>> We are currently working on the Intranet for ALaRI. Following are some

> of the features we plan to include for faculty members visiting ALaRI. We

> would appreciate any additional suggestions that you feel might add value

> to the manner in which you conduct your classes. Kindly mail you response

> to : *david@alari.ch*

>>

>> Regards,

>> ALaRI Website Development Team

>>

>> Course WebPages	Upload course slides (Faculty members)	yes
	Post Exercises (Faculty members)	yes
>>	Post Projects (Faculty members)	yes
>>	Submit projects/exercises (Students)	No
>>	Upload Tools >>	Yes.

>> Bulletin board for Discussions on web

Post question in discussion
Reply to specific question
Start new discussion

Not required for short term courses.

>>

>> Career placement center	Sponsor/ Faculty registers	
>> Sponsor posts job description/Faculty posts research assistantship positions	>> No.	
> Sponsor/ faculty updates job description	No.	
>> Upload CV (current/ graduated students)	No.	
>> Upload Cover Letter (Students)	No.	
>> Students submit CV/ cover letters >>	No.	
>> Project Database	Upload article/ research paper into shared resources	Yes
>>	View articles in shared resources	yes

Additional requirement: **we should be able to connect our laptops to the network, get connected to DHCP and use all standard functions on our laptop (mail, web).** >>

2.
From: Balasubramanian Prasad (*ndr. Alari student*)
Sent: domenica, 15. dicembre 2002 21:05
To: *David*
Subject: FW: Intranet
-----Original Message-----
From: *Giovanni De Micheli* [mailto:nanni@Stanford.edu]
Sent: mercoledì, 11. dicembre 2002 20:46
To: Balasubramanian Prasad
Cc: *Paul*

If a sponsor has the possibility to connect-in, I would be interested in the current and planned activities and schedules within ALaRI, means: a Calendar.

Project DataBase: documentation of current and already existing project-papers makes a lot of sense, but don't forget an outlook on possible, maybe planned, but not started projects.

Would be interesting for Infineon on what kind of project might start in the (near) future (to join).

Please take also into account that commonly used Development Tools could also be part of the system,

best Regards

Reinhard

2.

From: Jeff Owen [jefferson.owen@st.com]

Sent: mercoledì, 11. dicembre 2002 11:29

To: *David*

Subject: RE: Alari INTRANET survey

David,

They are both important, the first for the students and the companies and the second for the companies.

I do think this could be a full time job to implement and a bit tricky at that. We can talk and I will give it some more thought.

Jeff

-----Original Message-----

From: *david@alari.ch* [mailto:*negri@alari.ch*]

Sent: Tuesday, December 10, 2002 6:04 PM

To: jefferson.owen@st.com

Subject: Alari INTRANET survey

Dear Jeff,

I am in charge of designing and deploying an intranet for the institute. This will include, among other features, a jobs/projects/internship marketplace, accessible by all ALaRI students, alumni, and industrial partners.

Take a look at the enclosed document, it is a list of possible features (from the industrial partners point of view) to be implemented in the ALaRI intranet.

You can:

- Rate them based on the importance they have to you
- Suggest any other features you consider important that are not in the list

When done, you can return the document to me by e-mail.

Thanks

David

3.

From: Labros Bisdounis [lmpi@intracom.gr]

Sent: mercoledì, 11. dicembre 2002 08:52

To: *David*
 Subject: Re: Alari INTRANET survey

Dear *David*,
 I believe that your list is OK for the needs of the ALaRI intranet, from the industrial partners point of view.
 Regards,
 Labros.

 Labros Bisdounis, Ph.D.
 Electrical Engineer, Project Co-ordinator
 Development Programmes Department
 INTRACOM S.A.
 19.5 Km Markopoulo Ave., PO Box 68
 19002 Peania, Athens
 Greece

Students Intranet Survey

Dear Students,
 We start working on the Intranet for AlaRI shortly. Following are a few suggestions on what should go into the Intranet. I would like you to take a look at it and tell us if you think it is useful to you.
Any additional suggestions are welcome.
 Rate the cases below from 1-5 (A rating of 5 representing 'Very useful')
 Regards,
 AlaRI Intranet Development Team

From Students, David received 6 answers, among which:

1.
 Directory of Graduated Students/ Current Students/ faculty members/ Sponsors staff members

Update Contact addresses	4
Email addresses	4
Telephone numbers	2
Personal Web pages links	2

Course WebPages

Upload course slides (Faculty members)	5
Post Exercises (Faculty members)	4
Post Projects (Faculty members)	4
Submit projects/exercises (Students)	5
Upload Tools	4

Bulletin board for Discussions on web
 Post question in discussion 5
 Reply to specific question 5

Start new discussion	3	
Career placement center		
Sponsors register	4	
Sponsors post job description	5	
Sponsors update job description	4	
Upload CV (current/ graduated students)	4	
Upload Cover Letter	3	
Students submit CV/ cover letters	3	
Announcements		
	Post announcements	4
	Update announcements	3
(PhD students/ staff members/faculty members modify this section)		
(Career fairs/ changes in course schedule/ announcing seminars/ parties etc)		
Project Database		
Upload article/ research paper into shared resources	4	
Upload code/ project report into private resources – Access to private resources available to sponsors of the project.	4	
<hr/>		
2.		
Directory of Graduated Students/ Current Students/ faculty members/ Sponsors staff members		
Update Contact addresses	4	
Email addresses	4	
Telephone numbers	1	
Personal Web pages links	4	
Course WebPages		
	Upload course slides (Faculty members)	5
	Post Exercises (Faculty members)	5
	Post Projects (Faculty members)	4
	Submit projects/exercises (Students)	4
	Upload Tools	???
Bulletin board for Discussions on web		
	Post question in discussion	(all 4)
	Reply to specific question	
	Start new discussion	
Career placement center		
	Sponsors register	5
	Sponsors post job description	5
	Sponsors update job description	5
	Upload CV (current/ graduated students)	5
	Upload Cover Letter	5
	Students submit CV/ cover letters	5
Announcements		
	Post announcements	5

	Update announcements	5
(PhD students/ staff members/faculty members modify this section)		
(Career fairs/ changes in course schedule/ announcing seminars/ parties etc)		
Project Database	Upload article/ research paper into shared resources	5
	Upload code/ project report into private resources – Access to private resources available to sponsors of the project.	4
<hr/>		
3.		
Directory of Graduated Students/ Current Students/ faculty members/ Sponsors staff members		
	Update Contact addresses	- 5
	Email addresses	- 5
	Telephone numbers	- 5
	Personal Web pages links	- 3
Course WebPages	Upload course slides (Faculty members)	- 5
	Post Exercises (Faculty members)	– 5
	Post Projects (Faculty members)	– 5
	Submit projects/exercises (Students)	– 5
	Upload Tools	- 5
Bulletin board for Discussions on web	Post question in discussion	- 5
	Reply to specific question	- 5
	Start new discussion	- 5
Career placement center	Sponsors register	- 5
	Sponsors post job description	- 5
	Sponsors update job description	- 5
	Upload CV (current/ graduated students)	- 5
	Upload Cover Letter	- 5
	Students submit CV/ cover letters	- 5
Announcements	Post announcements	- 5
	Update announcements	- 5
(PhD students/ staff members/faculty members modify this section)		
(Career fairs/ changes in course schedule/ announcing seminars/ parties etc)		
Project Database	Upload article/ research paper into shared resources	– 5
	Upload code/ project report into private resources – Access to private resources available to sponsors of the project.	- 5

Report from usability analysis by external experts (summer 2004)

Relazione dell'incontro del 10-11-04 al Politecnico di Milano con:

Francis Rain, dr. in comunicazione – università di Siena

John Toby Car, phd polimi @elet.polimi.it

Francis e John hanno condotto nel luglio 2004 un'analisi della intranet di ALaRI, testandone l'usabilità. La ricerca è stata condotta utilizzando un tool capace di riconoscere i log degli utenti selezionati, e seguire così il percorso da loro svolto nell'intranet. Ciò ha consentito di verificare le difficoltà incontrate nell'utilizzo dell'intranet stessa, sia per l'accessibilità generale, sia durante l'esecuzione di un particolare lavoro (task). Bisogna ricordare anche che solo alcune delle funzionalità dell'intranet erano conosciute e poche quelle effettivamente utilizzate.

Inoltre attraverso interviste dirette sono emersi ulteriori problemi generali di utilizzo.

Chi erano gli utenti selezionati: STUDENTS

L'analisi è stata condotta testando il gruppo di utenza studenti – n.8 ragazzi (tra i 25 partecipanti) del master in ESD, anno accademico 2003-04, si sono offerti come campione di utenza da intervistare per testare l'usabilità dell'intranet ALaRI.

A Lugano, presso l'istituto ALaRI – USI, nell'aula di esercitazioni, luglio 2004, ciascuno studente è stato intervistato singolarmente, avendo il compito di svolgere 3 task dell'intranet.

Analisi empirica task-driven

Task da svolgere - Le attività da compiere per testare l'usabilità concernevano:

1) area/contenuto ALaRI Jobs: sottomettere una job request, ossia scegliere di candidarsi per svolgere un determinato part-time job, precedentemente "offerto", caricato sull'intranet dallo staff.

La scelta avveniva dopo avere controllato la descrizione dell'attività (details) e le deadline degli altri job già assegnati all'utente candidato e che quindi si era impegnato a completare.

2) area/contenuto ALaRI Jobs: sottomettere una job request dopo aver controllato i dettagli dell'attività da svolgere e le milestones del proprio Master Project, per verificare la disponibilità nell'eseguire il part-time job, senza tralasciare l'attività di progetto.

3) area/contenuto My Project: gestire la propria area My Project, caricando (uploading) public and private document.

Problemi riscontrati

Task 1):

a. mancanza di completezza - non tutti i job riportano la descrizione dell'attività da svolgere;

conseguenza: la mancanza di completezza nei details porta l'utente a non sapere con precisione cosa gli viene richiesto di fare nel part-time job; 3 utenti su 8 non portano a termine il task.

b. se si decide di sottomettere la propria candidatura per richiedere l'assegnazione del job (job application), dopo aver visto in dettaglio l'attività, non è possibile inviare immediatamente la sottomissione della richiesta;

conseguenza: è necessario tornare indietro (tasto back del browser) più volte fino al primo livello di descrizione del part-time job, e da lì sottomettere la richiesta.

c. mancanza di coerenza e visibilità - differente visibilità del formato della tabella ALaRI Job tra quando si accede dalla pagina My Job e quando si accede dalla barra in alto nella home page;

conseguenza: disorientamento dell'utente, a causa della diversa presentazione e assenza di visualizzazione del layout grafico.

Task 2):

- a. mancanza di completezza dei details dell'attività scelta (vd. task1, punto a)
- b. impossibilità di inviare la propria richiesta di applicazione (application submission) una volta entrati nei details, ma è necessario tornare alla pagina con elenco dei part-time job (vd. task1, punto b);
- c. mancanza di aggiornamento dei details e delle deadline;
- d. mancanza di coerenza e visibilità (vd. task1, punto c)
- e. scarso uso dell'intranet per accedere alla visualizzazione delle proprie milestones (gli utenti hanno preferito accedere alla pagina delle milestones passando dall'Academic Calendar dell'internet, o dalla propria homepage, per poi ritornare sull'intranet per scegliere il part-time job)

Task 3):

- a. costrizione a riempire campo "titolo" e "abstract" per caricare un proprio file/documento nella sezione My Project - ciò però non viene specificato dall'inizio, bensì alla fine della creazione del documento quando compare un messaggio di errore se i campi "titolo" e "abstract" non sono stati compilati (il messaggio non è però chiaro, poiché solo tornando indietro si capisce il tipo di errore con l'aiuto dello sperimentatore);
- b. mancanza di feedback quando viene segnalato l'errore per il caricamento di un documento, ossia non è subito chiaro cosa si sbaglia, cosa è considerato errore, che non permette di caricare il documento;
- c. mancanza di feedback che confermi la disponibilità del documento caricato per gli utenti corrispondenti, ossia per coloro che collaborano al medesimo progetto e hanno accesso alla visione dei documenti privati;
- d. mancanza di chiarezza del significato di alcune label in certi campi: per es. dopo aver cliccato il comando "create" per caricare il documento compare il tasto "details" che gli utenti cliccano per controllare se l'operazione è stata fatta correttamente, ma viene invece visualizzata una pagina con un link blu "document": tutti coloro che cliccano su "document" hanno ricevuto un messaggio d'errore in codice del sistema, assolutamente incomprensibile e senza alcun specificazione;
- e. solamente 1 utente su 8 ha portato a termine il task, controllando se il public document caricato era correttamente visualizzato nell'area Project and Research – nella lista *public document*.

In generale si è visto come tutte queste mancanze e difficoltà abbiano spinto gli utenti ad abbandonare il sito e rinunciare a portare a termine i task con i relativi obiettivi prefissati. I motivi principali sono risultati i seguenti:

- mancanza di integrazione della intranet con le altre applicazioni dedicate alla didattica (vd. per es. aggiornamento *milestones*, controllo propri progetti dalla home page personale o la preferenza di utilizzo dell'academic calendar da internet, piuttosto che dall'intranet);
- necessità di rendere più intuitiva l'interfaccia per l'esecuzione di alcuni task, specificando con chiarezza il significato delle label;
- messaggi imprecisi o assenti nell'esecuzione dei task impediscono di portare a termine il lavoro in modo sicuro e corretto;
- scarso utilizzo dell'intranet anche da parte degli altri gruppi di utenti (faculty e sponsor).

Suggerimenti e proposte migliorative

Task 1)

- specificare l'attività di part-time job offerta (se non chiara nel titolo) – vincolare la compilazione di tutti i campi del part-time job prima di renderlo pubblico per fornire all'utenza un'informazione completa;
- **offrire servizi più immediati**
 - i. es. inserire un tasto per la *job application* / *job request* anche nella pag dei dettagli del part-time job;
 - ii. permettere di visualizzare anche dalla propria pag My Job la tabella principale con tutti i part-time job disponibili
- agevolare l'utenza con una **visualizzazione coerente delle pagine**, stesso formato/presentazione per pagine uguali, anche se accessibili da diversi percorsi;

Task 2)

- (vd. punti precedenti, +);
- **accesso immediato alle proprie informazioni**
 - i. permettere l'accesso alle proprie informazioni anche dall'intranet, a qualunque livello dell'applicazione, per es. link alla sezione My Calendar: ciò consente di servirsi dell'intranet direttamente per verificare le proprie dead-line e le milestones di progetto;

Task 3)

- **fornire istruzioni chiare** per il caricamento dei public/private document (campi obbligatori, passaggi necessari, etc.) fin dall'inizio dell'attività;
- **vincolare la disponibilità di un bottone alla sua effettiva attivazione** (se un bottone è attivo significa che la sua funzione è disponibile), vd. es. bottone "create" per il caricamento dei documenti: sempre attivo, ma è funzionale solo quando sono compilati tutti i campi (title e abstract), altrimenti se viene cliccato prima compare messaggio di errore;
- **fornire feedback chiaro anche in caso di errore**; i.e. specificare di che errore si tratta, utilizzando un linguaggio naturale, non in codice, comprensibile all'utente;
- **fornire in generale feedback al termine di ciascuna attività**, in modo da confermare o meno il successo del lavoro; e.g. sapere se il documento è stato caricato correttamente ed è effettivamente disponibile anche per gli altri utenti – per es. mettendo un link diretto all'area ReSearch, public document, per verificare se il proprio document è stato caricato; oppure se si tratta di un private document, un link all'area del gruppo di

riferimento cui è stato inviato; o semplicemente un messaggio di conferma a chi carica tali documenti;

- visualizzare più informazioni simili in una medesima pagina; per es. accanto ai dettagli del documento caricato, poter aver accesso alla lista dei public document e dei private consentiti (won: poiché la sezione in cui si opera è protetta da password personale, non dovrebbero esserci problemi inerenti la privacy);
- specificare con label chiare (magari supportate da pop-up più dettagliati) il significato di sezioni come *Project and Research* e *ReSearch* – rendere più espliciti i contenuti con etichette informative più significative già nella home page.

Problemi in generale

L'intranet a luglio 2004 risulta essere ancora poco utilizzata rispetto alle potenzialità che può offrire sia agli utenti studenti, sia agli altri tipi di utenti (faculty e industrial partner/sponsor).

Gli utenti studenti utilizzano l'intranet solo per visualizzare i part-time job, e caricare i propri public / private document perché richiesti dal tutor o mentor.

È evidente in questo stadio di sviluppo del tool ancora una mancanza di consapevolezza e volontà di poter condividere la propria conoscenza non solo con il gruppo di lavoro sul progetto, ma anche con il resto della classe.

Inoltre è necessario rendersi conto dell'utilità che i documenti caricati acquisiscono, diventano patrimonio comune per gli studenti futuri, arricchendo e allargando la base di documentazione e conoscenza dell'istituto ALaRI e di tutti i suoi partecipanti presenti e futuri – e anche passati se si considerano anche gli *alumni* che possono accedere alle informazioni anche dopo aver essersi diplomati ad ALaRI, per un certo periodo di tempo.

Alla luce di tale situazione, risulta indispensabile investire tempo per l'apprendimento dell'utilizzo dell'intranet da parte degli studenti ALaRI.

Un impulso a questa fase può essere dato creando maggior *commitment*, e forte senso di partecipazione attraverso l'utilizzo di una risorsa strategica e sempre aggiornata:

- creando collegamenti diretti tra l'intranet e la piattaforma corsi con il calendario delle lezioni per gli studenti;
- providing a special feature to learn to use intranet platform (through brief common session in classroom or with an on-line handbook, schematic but well clear)

La maggior difficoltà deriva dal fatto che manca un riconoscimento comune dell'utilizzo del tool. Forse perché ancora in fase di implementazione e non completa nelle sue parti di servizio.

Ma l'intranet rimane uno strumento di comunicazione che permette l'interazione di persone tra loro distanti, seppur in modo asincrono. Dunque può ben funzionare solo se tutti i suoi utenti riconoscono la necessità di servirsi di tale tool e lo utilizzano come strumento preferenziale per comunicare con l'intera comunità ALaRI.

Field notes and emails by ALaRI actors (2005-2007)

Report from Forest

My request (December 2005)

Dear *Forest*, I would like to ask you to write a report about your activity with *David* concerning the building of the ALaRI intranet.

Please, try to follow the index here below, and do not hesitate to add any additional comments or remarks you want.

I would let you know that this report will be used by only me, in order to have a more complete picture/outline about the difficulties met to build and realize the alari intranet. It is absolutely not intended in order to evaluate you, your work or *David*, but just for me in order to better understand the environment and the conditions within which this intranet has been developed.

Thank you,

c.

General index

First part: technical

1. the technical building of the alari intranet (try to reconstruct step by step your activity on the intranet, from the beginning until you have been working, considering both when you have worked with Luca or somebody else, and when you have worked by yourself, alone)
 - a. when the work has started
 - b. what kind of information I had to learn
 - c. how Luca gave me the instruction (by meeting, by e-mail, by general speaking, etc.)
 - d. how many times (in one week or one month), how frequently, I met Luca to discuss about the state of the art of the intranet or any problem arisen (try to remember the duration/length of your meeting) – and usually at what time you two met together?
 - e. What kind of technical problems I have met? (If possible, write some examples, for instance technical problems with the web ratio model, or problems with the technical device on which you have worked)
 - f. Is the work finished? If not, how the work is proceeding?
 - g. Who is in charge of this now?
 - h. Who has passed the information about the intranet on to the other person/s now responsible for this work?

Second part: personal consideration (describe the situation at the beginning of the work, your condition as ALaRI student, and if there has been any worsening or improvement during your development of the work)

1. Was it difficult to learn the web ratio methodology? If yes, why?
2. what kinds of personal problems I have met: for instance, problems of time, problems of understanding the web ratio model, problems of understanding with Luca or with other persons, etc.

Forest report (February 2006)

Introduction:

WebRatio is a web development tool that uses WebML to develop and deploy web application. **WebML**[®] is the UML (Unified Modeling Language) of the Web and allows simple and intuitive development of Web applications with a visual approach, regardless of how complex the application is and the technological platform used.

I was interested in Mr *David's* presentation about AlaRI's Intranet and approached him to know about the tool used to develop AlaRI's. He then gave a brief introduction (to us - few students who were interested) about the tool and also about the advantage of this graphic tool over conventional web development software used. I then took up this part time job as AlaRI Intranet developer.

Technical Aspects:

My work started from the second week of October 2004. First task was to get accustomed to the tools environment, this was done with the help of user manual available with the software. Examples were tried out and thus I got a hands on about the tool. Mr *David* helped me through this learning phase by sorting out my doubts. Meetings, discussions and assignments were finalized through e-mails.

After I got comfortable with the tool, Mr *David* gave us an assignment to develop a web page which displayed list of available music files available in a database.

Welcome to music file database	
All Music Files Files By Category <ul style="list-style-type: none"> - Hip Hop - Pop - Rap - Romantic - Rock and Roll Search	

This is one of the few assignments that was done and in this process how various features in the tool can be utilized was learnt. Examples being: How to

- link files ?
- merge pictures into the page ?
- Implement scrolling feature in order to view a list of files ?
- Implement search feature ?
- Create Entities and Relationships ?

- Layout design, Style sheet etc

After these assignments I was elaborated on the way ALaRI Intranet has been designed using WebRatio.

ALaRI – Intranet

Fig 1. ALaRI – Intranet welcome page



ALaRI Intranet is a web location with different access levels depending on the group to which the user belongs. The various group includes:

1. The Steering Committee
2. ALaRI Staff – Professors from various institutes.
3. Administrative Staff
4. PhD students
5. Masters Students
6. Alumni

Fig 2. ALaRI – Student Site View



The figure shows how a students site view looks like. The site view has different areas which includes:

1. His/ Her CV
2. Masters Project Details
3. Career Center
4. Part time job available at ALaRI
5. Library
6. Research – where documents related to the masters thesis can be uploaded

The other users like the ALaRI staff and Steering Committee monitor various activities like:

1. Scheduling courses
2. Student progress in courses and thesis
3. Company meetings etc

Thus ALaRI Intranet has been designed to be user friendly as well as to have many usefull features embedded in it.

After acclimatizing with WEBRATIO and then to the basic design of ALaRI Intranet, the job of Intranet developer encompasses the following:

1. Developing new site views to have more functionality
2. Fixing bugs in the existing design if any
3. Group meetings to think about ways of improving the design.
4. Installing updates and new features

Communicating with Mr *David* was mostly through emails wherein details of the task is clearly typed with the necessary information. If a doubt arises then a personal meeting can be arranged depending on both our availability. Usually a task was assigned and depending on the priority the work is scheduled.

Personal meetings were usually for two reasons:

1. Clearing doubts – Doubts regarding some units in the software tool or on the task assigned. It was cleared in an effective manner sometimes with examples.
2. Checking the task completed – Comparing the requirements with what has been designed. Improving the design, improving the user interface and also how to incorporate changes in the design in the future if required.

The duration of our meetings varies depending on the purpose. If the meeting was for new assignment, or checking the work done, it usually take a little more than one hour.

The problems that I personally felt in the webratio tool was mainly with the documentation part of it. The manual is not properly documented and not many examples are available, hence I had to contact Mr *David* for even small doubts. The new version of Webratio-4 has better documentation.

The work with Mr *David* has been completed. Mr *Dante* is my supervisor for Webratio now. Mr *Dante* has already been working on Webratio with Mr *David*, hence he already knew about what has been going on with Intranet and the developments made. I am currently working on a project with Mr *Dante*. I have been using Windows OS to work on webratio

before. Now am using Linux OS and it is very challenging and am learning new things everyday.

Personal Considerations

Learning Webratio was not difficult. It is a very interesting tool which makes web development easier. I have not worked on web development before and hence it was really exciting to learn something new.

With any project, time constraints has always been there in the beginning. There are times in the beginning when I could not finish the assignments on time because I was a novice. I used to take much time trying to solve some simple problems and used to take Mr *David* help. But later when I knew how to address problem of various kinds it became a much easier task. I was frustrated during such time that I had planned to quit this part time job but Mr *David* was of much assistance during that time.

There has not been any problem with understanding my work because it was very well documented by Mr *David*. The documentation included all the details from what need to be done and how to approach the task from scratch. I used to have some doubts regarding the way of implementing certain features, which I would convey to Mr *David*.

Overall I had fun learning this tool.

Actors' emails

New Intranet Features

Dante

Inviato: mercoledì, 4. ottobre 2006 09:53

A: 404 Master AlaRI

-----BEGIN PGP SIGNED MESSAGE-----

Hash: SHA1

Dear all,

is online a new "beta" version of the official intranet (there are small things to fix).

The new version include the following areas.

Master Project Proposal (Area: "MP Proposal")

Link: <http://www.alari.ch/intranet/page1705b.do>

In this area is possible to add a Master project thesis proposals. At the moment the proposals are not belonging to the user that performs the update. So, pay attention that you can delete and modify also the others proposals.

I create a proposal example that you can select to see the mining of each attributes.

In the next days I'll add an online help to manage the MP_proposal. Starting from now, you can add your MP proposals by click on the left link _Add New Proposal_.

* New Part Time Jobs (Area: "PT Jobs")*

Link: <http://www.alari.ch/intranet/page1755a.do>

The PTJ are now re-design in order to manage the fiexd job.

Everything is managed in the home page, in which you can see all the details about your PT jobs.

Once you select a job you will see, on top of the page, the operations you can perform on it.

New features:

- - Now the _jobs belong to a Category_. Usually it belong to ALaRI, but some of them can be posted on behalf of others, such us CP-Startup, etc.

If you need a new category, please send an email to Andrushevic with me in CC.

- - when you create a New job, _you can also directly assign the job_ by:

selecting a student in the list menu, and clicking on the "Add_& Assign" link. To use "Add_& Assign" it must be present a student in the "Assigned To" field.

- - _A job can be Duplicated_. It helps to create new instances of the job in order to assign the same job to another students

- - _Complete and Duplicate_. Once the job is completed you can mark the current job as completed and, at the same time, you can recreate (duplicate) the job for a new assignment (to the same student or to a new one). You have to modify some fields, e.g. the "Completed by", and eventually you can also directly assign the job.

That's all folks.
If you need help, you can contact me.
Enjoy
Dante
-----BEGIN PGP SIGNATURE-----
Version: GnuPG v1.4.2.2 (GNU/Linux)
-----END PGP SIGNATURE-----

intranet presentation

Dante

Inviato: mercoledì, 5. luglio 2006 12:47

A: Salvioni Carola; *Diana*

Cc: *Paul*

Ciao,
mi sono accorto che sarebbe il caso di preparare delle slides sulla intranet e parte corsi di alari.
lo scopo di queste slide è di mostrare il perchè, ed il come la nostra intranet funziona.
Sarebbe utile fare degli screenshot su certe viste (professori, studenti) e sottolineare certe aree chiave delle nostre piattaforme. Direi che questo lavoro di promozione si addice perfettamente a voi due. Decidedete voi come distribuirvelo.
Sarebbero da includere le reference al lavoro di *David*, così come il suo minore.
Eventualmente aggiungo una parte tecnica io alla fine.
Credo sia un lavoro utile anche per capire come funziona e quali sono le caratteristiche chiave della nostra piattaforma.
Queste slides potrebbero poi essere usate anche per istruire i professori all'uso della intranet. Ma magari questa parte la facciamo prossimamente.
Diciamo che non c'è fretta per questo lavoro, ma sarebbe il caso di trovare lo spazio per farlo.

che ne dite?
Dante.

Course platform is online !!

Dante

Inviato: giovedì, 27. ottobre 2005 16:15

A: 6901 Alari MSc 04; 691 Studenti Alari 05; 404 Master AlaRI

Dear all,
 starting for now we have a new course platform where we can access to our course and their resources. The link to access to the course platform is: <http://www.alari.ch/courses> accessible also from the alari home page link.
 The account information (user and password) you should use to access is the same of the intranet one.
 Hermes Arian and Stefan Lubek are responsible of courses' resources and news management. The first for the MScs courses; The latter for the MAS courses.
 It's the version number 1, so please inform me of any kind of bugs. Also critics and comments are welcome.
 As soon as possible other features, e.g. a forum, will be added to the platform to increase the usability and communication capabilities.
 Thanks
 Dante

Ciao Franz (email del 5/01/07),

Per quest'ultima funzionalità (REQUEST MNG) vorrei farti alcune domande:

1. è possibile **visualizzare anche la data in cui viene inviata una richiesta?** - in questo modo ci si potrebbe meglio rendere conto se la persona è da tempo che aspetta una risposta **FR: sì, è possibile, ma non è stato fatto -> è in programma mettere data**
2. è possibile tenere un archivio delle richieste inoltrate dagli utenti (anche dopo che la richiesta è stata cancellata, una volta che si è risposto) con relative risposte (e autore della risposta)? **FR: no, una volta cancellata la richiesta, non vi è più traccia - anche la risposta non viene mantenuta in archivio perché è inoltrata al richiedente come semplice e-mail (nella prima release, non c'è un form che predispone e mantiene in archivio la risposta inviata) - è in programma creare all'interno del db intranet un form in cui inserire la risposta di cui poi rimane traccia ed è visibile a tutti gli utenti che hanno accesso alla pagina Req Manag. (per ora solo gli studenti e staff). CS: NB ad ora la funzionalità Req Manag è visualizzata dagli studenti come semplice pag -> menu a sin; mentre dallo staff anche come area -> top menu in alto e a sin.**
La risposta che rimane visibile riporterà titolo e argomento della richiesta + risposta + nome autore risposta. La visibilità è assicurata finché non si cancella la richiesta risposta (answered request). Per questo motivo si pensa di creare anche una pag o area FAQ dove raccogliere tutte le risposte (con relative domande) man mano che le richieste vengono evase (di modo che si libera l'area Req Manag. e si crea un'altra area FAQ). possibile
3. questa funzionalità (REQUEST MNG) è solo per gli studenti o anche per gli altri utenti intranet, e.g. prof.? - **per ora solo per studenti**

4. è possibile aggiungere un'altra funzionalità (tipo: "suggestions") dove raccogliere feedback e suggerimenti per migliorare il servizio intranet, mantenendo però l'anonimato dei mittenti? - forse può anche invogliare l'invio di commenti

Possiamo magari discuterne in modo più approfondito in un prossimo meeting dedicato al nostro caro Orazio ?! (discussione dell'8/01/07): FR: prima release della Req Manag il 17/11/06, prima e unica richiesta inviata in data 30/11/06. Seconda release interfaccia con modifiche anche nel db delle informazioni e gestione dati genn 07

CS_problemi riscontrati:

A) ottima iniziativa, ma da rivedere l'impostazione e la struttura delle info e loro visibilità

B) è necessario aggiungere e specificare all'utente altre info (e.g. istruzioni di utilizzo che non sono state chiarite né con l'email che annunciava la nuova pag. e funzionalità, né sono state inserite nell'help Index generale) ; cosa si intende per "Filter by type -home, course, job-";

C) nella prima e unica richiesta inviata, infatti, l'utente non aveva selezionato il filter by type, mentre aveva inserito solo un titolo generico "feedback"

Ciao a tutti,
Carola

-----Original Message-----

From: *FRANZ*

Sent: venerdì, 17. novembre 2006 13:18

To: *DANTE*

Cc: 404 Master AlaRI

Subject: Intranet's new Features

Ciao,

we have added two new features to the Intranet. The INVENTORY MNG allows you to manage the loan of Hardware resources, while the upload and delete of a new HW resources can be done only by the system Admin. of the Intranet. In this area you can accept a request of a resource defining the date of return or refuse it (the system will send automatically an email to the student interested); you can also view the resources on loan, remind to the student to give a loan back (the system will send automatically an email to the student interested) and sign when a resource is back.

In the REQUEST MNG, instead, you can see and reply to all kind of question or request of the students. It's really simple: select a request from the "unanswered requests" index, you'll see the text of the request, select reply, fill the form and the system will send a mail to the student that has made the request!! To delete an answered request select it from the "answered request" index.

If you have questions/problems/suggestions mail me.

Enjoy :-)

Franz

Usability analysis (December 2004)

Methodology used and main results follow

Executive summary

Considering the particular type of the application analyzed, i.e. the ALaRI intranet site, I have chosen to take into consideration especially those area and services that are more used by ALaRI people. I have selected, among the more important activities, the ones that better help me identify the critical issues of the intranet site.

Aim of this report is, in fact, to detect the most part of the problems, obstacles and breakdowns for the users who interact with this particular intranet site, according to the definition of usability, as “the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments” (ISO 9241-11).

The methodology used to carry out this usability evaluation is based on some inspections that offer two different evaluation perspectives. The first one is concerning technical aspects, such as the contents of the intranet and their structure, the navigation system, the analysis of interface design (that includes semiotics, cognitive and graphic features), and the technological performance; while the second evaluation is about user-experience aspects, that are analysed using some typical and characteristic scenarios (stories about uses, made up of user profiles, tasks, and goals).

Following these perspectives, the technical inspection helps me evaluate and discover specific and particular problems of the application; while the user-experience inspection allows verifying the found troubles through the execution of practical and concrete tasks. In this case I have put myself in user’s shoes, according to some profiles, using scenarios to achieve certain goals.

Finally, I have carried out a user testing, interviewing typical real users of the ALaRI intranet site, who gave me confirmation about the results of the two previous analysis and also other interesting suggestions.

The main usability problems emerged during the evaluation are about interface design and navigation, in particular they are:

- lack of self-evidence and conventional symbols, concerning interactive elements, such as identification of links, that should support basic operations;

suggestion: use more intuitive and conventional signs to improve the self-evidence of textual and non-textual links

- overlapping labels, that have similar names, but different meaning;

suggestion: try to find more suitable names of those labels, focusing on their particular contents

- misleading and ambiguous headings, that do not allow understanding to what they refer;

suggestion: specify with clearness what they synthesize

- overloaded information on some pages;

suggestion: try to better structure the organization of pages, such as *Projects Search* page

- segmentation of topics in sub-areas not always well organized;

suggestion: review the grouping of some topics, such as in ALaRI Jobs and Projects and Research

- sometimes the application required too many clicks to access specific information;

suggestion: try to reduce the path to access information, where it is possible.

Inspection: Technical inspection (scenario-based or not)

The ISO (International Standardizing Organization) definition of usability⁶⁰ reports that it is the “*effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in a particular environment/context of use by means of a product*”. Where *effectiveness* principally means accuracy and completeness; *efficiency* means resources expended in relation to the accuracy and completeness, i.e. money and time; and *satisfaction* principally means freedom from discomfort and positive attitudes towards the use of the product.

Starting from this point I will try to identify design problems and implementation breakdowns of the ALaRI intranet.

My evaluation of the application will consider the following perspectives:

- **Content;**
- **Navigation;**
- **Interface Design** (that includes: **Semiotic, Cognitive, and Graphic** aspects);
- **Technology.**

Content

From this perspective I will explore the quality of the content (efficacy of the communication), according to the following technical heuristics (words in bold).

Accuracy: the texts on the intranet pages describe adequately the referenced world, i.e. an environment for engineers, technical and scientific people that use the intranet to see projects or to find specific information of their interest, studying and working at the ALaRI institute. The contents are consistent in themselves and on each page the text is suitable, according to the subject of the page. Also the text grammar does not seem to contain errors, and on the whole the writing is accurate.

Currency: generally the text appears updated.

I have found only a case where a person had changed work and company in September 2004, but, while his data (e-mail included) were up-to-date on the ALaRI web site (internet), they were not on the intranet application, because he still appeared as working in the previous company with another person, who instead was not more his colleague. This lack of updating is enough serious, due to the impossibility to contact the person in case of any necessity, and in a platform as the intranet is much more important to have the correct e-mail rather than having the telephone number (it is also very rare that the people want their phone numbers displayed).

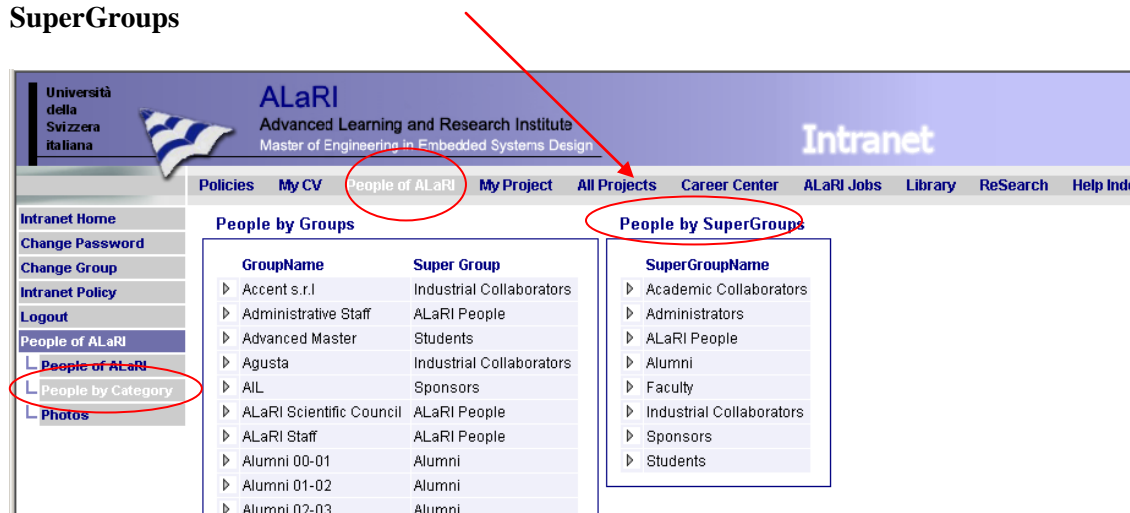
Coverage: the coverage of the texts is clear and understandable in each intranet pages, according to the content supposed.

⁶⁰ ISO 9241-11 point 3.1- Ergonomic requirements for office work with visual display – Guidance on usability

Content objectivity: about this aspect, the intranet does not allow any advertisement or banner on its pages or homepage. In case of any other content, it is always evident its objectivity.

Authority: the competences of the author of the application and of the institution are reliable, precise and very professional. All the readers, as said above, are technical and scientific people and it seems that any lack of identification to them does not exist.

Conciseness: in the site analyzed, the major problem about this feature consists of the long lists of names regarding ALaRI participants, developed or on-going projects, books or papers in ALaRI. In fact, as it is possible to see in **People of ALaRI**, **Projects and Research** and in **Library** areas, there are too long lists to scroll. It was tried to minimize this problem creating, for example in **People of ALaRI** a particular view, which is **People by Category** where there is a mask with the various users collected by typology in **People by SuperGroups**



So clicking on a super group name, it is possible to have a more selected view of the profile of people searched.

For the other areas, **Projects and Research** and **Library**, instead, it is necessary to do a research by means of the sub-area **Projects Search**, and **Search Books** even if these sub-areas present some problems of cognitive aspects, as we will see more ahead.

Navigation

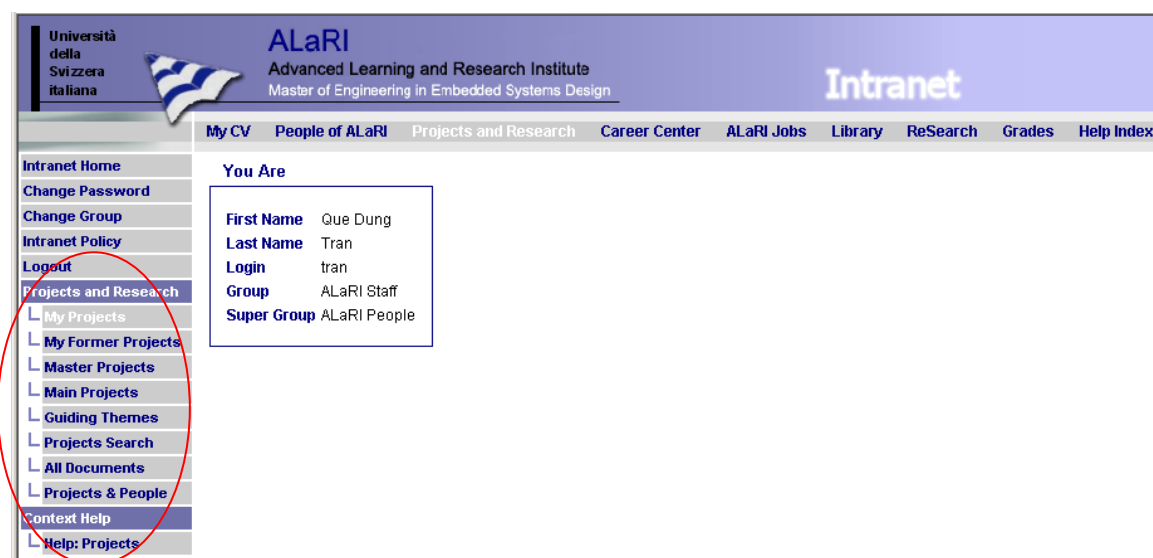
From this perspective I will explore the ways that can be used to reach specific information and the connections for passing from content to another one, according to the following technical heuristics (words in bold).

Segmentation: some information about one topic can be segmented in different pages, and it is important that the user not only understand which pages belong to the topic, but also how the navigation between these pages work. This is the case concerning the majority of information in ALaRI site that deals with topics about people, projects developed during the years, part-time jobs assigned, books & papers, repository area, etc. In fact under each area

there are some sub-areas with the relative topic belonging to the major area. Generally, the information is well divided, so that is possible to understand which is the topic, but the trouble is that often the navigation within the sub-area pages is not clear to understand immediately. So that the time spent to reach the necessary information is sometimes too long.

This problem might also be attributed to the fact that some navigation clues are not immediately visible or understandable, as the sub-areas listed on the left site, or might be the fact that the links are not always evident.

An example can be given from Projects and Research area and its sub-areas. Here the projects, already developed or on-going, are shared out in 9 different sections according to some criteria, such as master projects, main projects, all the project, search project, my project, my former project, projects and people, etc. Understand how the navigation between these pages work is not immediately recognizable, because often some information are overlapping, like for example the list of projects, the people working on, and the relative documents. In this case might be clearer to have few paths of navigation, but better structured and linked one to others.



The same problem occurs also in ALaRI Job area with its 8 sub-areas (under the view for ALaRI staff), especially for the following three sub-areas: *tokens*, *payments*, *token blocks*, concerning the tokens assigned to the students for their part-time jobs. In these three sections the information is not very well organized, due to the long lists of the tokens given to the students during each month.

Assigned Jobs - Microsoft Internet Explorer - [Working Offline]

Address: <http://alarisrv01.alari.ch/intranet/page327.do>

Università della Svizzera italiana **ALaRI** Advanced Learning and Research Institute Master of Engineering in Embedded Systems Design **Intranet**

My CV People of ALaRI Projects and Research Career Center ALaRI Jobs Library ReSearch Grades Help Index

Intranet Home
 Change Password
 Change Group
 Intranet Policy
 Logout
ALaRI Jobs
 Assigned Jobs
 Unassigned Jobs
 Completed Jobs
 New ALaRI Job
 Tokens
 Payments
 Token Blocks
 Context Help
 Help: ALaRI Jobs

Assigned Jobs of Mine

Complete By Name	Assigned To	Value (Tokens)
15/01/2005 Alari documents	Kaveripakam Sathish Chandra Kumar	4.0 Details Delete
15/01/2005 photocopy lecture and working for U.B	Singirikonda Suresh	6.0 Details Delete
11/01/2005 electricitor of apartment	Fabbri Fabio	1.0 Details Delete
10/01/2005 email to candidates of Alari master	Prasad Rishi	3.0 Details Delete
09/01/2005 assitant	Sankaranarayanan Karthik	3.0 Details Delete
copy document for Umberto	Kapoor Payal	1.0 Details Delete
mailing list-USI	Mirjalili Seyyid Hasan	5.0 Details Delete
mailing list-USI	Barakov Tihomir	5.0 Details Delete

Other Assigned Jobs

Complete By Name	Posted By	Assigned To	Value (Tokens)
31/01/2005 press release (alan)	Salvioni Carola	Finardi Davide	1.0
12/01/2005 USI placement contact	Salvioni Carola	Fabbri Fabio	1.0
17/12/2004 ANTITESYS	Bondi Umberto	Rivard Philippe	5.0
17/12/2004 coordination (UB) assistant	Bondi Umberto	Xu Liufang	4.0
17/12/2004 coorporate model	Bondi Umberto	Baghdasaryan Yelena	2.0
17/12/2004 cpsturtup	Bondi Umberto	Kaveripakam Sathish Chandra Kumar	2.0
17/12/2004 library	Bondi Umberto	Derin Onur	3.0
17/12/2004 teachers' assistant	Bondi Umberto	Tekbas Dilek	7.0
17/12/2004 web master	Bondi Umberto	Baghdasaryan Yelena	5.0
16/12/2004 Calendar	Ferrante Alberto	Mirjalili Seyyid Hasan	0.5

In this case my suggestion is to have only one page (instead of three) with the general view of the tokens assigned to the students, and a link for each student, where the amount of the tokens received each month is summed up (instead of having other two pages: one with a very long history of payments for all students in each month; and the other with redundant token blocks information).

Università della Svizzera italiana



ALaRI

Advanced Learning and Research Institute

Master of Engineering in Embedded Systems Design

Intranet

My CV

People of ALaRI

Projects and Research

Career Center

ALaRI Jobs

Library

ReSearch

Grades

Help Index

Intranet Home

Change Password

Change Group

Intranet Policy

Logout

ALaRI Jobs

Assigned Jobs

Unassigned Jobs

Completed Jobs

New ALaRI Job

Tokens

Payments

Token Blocks

All Students

Full Name	Group	Tot Allowed	Tot Compl	Tot Paid	Payable (max)	Unpaid	Pending
Abrahamyan Harutyun	Internship Students	14.0	0.0	14.0			
Ansaloni Giovanni	Advanced Master	21.0	10.5	10.0	11.0	0.5	2.0
Baghdasaryan Yelena	MSC 1st Year	21.0	18.0	14.0	7.0	4.0	7.0
Barakov Tihomir	MSC 1st Year	14.0	4.5	1.0	13.0	3.5	7.0
Derin Onur	MSC 1st Year	28.0	19.0	19.0	9.0	0.0	3.0
Dimitrova Daniela	Internship Students	14.0		0.0	14.0		
Djackov Maksim	MSC 1st Year	14.0	6.5	4.0	10.0	2.5	3.0
Dorosh Oleksander	Advanced Master	21.0	12.5	10.5	10.5	2.0	2.0
Ebenezer Navin Hohn Fefferson	Other Contacts	7.0		0.0	7.0		
Fabbri Fabio	MSC 1st Year	14.0	5.5	4.0	10.0	1.5	5.0
Finardi Davide	Advanced Master	21.0	10.0	8.0	13.0	2.0	1.0
Fiorin Leandro	Internship Students	7.0		0.0	7.0		
Giaconia Matteo	Internship Students	7.0		0.0	7.0		
Giannetta Hernan	Advanced Master	14.0		0.0	14.0		
Isaza Sebastian	MSC 1st Year	14.0	8.5	7.0	7.0	1.5	0.5
Kapoor Payal	MSC 1st Year	21.0	20.5	14.0	7.0	6.5	1.0
Kaveripakam Sathish Chandra Kumar	Advanced Master	21.0	29.0	14.0	7.0	15.0	6.0
Macii David	Advanced Master	14.0		0.0	14.0		
Mirjalili Seyyd Hasan	MSC 1st Year	14.0	6.0	6.0	8.0	0.0	6.5
Montella Willy	Other Contacts	7.0	1.0	0.0	7.0	1.0	
Mura Marcello	Advanced Master	7.0		0.0	7.0		
Olsevskis Antons	MSC 1st Year	14.0	14.0	7.0	7.0	7.0	

Orientation clues: if you have to reach a macro area, this is quite evident and easy to access. More problems, instead, come out if you want to move along the topics in that area. In fact, even if the context where you are is clear, sometimes it takes more time understanding which paths you can engage within the selected area and where these paths bring you. From my point of view, this trouble depends more on semiotics and cognitive problems tied with names of the labels and structure of the contents, rather than on the status of the browsed page or on the visibility of the context where you are.

Accessibility to different pages: i.e. all pages of a topic, in a macro area, have to be easily accessible in few clicks. Within this feature, it is possible to note a difficulty, for example, to reach the public documents, when you are in [Guiding Themes](#) (sub-area of [Projects and Research](#) area). Here there are the four principal themes of the research projects (*HW/SW for Advanced Applications*; *IPSEC*; *Pervasive Computing*; *Security for Mobile Systems*) with the links to their relevant area.

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Projects and Research

- My Projects
- My Former Projects
- Master Projects
- Main Projects
- Guiding Themes**
- Projects Search
- All Documents
- Projects & People

List Of Guiding Themes

Name	HWSW for Advanced Applications
Description	Projects in this area do not fall into a specific guiding theme.
Click Here For Details	
Name	IPSEC
Description	IPSec is a suite of protocols that provides security at the IP level in the communication stack. The main protection mechanisms are given by standard cryptographic algorithms. IPsec can be used both for securing the communications between two single peers and for securing the communications between subnetworks. In the latter case two gateway-like machines, beyond managing the communications between the two subnetworks, provide all the IPsec services. The component of the two subnetworks could be unaware of IPsec for protecting their communications.
Click Here For Details	
Name	Pervasive Computing
Description	Pervasive Computing represents the latest frontier in computer development and deployment. The vision is that of a huge number of tiny computer devices that seamlessly disappear into the real world and into everyday's life.
Click Here For Details	
Name	Security for Mobile Systems
Description	Security for Mobile Systems
Click Here For Details	

From this point to reach a document of interest, you need to click 4 times. But this path might be reduced to 2 clicks. In fact when you choose a theme and click on for having the details, the titles of the projects related to the selected theme are showed to you (please, see the figure below); and, at this point, instead of having an empty column (**Homepage**) on the title row, as presented in the table, a link to the relative document could be enclosed, under the label “**Document**“. On the contrary, actually you have to click other 3 times before reaching the document of your interest.

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Projects and Research

- My Projects
- My Former Projects
- Master Projects
- Main Projects
- Guiding Themes
- Projects Search
- All Documents
- Projects & People

Guiding Theme

Name Pervasive Computing

Description Pervasive Computing represents the latest frontier in computer development and deployment. The vision is that of a huge number of tiny computer devices that seamlessly disappear into the real world and into everyday's life.

Related Master Projects


Name	Status	Year	Homepage
▶ A LightWeight Secure IP for pervasive applications on embedded systems	Completed	2002-2003	
▶ Impact of Routing Protocols on Reliability in Wireless Sensor Networks	Completed	2002-2003	
▶ Implementation and Power Optimization of a Bluetooth Universal Remote Controller	Completed	2003-2004	
▶ Performance analysis of power-constrained communication with Bluetooth	Completed	2002-2003	
▶ Power Optimization of a Bluetooth Ad-Hoc Network	Ongoing	2003-2004	
▶ Security evaluation of Bluetooth and 802.11	Completed	2002-2003	

Related Main Projects

Name	Status	Start date	Homepage
▶ Wireless Protocols Power			
▶ Optimization for Pervasive Computing	Ongoing	01/03/2003	

Introduction list: this kind of feature should help the navigation to a specific topic, being clear the strategy used for organizing a certain list. Unfortunately this strategy is not so clear in **All Public Documents for All Projects**, where a long list presents all the public documents in the Projects area (this list comes from the student profile status and access, see

figure below – but the same problem exists also for the other users under the label **All Documents**, in Projects and Research area)



Date	Master Project	Title	Authors	Document
11/11/2004	Routing Scheme in the Spidergon Network-on-Chip	Master Project Presentation	Leandro Florin	Document
17/08/2004	Developing Concurrency for a Crypto-Accelerator	Project Report	Abhishek Rastogi	Document
10/08/2004	Design Space Exploration for the FOX Encryption Algorithm	FOX Presentation	WenYu Chen	Document
10/08/2004	Study and Optimization of an IPSec Accelerator Usage Based On Dimension Of IP Datagrams	Presentation Slides	Antonio Taddeo	Document
10/08/2004	Study and Optimization of an IPSec Accelerator Usage Based On Dimension Of IP Datagrams	Poster Slides	Antonio Taddeo	Document
10/08/2004	ARM 9 Instruction-Set Emulator	Presentation Slides	Romolo Camplani	Document
10/08/2004	ARM 9 Instruction-Set Emulator	Poster Slides	Romolo Camplani	Document
02/08/2004	Study of the new Linux IPSec Implementation	presentation	Marina Sahakyan	Document
02/08/2004	Performance Comparison of Automatic Instruction-set Extension Methodologies	Master Project Presentation	Pascal Fuchs, Adrian Sarbu	Document
02/08/2004	Controlling embedded systems with GSM phone on a personal network	Master Project Presentation	Daniela Dimitrova	Document
02/08/2004	Noise Reduction in Return Path of DOCSIS Cable Network	Master Thesis Posters	Deepaknath Tandur	Document
02/08/2004	Noise Reduction in Return Path of DOCSIS Cable Network	Master Thesis Presentation	Deepaknath Tandur	Document
27/07/2004	A Study on Open Source Adequacy for	Slides (auth)	Javier Cardona	Document

In this table the documents are listed by a simple chronological order, but it is not of great help to identify the documents of interest. I think that in this case it would be useful to list the projects by alphabetic order, or to have a drop down box in order to search the documents by author or by title of master project (but here there is another semiotic problem about the labels, as we see more ahead).

Landmarks: the access to the main areas of the ALaRI intranet site is well evident in any page you are, thanks also to the main menu always present at the top of the pages.

Backward navigation: unfortunately in this intranet site is present only the back functionality offered by the browser. Any backward button is missing; on each intranet page there is not any backward button to offer the users the navigation to the previous visited page.

Interface Design

During this section I will evaluate the intranet application according to the following aspects: **Semiotics, Cognitive, and Graphics.**

Within the **Semiotics** aspect, it is possible to analyze if the meanings of the messages proposed are understandable by the users. The main semiotic features to take in consideration regard: the string of characters, i.e. the expectation to reach a particular content starting from the meaning of a label; the terms used for titles, headings or keywords to synthesize the contents to which they refer; and the interaction images, i.e. the meaning of any non-textual sign or symbol used for navigation purpose; the macro-areas, i.e. the organization of the messages according to the topic and the meaning of the whole page.

The string of characters

According to this feature, in ALaRI intranet there are troubles concerning the meaning of some labels, which are overlapping or ambiguous and not very clear, or also too specific, while instead the content is more various.

One example is about the labels of the links in the sub-area of Projects and Research, which are “Master Projects” and “Main Projects”.

Accessing this point, it is not easy to perceive where to go clicking on the two links. In fact, even if not very simple to explain, it would be better to offer clearer clues of the different topics the two link labels bring to. The label “[Master Projects](#)” refers to all students’ projects, developed or on-going, in ALaRI institute; whereas the label “[Main Projects](#)” is about those project in which ALaRI is involved as university institute. This distinction is not evident from these labels, and so it would be better to try to find more specific names; a suggestion may be “*Student Master Project*” (instead of Master Projects) and “*Project in which ALaRI is involved*” (instead of Main Projects). This last name is surely longer, but, from my point of view, it can explain better the content of the referred page.

Another example is about the two link labels at the top bar in menu areas: Projects and Research (but in student’s view we found the label All Projects that has the same content) and ReSearch. The titles of the two labels are very similar, but the contents are completely different. In fact the label Projects and Research (and label All Projects) points all the master projects developed by ALaRI students and those projects in which ALaRI is involved as university institute; whereas the label ReSearch points the whole ALaRI repository, i.e. a sort of electronic archives where each person affiliated to ALaRI institute can research the uploaded materials of interest (scientific articles or papers, commercial or internal reports, thesis, books, etc.), selecting the chosen ones and adding them to his/her personal page on the intranet site; or also he/she can upload new materials found elsewhere and considered of utility for the community, so that the new documents can be shared with the others participants. This service improves the possibility of finding useful materials for deepening the own studies and for having suitable landmarks about scientific literature in ALaRI research field. For these reasons the label ReSearch seems to be too generic, while it should be more specific to its content. My suggestion is to re-think the name of this last label, maybe replacing it with a name that can sound like “*Repository of scientific materials*”.

A third example is about two titles in the intranet page All Public Documents, already analyzed in *Navigation* section. In fact, as reported in the figure below, we see two ambiguous headings, which are **Master Project** and **Title**. The first one would indicate the titles of the master projects, and the second the type of document (e.g if it is about a presentation, a report, slides, and so on), but these two headings do not help the general understanding. Further, given that there are also the relative attached documents, I would like to delete the column **Title**, maybe putting other specific information about the type of the document in the page of the project itself.

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Policies My CV People of ALaRI My Project All Projects Career Center ALaRI Jobs Library ReSearch Help Index

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Logout
All Projects
Master Projects
Main Projects
Guiding Themes
Projects Search
All Public Docs

All Public Documents for All Projects

Date	Master Project	Title	Authors	Document
11/11/2004	Routing Scheme in the Spidergon Network-on-Chip	Master Project Presentation	Leandro Fiorin	Document
17/08/2004	Developing Concurrency for a Crypto-Accelerator	Project Report	Abhishek Rastogi	Document
10/08/2004	Design Space Exploration for the FOX Encryption Algorithm	FOX Presentation	WenYu Chen	Document
10/08/2004	Study and Optimization of an IPSec Accelerator Usage Based On Dimension Or IP Datagrams	Presentation Slides	Antonio Taddeo	Document
	Study and Optimization of an IPSec			

Another misleading title appears on the homepage of each user, which is *Getting Started*. This title suggests bringing the user to a not better defined introductory page (even if the homepage should be enough), but – surprise – the user, clicking on it, finds himself on the [Help Index](#) page, as showed in the figures here below:

My CV People of ALaRI Projects and Research Career Center ALaRI Jobs Library ReSearch Grades Help Index

Intranet Home
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Welcome to the ALaRI Intranet

The site is divided into **areas**, which are listed in the upper gray menu bar (Projects and Research, My CV, etc.). By clicking on one of these, a list of the **sub-areas** contained in that area will appear on the left-side vertical menu bar. This vertical bar also contains, in its upper section, links to site-wide accessible pages, such as Intranet Home, Change Password, and so on.

As a Member of the ALaRI Staff, you can:

- View detailed information on all the ALaRI Master Projects and actively supervise those you are involved in, in **Projects and Research**
- Edit Your CV and make it Visible/Not Visible to other Intranet Users **My CV**
- Search for People of ALaRI in the ALaRI Directory in **People of ALaRI**
- Browse Students and Alumni CVs, Post Jobs for them and see their Applications to your Job Offers in **Career Center**
- Manage Part-Time Jobs for the ALaRI students (post, assign, mark them as completed) in **ALaRI Jobs**
- Learn more about the ALaRI Intranet and how to use it in **Help Index**

For Feedback and Queries: negri@alari.ch

[Getting Started](#)

My CV People of ALaRI Projects and Research Career Center ALaRI Jobs Library ReSearch Grades Help Index

Getting Started

The site is broadly divided into the 6 areas you see in the above horizontal gray bar which are Projects, My CV, People of ALaRI, Career Center, ALaRI Jobs and Help Index.

Areas

An area is a collections of pages related to normally one or sometimes more topics. When you click on an area in the top horizontal area bar you are directed to the default sub-area of the area. The other sub-areas in the area are displayed as a list on the left gray bar and can be accessed by clicking on the links. Brief descriptions of the Areas:

- 1) Projects:** Here you can find all the pages related to the ALaRI Master Projects. You can see who is working on what and how each project is progressing, along with its public and private reports. In addition to that, for projects you are associated with (projects you mentor, tutor, or supervise) you may set milestones to actively supervise the work with the project besides the description of the project.
- 2) My CV:** Here you can edit the information about you to be viewed by others. You can also set your information or name not to be shown in the people of ALaRI pages.
- 3) People of ALaRI:** Here you can find the category-wise listing of people associated with ALaRI. Also you can search for names.

Getting Started
Area Help: Projects
Area Help: My CV
Area Help: People
Area Help: Career
Area Help: ALaRI Jb

As final example, we can notice that in **Library** area, there is the sub-area **All Books**, with the title **List of Books**, but it is too specific about the content it refers to. In fact, here there are

not only the books available in the office, but also other documents, such as thesis, CD-ROM, photocopies, proceedings.

The interaction images

According to this feature, I will analyze some troubles that emerge from the lack of conventionality and intuitiveness of certain symbols.

An example can be given by means of click buttons, present in almost all ALaRI intranet pages. They are represented as little squares, with triangles, that link to a specific page (please, see the figure below). Unfortunately they are not conventional signs, and moreover at the first time it is not intuitive to recognize them as links. You have to go around about them by means of the cursor and so you can see that the cursor becomes the classic little hand that shows you the presence of a link, a button to click on.

Visible	Last Name	First Name	Group	Super Group
yes	Abrahamyan	Harutyun	Internship Students	Students
yes	Agosta	Gianpaolo	PolIMI PhD	Faculty
yes	Ahuja	Sumit	Alumni 03-04	Alumni
yes	Alavandar	Saravana Kumar	Alumni 02-03	Alumni
yes	Ansaloni	Giovanni	Advanced Master	Students
yes	Annaout	Talal	Alumni 01-02	Alumni
no	Atasu	Kubilay	Alumni 01-02	Alumni
yes	Bacchetta	Paolo	Alumni 01-02	Alumni
yes	Baghdasaryan	Yelena	MSC 1st Year	Students

Another trouble is that on the pages some words underlined are links, some others are not. But, by now, people navigating on web site and also intranet site, are used to recognize the words underlined as links, so it would be better to distinguish between underlined words that are links and the others that are not, maybe writing these ones in italic. For example in faculty's homepage the words Course Software Installation are underlined, but they do not bring to anywhere.

Welcome to the ALaRI Intranet

As ALaRI Faculty Member, please you can:

- in **Policies** see Course Software Installation
- in **Projects and Research** see My Projects see list of projects you mentor, tutor, and supervise, plus the list
- in **My CV** edit your CV and make it Visible/Not Visible to others
- in **Projects and Research** browse through the Research Work going on at ALaRI, accessing all Public Di
- in **People of ALaRI** see all people at ALaRI
- in **Career Center** Post Jobs and Browse CVs, see Applications to your Job Offers
- in **Help Index** see something more about the ALaRI Intranet and how to use it

for feedback and queries: neqri@alari.ch

[Getting Started](#) [Read ALaRI Policies](#)

The macro-areas

Generally, the main meaning of the messages in the different macro-areas is well grouped according to the specific topic. For this feature, I did not note any particular breakdowns.

Within the **Cognitive** aspect, there are two dimensions that can be evaluated.

One is the cognitive effort of the user while reading an intranet page and it may concern the problem of a page overloaded of information or with redundant terms; the second dimension refers to the understanding of the information architecture, i.e. the whole meaning and the structure of the intranet site (the way the information objects are classified within specific arguments or are separated; and the general mental map of the site)

In this context we can consider the sub-area **Projects Search** that is a mask for researching projects present on the intranet site. Here there are problems regarding the organization of the available information for the research, in the sense that first it is difficult to remember a project by its name; second the term **Abstract** can disorient the user, since it is not common to remember the abstract, but I would suggest using another term, such as *Keyword*; third there would be also useful to have a drop down box to choose the academic year of reference, since there are only 4 years available. Then there is the section of research about the **Guiding themes**, but they are already listed below, with their relevant links.

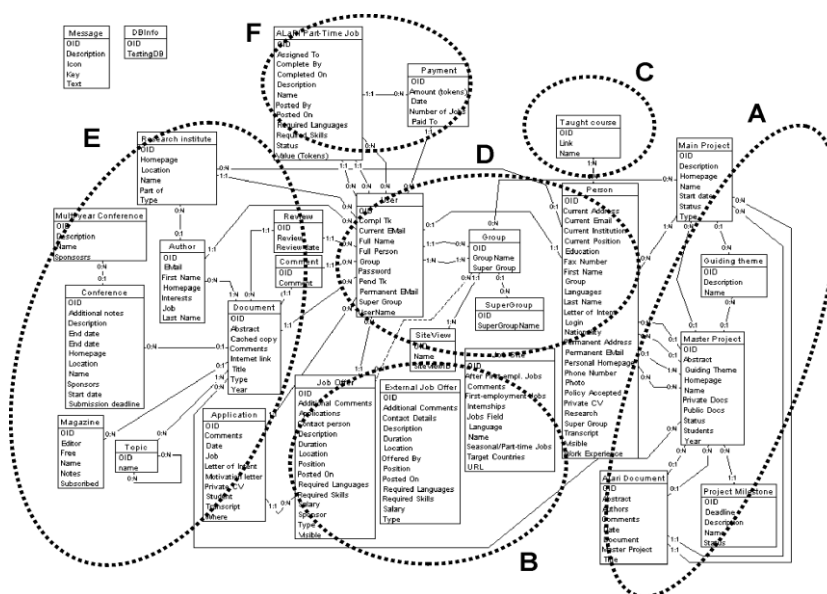
Finally, on this page there are too much information with three research masks (search master project; search main projects; search guiding themes), that could be easily reduced.

The screenshot shows the ALaRI Intranet interface. The header includes the University of Switzerland logo, the ALaRI name, and the text 'Advanced Learning and Research Institute Master of Engineering in Embedded Systems Design'. The main navigation bar contains links: My CV, People of ALaRI, Projects and Research, Career Center, ALaRI Jobs, Library, ReSearch, Grades, and Help Indi. A left sidebar lists various links including Intranet Home, Change Password, Change Group, Intranet Policy, Logout, and a 'Projects and Research' section with sub-links like My Projects, My Former Projects, Master Projects, Main Projects, Guiding Themes, Projects Search, All Documents, and Projects & People. The main content area is divided into three search sections: 'Search Master Projects by...', 'Search Main Projects by...', and 'Search Guiding themes by...'. The 'Search Master Projects by...' section has fields for Name, Abstract, Year (e.g. 2001-2002), and Status, with a Search button. The 'Search Main Projects by...' section has a Name & Abstract field and a Search button. The 'Search Guiding themes by...' section has a Name & Description field and a Search button. Below this is a 'List of guiding themes' with a list of topics: HW/SW for Advanced Applications, IPSEC, Pervasive Computing, and Security for Mobile Systems. Red circles are drawn around the 'Name' and 'Abstract' fields in the Master Projects search, and the 'Name & Description' field in the Guiding Themes search.

Also on the **Library** area in **All Books** page there is an example of redundant information. Here the same meaning is communicated in two different ways. **Available** and **Requested** report if a book is in the office library or it is borrowed, but the result is the same. So I think that only one of the two pieces of information is enough.

As far as concerning the mental site map, I think that in ALaRI case the users are facilitated due to the fact that each of them has access to an own specific navigation area with services and activities useful for their status and position, e.g. the faculty's intranet view is different from student's one.

Instead having the complete mental map of the site would be complex to figure out.



Within the **Graphic** aspects, two features can be considered: the graphic design (that means font size, colors, font type, icons and all the graphic elements) and the layout of the intranet pages (the spatial distribution of the graphic elements).

- Colors: the main colors used are the colors of the logo: blue and silver and their shade – no other color are present. The links clicked become white if they belong to the main menu (on the top bar or on the left side); while they become green if in the text body, but not all. If it were possible to make the color of the links homogeneous, it would be nicer for the “look and feel” of the site.
- Font size and type: now the font is big enough and easily readable. Instead sometimes ago I found it too small.
- Icons: no icons are present, but there are only links.

Generally the lay out is very simple, clear and neat, and kept consistent across the pages. Maybe the layout is also too tidy for a person searching a prettier and nicer graphic design, but it is not to forget that the site is principally built for and used by engineers and technical people.

Also the homepage presents the same simple structure of the other pages, without annoying or cumbersome designs.

Technology

Some technology troubles do not allow performing and completing some task, as here below reported. Problems concern:

- Data changing

In fact, trying to modify personal data on **My CV** page, there is not the possibility to up date them. Clicking on Modify button, I fill in my new data and then I click on the confirmation button, but all data disappear and the fields of the form remain empty. When then I come back to my cv, it is still the old one.

A same problem also results from [ALaRI Jobs](#) area, when I want to modify an assigned job. In fact after having waited for a long time the uploading of the new data, the operation results failed.

- Generation of error without any natural message that can help to understand

During the upload of a document, sometimes it happens that an error is generated, but without any specific feedback, so that it is not clear what action is wrong, what prevents from the correct uploading. For this reason, it would be useful to provide a feedback error using a natural language, not in code, but understandable to the user, that can show of what the error consists.

- Error page using the backward browser

Sometimes using the backward browser, an error page appears; then, clicking on back button again, it appears another page requiring the log-in, but if you click another time on back browser, without doing any log-in, you finally reach the intranet page from which at the beginning you met the first page error. Why?

User-experience inspection (scenario-based)

During this phase, I will put myself in some users' shoes, trying to have an overall view of the intranet site, considering it within the aspects of content, navigation, cognitive and interaction with the application. The use of some scenarios will help my exploration.

I can start to evaluate the site from **ALaRI staff's perspective**.

Two scenarios are taken into consideration.

The first one regards the possibility of monitoring some student's activities, such as in which project he is involved; and change some details of the part-time job assigned to him.

The second one is about the possibility of borrowing a book from the Library.

For accomplishing the first goal, I go on [ALaRI People](#) area, looking for the student I want to monitor. From this area I can select the group in which current students are present, and then search him scrolling the list that is in alphabetic order, or putting his name in the search mask. Once I have found him, I can also see the information related to the project in which he is involved.

Now I try to find him and his project from [Project and Research](#) area, looking in all documents. When I am in the page [All Documents](#) I have a long list of documents in chronological order, but there is not the possibility to search the documents by author. In fact on the page there is a column where the authors are reported, but it is not possible to sort the column by the authors – the names are fixed. Moreover if I go on [Project Search](#) page, where there is a mask that should help me look for a particular project, I see that the field of research by author is missing. What can I do? Or scrolling all the authors to find the one of my interest or leaving this task incomplete.

Then, when I want to change some details of the part-time job assigned to the monitored student, I go on [ALaRI Jobs](#) area, in [Assigned Job](#) page and select the job of my interest. In this case clicking on details it is possible for me to modify some data of the job. For example I could decide to give him more token, and so I change the numbers. But when I want to confirm my change and I click on [commit](#) button, first I have to wait for a long time, but then the operation results failed and the details are still the old ones.

For the second goal, I go on [Library](#) area and search in [All Books](#). Here it is possible to do a research by authors from [Search Books](#) page, but not from [All Books](#) page. The books are listed in alphabetic order and, although there is a column with the authors, it is not possible to sort the books by authors (it would be useful to have a drop down box with authors' names). Then there is some redundant information about the availability or not of a book (two columns specify the status of the book: [Available](#) – [Requested](#), but the final meaning is the same). Further I note that if I want to check some data of a book, like edition or any comments, the relative fields are empty. Finally in [All Books](#) page the content is evident, but besides the books I also find other types of documents (master thesis, presentations, photocopies, etc.), that unfortunately are not categorized.

So from the staff's perspective, general problems that came out are about:

- **Completeness and Richness:** it is impossible to do a research by author/student starting from [Projects Search](#) page or sorting the projects by authors from [All Documents](#) page. Then in [Library](#) area some details of the books are missing, such as [Edition](#), [Comments](#) or [Price](#).
- **Comprehensibility and Relevance:** in the library page the content is evident, but besides the books I also find other types of documents, that unfortunately are not categorized in [All Books](#) page.
- **Interaction flow:** not always the tasks performed bring to a successful operation, e.g. the technical problem to change data concerning part-time job.

Another scenario could be taken from **faculty's perspective**. Putting myself in professor's shoes, I would like to search some information about projects that can be of my interest on ALaRI intranet.

First of all, entering [Project and Research](#) area and then [My Group's Projects](#), I see that intranet site is not well update, because my profile is still in an old group, belonging to a previous company; while since the new academic year 2004-05 this profile has changed the company and moved to another one.

Considering then the projects, there is not a clear difference between the two labels [Master Project](#) and [Main Projects](#) – what they focus on?

Viewing the [Master Projects](#) page, there are two box areas: one of the [Ongoing Master Projects](#), the other of the [Previous Master Projects](#), but they have two different lay out, different graphic design. In fact, even if they contain the same information, one seems to be more compact, whereas the second is too extended and it creates a not very pleasant visual impact. Which is the reason?

Then clicking on a project to see the public document, I find a power point presentation, but it is not easily readable, due to figure and text animations, instead to be fixed – it takes too long time to read the document.

Further if I am interested in a particular project, the possibility to get more involved in it lacks. In fact there is not a direct way to contact people working (or having worked) on that project. But it would be nice to offer also authors' direct e-mail contact to ask more information, and to subscribe to the project of interest for receiving the master thesis.

Instead in [Main Projects](#) section, some projects do not show public document, and also authors' or sponsors' names are not available. How can I guess who is in charge of those projects?

Then, if I want to search some projects using the search mask in **Projects Search** section, it would be useful to have a drop down box to sort the project by year, since only a few years are available; and another field to sort by main or master projects. Further there are other two research masks on the same page, the one is **Search Main Projects**, the other is **Search Guiding themes**. But these two are useless, because first it is possible to search only by **Name & Abstract** or **Name & Description** – with the difficulty to remember project names –; second it is already present the **List of guiding themes** where there are the four principal themes (*HW/SW for Advanced Applications*; *IPSEC*; *Pervasive Computing*; *Security for Mobile Systems*) with the links to their relevant area.

Finally, going on **All Documents** section, there is a table split up in to five columns, where two headings are not very clear: **Master Project** and **Title**

These two headings create a little bit of confusion, because the first one presents the title of each master project, whereas the other is for nothing clear what it means. In fact under the heading **Title** there is a strange list (Master Project Presentation; Project Report; FOX Presentation; Presentation Slides; Poster Slides; Slides (pdf); Cover; Giaconia_slides), that is not evident to what it refers.

So from the faculty's perspective, general problems that came out are about:

- lack of information updated;
- overlapping labels;
- ambiguous and not clear headings (**Master Project** and **Title**), with consistency problem, since the label **Title** does not match with what is written in its column and it does not give any help or suggestion to guess something more;
- no possibility to have direct contact with authors or sponsors of the projects
- redundancy of information
- not consistent graphic representation

Last scenarios I have considered are about **students' perspective**. Here a student might want to reach two main goals:

- submit his application for a part-time job, that has been posted on **ALaRI Jobs** area, on intranet site, by ALaRI staff; and
- manage the own area in **My Project**, uploading his private and public documents.

In the first scenario (i.e. submit application for a part-time job), I want to check the details of the jobs offered, in order to better know the kind of the job proposed and in concrete what I have to do.

Unfortunately not all the jobs report in their details the description of the activity, so that becomes a problem to know of what they consist. Further also the deadlines of the job are not assigned, so that I cannot know by what time they need the job completed.

For students, these shortages are troubles, because they have to split time between study and part-time jobs, but in this way, not knowing important details, they cannot well organize the work.

Then, if I choose to submit my application, after having checked the details, I have to come back to the previous page (obviously using the back browser – remember that there is not any backward button on the intranet page), where there is the list of the jobs posted and click on **Apply for this Job**, since from the page of the details it is impossible to submit the application. There is not any button to apply for the job selected when you are in details page.

Performing the second scenario (i.e. manager the area in **My Project**, uploading private and public documents), I want to up load a document. The first problem met is about the labels: **Private Documents** and **Public Documents** in **My Project** area. In fact they do not explain in a clear way that it is possible to up load documents. At first sight, they seem suggesting only that they contains private or public documents in general, but clicking on them I can verify that their utility is to up load documents exclusively.

The screenshot shows the ALaRI Intranet interface. The main header includes the university logo and navigation links. The left sidebar contains a menu where 'My Project' is selected, and 'Private Documents' and 'Public Documents' are highlighted with red circles. The main content area is titled 'Upload New Private Document' and contains a form with the following fields: Date (21/12/2004), Title, Authors, Abstract, and Comments. At the bottom of the form are a 'Document' field with a 'Browse...' button and a 'Create' button. The right sidebar contains a 'TIP: Documents' section and an 'About Private and Public Documents' section with a warning and note.

Then, filling in the data, it results impossible to up load the document if some fields are not completed. The problem is that the error message occurs not at the beginning, but only at the end of the creation of the document, and it is not even clear. The error message is not functional, because it does not give the necessary information to understand what is wrong or what is missing, uploading the document. Only coming back with some clicks it is possible to understand that fields, such as **Title** and **Abstract**, are compulsory to filled in.

Instead, in case the document is uploaded with success, there is not any message that confirms the correct operation. I mean that any confirmation feedback lacks, so that I cannot be sure if the document is available to the relevant users (all the users, if the document is public; only users working with me on the project, if the document is private).

Another problem regards the interaction with this service due to some misleading labels that do not allow understanding and accessing correct information. In fact, after having clicked on the **create** button (to up load documents), it appears the button **details**; but clicking on it to check if the document is correctly uploaded, a page with a blue link **document** occurs – at this point clicking on the blue link **document** an error message is received, but absolutely not understandable, due to it is in a system code, without any other specification.

So from the students' perspective, general problems that came out are about:

- lack of some information; that means lack of completeness and richness in part-time job details;
- effectiveness to perform some activities; that means to improve the capability of the user to attain his goals, adding for instance some facilities, such as the availability of the **Apply** button in job details page; or the possibility to up load a document in a more intuitive way;

- predictability of some contents, such as from the two labels **Private Documents** and **Public Documents in My Project** area;
- lack of comprehensibility; both about the message of the occurred errors, and about the success of an activity, e.g. no any feedback if the document is correctly uploaded;

Summarizing the results from these students' scenarios, I cannot say to be satisfied with these two services explored, since it becomes complex and a little be hostile to perform the tasks requested to accomplish the final goals.

User Testing

In this phase I will verify user problems, interviewing some real users who can help me giving more reasons for justifying problems found during the technical and user experiences inspection. Moreover the real users can also help me discovering other problems not seen before.

The ALaRI network currently counts roughly 135 students (including current and former ones – the alumni - from the four past editions of the master), 50 between sponsors and industrial collaborators, 35 faculty members, 10 scientific council members and 8 staff members.

All people taking part in ALaRI activities can influence the ALaRI intranet design. They are also an important source in order to better understand the usability and the suitability of the intranet for their needs and goals.

Professor

I asked professors to perform the goal about searching some students' curricula of interest, paying attention also to the general structure of the content, the degree of clearness of labels, headings and links. Some results stood out, adding new important details to my previous analysis concerning this profile.

During the navigation, it was very strange for the professor to log in the intranet and at the beginning, before the homepage, to see the [Policy](#) for the faculty on the first page. From this start, he did not know how to go on.

The problem is that usually appears the homepage with information concerning the navigation system and the contents. But in this case it was necessary to scroll the page and accept the policy clicking on the [accept](#) button, before entering the homepage automatically.

- problem of navigation about lack of orientation clues and the non-predictable result

Further, professors confirmed problems discovered about:

- labels overlapping (i.e. different labels having a similar meaning), e.g. [Intranet Policy](#) label (the general policy of the intranet on left menu) and [Policies](#) label (the specific policies and rules for faculty members on top menu bar) create confusion; and also e.g. the two labels: [Master Project](#) and [Main Project](#)
- links not visible, due to lack of conventionality and intuitiveness. The user cannot recognize if some underlined words can be clicked on, or where it is possible to click to move from a page to another.

Then, researching some interesting curricula, the professor realized a lack of some information to better evaluate and choose among the students' available curricula.

In fact entering the [Career Center](#) area and then the [Cv Search](#) page, he would like to search the CVs sorting by *visa and work permission* (information that would be useful to have as

fields to be filled in also in [New Job Offer](#) – the page dedicated to posting a job on behalf of faculty members, sponsors or industrial collaborators). Having information about visa or work permission is a critical aspect for European companies that would like to employ people. In fact, as professor explained, “... in a company environment is more complex and difficult to employ people coming from extra European Union countries” – so knowing before if they have got visa or regular permission is very important.

Moreover, always in [Cv Search](#) page, the professor would like to carry out CVs research by selecting the candidates on the basis of their skills (technical and scientific knowledge, e.g. programming languages skills), rather than searching by [Name](#) or [Current Institution](#), as it is actually.

The screenshot shows the ALaRI Intranet interface. The header includes the logo of the Università della Svizzera italiana and the text 'ALaRI Advanced Learning and Research Institute Master of Engineering in Embedded Systems Design'. The main navigation bar contains links: Policies, My CV, People of ALaRI, Projects and Research, Career Center, and Help Index. On the left, a sidebar lists various links including Intranet Home, Change Password, Change Group, Intranet Policy, Logout, Career Center, All Student CVs, CVs by Group, CV Search, My Job Offers, New Job Offer, and Applications. The main content area is titled 'Search CVs by...' and contains a form with the following fields: Name, Nationality, Languages, Current Position, and Current Institution. A 'Search' button is located below these fields. Below this form is another section titled 'Full Text CV Search' with a 'Find...' input field and a 'Search' button.

A last note from the professor’s navigation comes from the suggestion to receive, directly on his current e-mail box, an e-mail message, that lets him know that somebody has applied for a job posted by him.

In fact it might happen that he checks the intranet site only sometimes, not regularly, and so he might not see the application request/s on behalf of the students for too much time.

ALaRI staff member

Besides the problems found out during the previous analysis of this profile, another trouble stood up about borrowing a book from the Library. In fact when I asked the user to carry out this goal, she noticed that it would be very useful also adding a reference code to each book or text that is contained in the office library and reported them also on intranet Library.

In fact in this way it would be easier to search the books not only in library office, but moreover on intranet site; while now they are sorted by alphabetic order.

ALaRI students

Generally, asking the students to carry out the same tasks of the previous analysis – i.e. submit application for a part-time job; and uploading private and public documents - they confirmed my results.

They need a more intuitive interface to perform their goals, providing them with a clearer meaning of the labels. Further it is useful to offer more accurate messages during the execution of the tasks, so that they can complete their activities in a correct way.

Synoptic of Usability problems

Summarizing the problems that came out from this analysis, it is possible to distinguish them between the more serious and critical ones, and the minor problems.

Obviously, I will not treat all the positive aspects that already contribute to the success of the intranet site.

Serious and Critical problems

About Interface Design: semiotics, cognitive and graphic aspects:

- Ambiguous names of some labels and headings, that do not help the user understand the contents to which they refer (*Main Projects – Master Projects; Master Project and Title*, on All Documents section);
- Overlapping meaning of some labels (*Intranet Policies – Policies; Project and Research – ReSearch*);
- Misleading titles, such as *Getting Start* on homepage, or some labels that should lead to up load documents (in *Private Documents – Public Documents* on *My Project* area);
- Not conventional symbols for some links, such as little squares with triangles;
- Some underlined words are not links;
- Overloaded or redundant information, such as on *Project Search* page, and on *All Books* page;
- Consistency of position – in particular when the user enter the first time the intranet site, the policy appears as first page, and he has to read it (scrolling the page) and accept it (clicking the button at the end of the page), before entering his specific homepage.

About Navigation:

- Self-evidence some interactive elements, such as links, are not immediately evident, but only if the cursor goes on it, otherwise they are not recognizable (the little squares with triangles);
- Predictability: some links not allow predicting what their content is about (such as on *All Public Documents* page, where there is a not very evident link, close to the master project, but there is also another link for the related document – so the question is: to what kind of page the link near the master projects will bring me?);
- Accessibility to some pages requires too many links, such as for reaching public documents from Guiding Themes (sub-area of Projects and Research);
- Segmentation problems: sometimes some pieces of information are split up in too many sub-areas (see *Projects and Research*; and *ALaRI Jobs* areas).

About Content:

- Lack of Richness and Completeness of some details on certain pages, that can also improve the navigation for reaching some information of interest, such as the possibility to sort a project by author; or to search a particular curriculum by candidate's skills or visa and work permission;
- Lack of feedbacks at the end of an activity that can confirm or not the success of a task (for instance the uploading of a document).

About Technological aspects:

- Problems about modifying some data, such as private information in the own CV or information about details of an assigned job;
- Generation of errors without feedback or clear explanation.

Minor problems

- No all details of the books and part-time jobs offered are complete and filled in into their masks;
- lack of facilities to perform a task, such as the submission of application for part-time jobs;
- problems about scrolling long list of documents, projects and books;
- power point presentations with animations;
- lack of back button on intranet pages (there is only the back functionality offered by the browser);
- one piece of information is not updated
- general “look and feel” of the site too austere and squared;
- multilinguisticity problem, due to the intranet site and relative documents are available only in English language (so they are accessible only to people knowing English).

Requirements for Improvement

Considering the possibility of improving the intranet site usability, I would suggest that you should take into consideration the following requirements, divided according to the aspects of interest.

About Interface Design: semiotics, cognitive and graphic aspects

- write labels with names that can suggest the contents of their pages, allowing clear navigational choices to the user;
- try to better distinguish the names of similar labels, so that the user can choose the right link, anticipating the related content and the effects of the interaction;
- choose conventional symbols to link on them, such as making linkable not only the little squares, but also the correlated words close to them, so that the user is pushed to click on them;
- choose another strategy to put on relevance some words, rather than underlining them, since these words would be too similar to the conventional signs for linking them;
- reorganize the *Projects Search* page with only necessary information; and delete redundant information where present;
- modify the presentation of the policy – maybe putting it as visible link, but not as first page when the user enter the first time (it is too noisy and at the first time it disorients the user);
- uploading of static document, without animation such as in some power point presentations.

About Navigation

- make predictable and self-evidence the interactive elements to anticipate the related content;
- reduce the path to access to some information;

- organize the segmentation of some sub-areas in a better way;
- offer more facilities to perform a task, such as the submission of part-time job application;
- add some details and facilities for improving the research of projects and curricula of interest;
- provide back button on intranet pages.

About Content

- provide feedbacks at the end of an activity that can confirm or not the success of an activity (for instance the uploading of a document);
- multilinguisticity: offer the site available also in other languages, not only in English;

About Technology

- allow to modify data on private curriculum and part-time job details;
- provide feedbacks of errors using a natural language, not in code, but understandable to the user, that can show what the error consists of.

Interviews and field notes in 2007

Interviews with ALaRI Lecturers

1. (10Jan07)

Dear Professor, the questionnaire here below would like to investigate how to improve the use of the intranet system among ALaRI actors, making light of the main critical aspects, and taking into account your considerations and suggestions.

The questionnaire will help to focus on what are up to now and what could be in the next future the role and the benefits/drawback of the intranet within the ALaRI institute.

At the beginning, there are some questions about your general knowledge of the alari intranet, in order to evaluate how the promotion of the tool has been managed.

Then, more specific questions about the use, the usability, and the usefulness of the intranet services follow.

Please, note that for intranet I always mean the ALaRI intranet.

Thank you in advance for you time and collaboration.

Please, before entering the intranet, answer the following questions.

1. Since when have you been teaching at ALaRI? 2000

- a. When have you known about the ALaRI intranet the first time? 2004 or 2005 (can't recall correctly)
- b. Have you ever been asked for an interview about the intranet requirements that can be necessary and important for you? No
- c. Have you never received the document here enclosed (please, see the file Faculty_requirem_dec2002)? probably not (but, I may have forgotten about it)
- d. What do you think about the features presented in this document (Faculty_requirem_dec2002)? – Is it clear for you this presentation of services?

It pretty much covers everything I'd consider necessary. Possibly, an addition of a mailing list would be useful as well to cover announcements, etc. Also, something along the lines of a wiki-like tree (easily editable) to be able to add links, etc.would help to capture things like external pointers, etc.

- e. Have you never received any kind of communication (via e-mail or other) about the first release of the intranet system and its functionalities?

I seem to recall some early communication. However, consider that some teachers (like me) only teach once a year, so a yearly reminder would probably be necessary so that I don't forget access details, etc.

- f. In your opinion, the ALaRI intranet system has been promoted in a sufficient way? Probably not, and I have the impressions that students don't use it that much either.

- g. Do you know what services and functionalities are offered on the current ALaRI intranet? Not all of them certainly.

- h. What services are you expected to find on the intranet?

Upload course material

Browse other courses (important to understand overlaps, prereqs, etc.)

Make announcements

Bulletin-board style discussion to cover common Q&A threads

A wiki-like page to add course information and related links.

Mailing list and information for all students attending the course

i. In your opinion, what important services and information should be present?

See above

Please, now enter the intranet system with your log-in and password

See and browse the services offered:

- a. Have you seen and read the alari policy to be accepted on the intranet home page?
yes
- b. Please, scroll the page down and accept it. Now you will have a shorter and clear home page.
- c. Please, tell me your first impact and considerations (if you have something to say):
reasonably clean page, with information where you'd expect it to see.
however, it's missing a link to courses
- d. Do you think that you will have any problem/trouble in order to remind your log-in and password?
yes, please provide a way to search for the name at least
- e. What services would you like to add? **bulletin board, wiki**
- f. What services would you like to improve? **Search**
- g. What services would you like to remove? **None**

Now, please, try to carry out some actions/tasks in specific areas/scenarios:

The aim of the following questions is: a) see whether the more important tasks on the intranet are clearly understandable and easy to perform or not; b) identify the main lacks of data/information and what does not work on the intranet; c) verify the utility and efficiency of some services.

- a. check your data, and if necessary update them **ok**.
- b. try to check any student's cv **ok**
- c. May you be interested in knowing his/her background/skills? **that's already in the CV**
- d. What other cvs could be interesting for you / which group do they belong to?
- e. What other data/information you would like to be visible on the public cv?

homepage link

I'd like to be able to search for a student and to list students enrolled in a specific course, and to know which other courses students have taken. The course pages theoretically list students, but that information seems to be very stale. For this year's VLIW course, I see 0 students (but had about 30 in the class) and I see 1 student for 07/08... If you could make that information fresh, it'd be very helpful.

- f. Search a project of your interest.

Have you met any difficulty? Which ones? **No problems, all info looks ok.**

You are missing a contact name in case someone wants to know more about the project and who's working on it.

- g. check the report uploaded by a student in your project team **I don't have a project team**
- h. upload your corrections and notes to the student's report

No project team. However, it'd be good to extend this functionality to exam reports as well. This way I could provide feedback directly to the students.

- i. post a new job offer. Have you met any difficulty? Which ones?

No problems. Make sure you manage links correctly. Most job offers are likely to point to a company recruiting website.

Entering the Courses platform from the ALaRI web site home page – bottom menu (please, note that log-in and pw are the same of the intranet), you should try to:

- j. check your course information

Why do I need to go back to the home page. Add a link to courses from the intranet please!

- k. Upload your teaching material resources No problem

The course pages are less useful than I expected. Even if I can't enter grades, I'd still like to be able to read at least the names of the students that have signed up for my class, and have that info linked to their CV and possibly the other classes they're attending, and the projects they're part of. I'd also like to be able to browse other course material, but either that is well hidden or I don't seem to be able to.

At the end,

- Do you think that could be useful an intranet training to use this information system?

No, intranets should be self documented. Nobody has time to take courses.

- if yes, how would you like the intranet training to occur?
 - o Providing a detailed Help Index online (both for the intranet and for the Course platform)
 - o Providing slides explaining the various intranet services and functionalities with screen-shots
 - o Via conference call
 - o At the alari institute - maybe during a break – providing an ad hoc training for each lecturer

Probably, only the help index online, as long as it's up to date.

For our administration office, some your personal data are requested in order to go on with dossier, such as refund forms.

In order to speed up the dossier, would you be available to fill a fund form/template in with your data (name, title of your course, and period of teaching at ALaRI), and send it to the alari administration office via intranet?

Yes, that would be an improvement over paper filing.

Any your additional comments is very welcome

I think you have most of the stuff that's needed. You probably need only to publicize it more and make it “mandatory”, so that – for example – teachers are forced to upload their material instead of emailing it. This way, you'll raise the awareness, and get people using it. I couldn't find the “forum” area (or bulletin-board, etc.) where to get conversations going with students. This would be a major improvement. Also, making sure that all course materials are available to teachers would improve cross-course interaction and possibly remove some overlaps.

Finally, you absolutely need to have student lists that are up to date. Force students to sign up for a class in the intranet that should be easy enough and would make the life of teachers definitely easier.

Questionnaire about the ALaRI intranet platform (10Jan07)

Criteria: ease of use

How attractive is the interface?

- ☐ 1 (not at all attractive) ☐ 2 ☐ 3 ☒ 4 (very attractive)

Is the interface easy to understand?

- ☐ 1 (very difficult) ☐ 2 ☒ 3 ☐ 4 (very easy)

Do you think additional training is needed for using the platform?

- ☒ Yes, couldn't use the system without additional training
☐ No, all the information needed for using it is available onsite

Was the training (if provided) sufficient?

- ☐ 1 (not sufficient) ☐ 2 ☐ 3 ☐ 4 (sufficient)

The help index for using the platform is:

- ☐ 1 (not useful) ☒ 2 ☐ 3 ☐ 4 (very useful)

Does the organization of menus and links facilitate your navigation in the platform?

- ☒ 1 (not at all – they are confusing) ☐ 2 ☐ 3 ☐ 4 (yes – they are clear and helpful)

How would you rate the quality of the graphic interface design:

- ☐ 1 (very low) ☐ 2 ☐ 3 ☒ 4 (very high)

The ALaRI intranet document search is a helpful tool for finding information:

- ☐ 1 (not at all helpful) ☒ 2 ☐ 3 ☐ 4 (very helpful)

How easy it was to organize your documents into virtual folders?

- ☐ 1 (very difficult) ☒ 2 ☐ 3 ☐ 4 (very easy)

Criteria: degree of use, usefulness, quality

How accurate are the documents provided?

- ☐ 1 (not at all accurate) ☐ 2 ☒ 3 ☐ 4 (very accurate)

How useful is the information on the intranet for your work?

- ☐ 1 (not at all useful) ☒ 2 ☐ 3 ☐ 4 (very useful)

How often did you use the intranet system?

- ☒ 1 (never) ☐ 2 (seldom) ☐ 3 (often) ☐ 4 (every time I needed some new information for my work)

Communication tools: chat, forum**Criteria: usefulness**

In order to communicate with your project team, do you think that could be useful to have a communication tool such as chat or forum on the intranet?

- j. chat
☒ 1 (not useful) ☐ 2 ☐ 3 ☐ 4 (very useful)
- k. forum
☐ 1 (not useful) ☐ 2 ☐ 3 ☒ 4 (very useful)

Rate how well these communication tools could support collaboration among students:

- h. chat
☒ 1 (very badly) ☐ 2 ☐ 3 ☐ 4 (very well)
- i. forum
☐ 1 (very badly) ☐ 2 ☐ 3 ☒ 4 (very well)

Rate how well these communication tools could support collaboration between students and lecturers:

- l. chat
☒ 1 (very badly) ☐ 2 ☐ 3 ☐ 4 (very well)
- m. forum
☐ 1 (very badly) ☐ 2 ☐ 3 ☒ 4 (very well)

Master projects planning and development**Criteria: degree of use**

How many master projects have you been involved in?

- ☒ 1 (no one) ☐ 2 ☐ 3 ☐ 4 (many)

2. (15Jan07)

Please, before entering the intranet, answer the questions.

1. Since when have you been teaching at ALaRI? 2000
 2. When did you know about the ALaRI intranet the first time? 2006, a.a. 05-06
 - a. Have you never asked for an interview about the intranet requirements that can be necessary and important for you? NO
 - b. Have you never received the document here enclosed (please, see the file Faculty_requirem_dec2002)? Forse l'ho ricevuto, ma non ricordo, non l'ho mai fatto - si utile funzionalità, forse solo il tool
- Ho sempre contattato per e-mail Bondi per tutto quello che si doveva fare (orari schedule, materiale, etc.); da quest'anno interagisco con studente incaricato di caricare e preparare materiale didattico
3. In your opinion, the ALaRI intranet system has been promoted in a sufficient way? Ma io non lo uso mai; mando solo e.mail agli studenti
 4. Do you know what services and functionalities are offered on the current ALaRI intranet? No, non lo so

5. What services are you expected to find on the intranet? what important services and information should be present? *Elenchi studenti, upload materiale didattico, e voti in maniera riservata – magari potendo inviare commenti personali a UB; trovare info riguardo I sevizi a lugano (hotel, ristoranti etc.)*

Please, now enter the intranet system with your log-in and password

See and browse the services offered:

- Have you seen and read the alari policy to be accepted on the intranet home page?
Si, policy letta e accettata
- Please, tell me your first impact and considerations (if you have something to say):

Ok, va bene – vado avanti (vede i diversi servizi – spiego brevemente l'impostazione generale)

- What services would you like to add? *Supporto a chi viene da fuori, una mappa della città, dov'è la stazione, dove si può andare mangiare (magari, aggiungo io anche gli orari, visto che a Lugano chiude tutto presto!)*
- What services would you like to remove? *(le policy – all'inizio non capiva a cosa servissero -)*

Nota come l'help index non sia ben strutturato e fuorviante la label “getting Start”. Poi cliccando su un link titolo della policy, si entra nello specifico della policy, ma si aspetterebbe invece di entrare nel vivo della funzionalità del servizio

Now, please, try to carry out some actions/tasks in specific areas/scenarios:

The aim of the following questions is: a) see whether the more important tasks on the intranet are clearly understandable and easy to perform or not; b) identify the main lacks of data/information and what does not work on the intranet; c) verify the utility and efficiency of some services.

1. check your data, and if necessary update them – *ok, trovato subito come editare e aggiornare, - infatti aggiorna - ma purtroppo si può modificare solo una e.mail (la current), non l'e-mail “permanent”*
 - a. *controlla anche le persone nella people directory.*
 - b. *Non trova De Micheli tra i docenti – forse dico io è nello steering committee, ma si dovrebbe aggiornare anche nel gruppo faculty*
2. try to check any student's cv – *non compaiono i cv student privati, ma solo il cv pre-definito e neppure loro foto*
 - a. *May you be interested in knowing his/her background/skills? si*
 - b. *What other cvs could be interesting for you / which group do they belong to? Docenti*
 - c. *What other data/information you would like to be visible on the public cv? Si le foto studenti, sarebbe interessante vederle. Osservazione: la divisione in gruppi non si capisce, non è facile interpretare a quali persone si riferiscano, chi appartiene a questi gruppi – si dovrebbe mettere una nota, legenda con spiegazione “di sti cosi” (i.e. dei gruppi)*
3. Search a project of your interest. – *non si aprono i documenti pubblici*
 - a. *post a new job offer. Have you met any difficulty? Which ones? Si, nel search non si riesce a vedere i curricula private degli studenti*

Entering the Courses platform from the ALaRI web site home page – bottom menu (please, note that log-in and pw are the same of the intranet), you should try to:

4. check your course information - ok
 - a. Have you met any difficulty? Which ones? *Gli studenti che seguono il corso non sono aggiornati: l'intranet ne riporta solo 12, ma proprio oggi in classe erano una trentina. Sono invece aggiornati gli studenti che avevano seguito il corso l'anno scorso*
5. Upload your teaching material resources
 - a. Have you met any difficulty? *Yes, quando si chiude un documento si viene buttati fuori dal sistema – bisognerebbe fare in modo che il documento si apra in una propria finestra indipendente*

(Sorry, but the area about assigning marks to students is not yet ready – there still are some technical problems to solve) – *prova comunque a fare l'upload dei voti, ma l'operazione risulta essere molto contorta - il prof non sa la scala voti, pensa sia ancora da 1 a 5 ma ora è stata adeguata a quella USI, e quindi è da 1 a 10 – prova ad assegnare comunque i voti, “bisognerebbe semplificare, così ci vuole una vita, mi aspetterei di vedere un form con nome studenti e possibilità di fare un cut and paste da excel x assegnare i voti” – altrimenti mando il mail a Bondi e ci pensa lui*

At the end,

Do you think that could be useful an intranet training to use this information system?

Sì, un tutorial online, tipo quello Microsoft che fa una simulazione d'uso tramite un video, che fa vedere le features + importanti: come si carica il materiale, come si assegnano i voti, le info sui progetti – un video che dura al max 5 minuti. No le slide perchè la gente non le legge

For our administration office, some your personal data are requested in order to go on with dossier, such as refund forms.

In order to speed up the dossier, would you be available to fill a fund form/template in with your data (name, title of your course, and period of teaching at ALaRI), and send it to the alari administration office via intranet? *Sì, l'unico problema è quello che bisogna anche inviare le ricevute delle spese sostenute – potrebbero accettare i pdf, scannerizzati delle ricevute.*

Questionnaire about the ALaRI intranet platform (15Jan07)

Criteria: ease of use

How attractive is the interface?

- ☐ 1 (not at all attractive)
 ☐ 2
 ☒ 3
 ☐ 4 (very attractive)

Is the interface easy to understand?

- ☐ 1 (very difficult)
 ☐ 2
 ☐ 3
 ☒ 4 (very easy)

Do you think additional training is needed for using the platform?

☒ Yes, couldn't use the system without additional training – *un tutorial online, tipo video Microsoft*

☐ No, all the information needed for using it is available onsite

Was the training (if provided) sufficient?

- ☐ 1 (not sufficient) ☐ 2 ☐ 3 ☐ 4 (sufficient)

The help index for using the platform is: **un po ti confonde, perchè clicchi getting start e vai sull'help index - non ben chiaro per descrizione label e indicazioni generali (getting start/help index)**

- ☐ 1 (not useful) ☐ 2 ☐ 3 ☐ 4 (very useful)

Does the organization of menus and links facilitate your navigation in the platform?

- ☐ 1 (not at all – they are confusing) ☐ 2 ☐ 3 ☒ 4 (yes – they are clear and helpful) – **tranne la sezione voti nella course platform**

How would you rate the quality of the graphic interface design:

- ☐ 1 (very low) ☐ 2 ☒ 3 ☐ 4 (very high)

The ALaRI intranet document search is a useful tool for finding information: **si, ma non funzionava – sembra che manchino i documenti da vedere (ci sono i file, ma non compaiono i docs)**

- ☐ 1 (not at all useful) ☐ 2 ☐ 3 ☐ 4 (very useful)

Criteria: degree of use, usefulness, quality

How accurate are the documents provided? – **mancavano documenti da vedere: quando si cliccava sul link del documento non si apriva nulla – come se non fossero stati caricati**

- ☐ 1 (not at all accurate) ☐ 2 ☐ 3 ☐ 4 (very accurate)

How useful is the information on the intranet for your work?

- ☐ 1 (not at all useful) ☐ 2 ☒ 3 ☐ 4 (very useful)

How often did you use / are you planning to use the intranet system? – **prima non utilizzata, ora la userò più spesso quando ne ho bisogno**

- ☐ 1 (never) ☐ 2 (seldom) ☐ 3 (often) ☐ 4 (every time I needed some new information for my work)

sarebbe molto utile e importante avere una parte sull'orario delle lezioni, per definire lo schedule dei docenti, tipo una tabella on line con lo stato dell'arte, visibile ed editabile solo dai docenti e con supervisione di UB

Communication tools: chat, forum

Criteria: usefulness

In order to communicate with your project team, do you think that could be useful to have a communication tool such as chat or forum on the intranet?

a. chat

- ☐ 1 (not useful) ☐ 2 ☐ 3 ☐ 4 (very useful)

b. forum

- ☐ 1 (not useful) ☐ 2 ☐ 3 ☒ 4 (very useful)

Rate how well these communication tools could support collaboration among students:

- a. chat
☐ 1 (very badly) ☐ 2 ☐ 3 ☐ 4 (very well)
- b. **forum**
☐ 1 (very badly) ☐ 2 ☐ 3 ☒ 4 (very well)

Rate how well these communication tools could support collaboration between students and lecturers:

- a. chat
☐ 1 (very badly) ☐ 2 ☐ 3 ☐ 4 (very well)
- b. **forum**
☐ 1 (very badly) ☐ 2 ☐ 3 ☒ 4 (very well)

Sarebbe utile poter postare risposte a domande degli studenti, così che le risposte e le domande possono essere visibili da tutti i partecipanti al corso

Utile anche essere avvisato nella propria mail box quando arriva una domanda – il docente dovrebbe anche poter scegliere l'indirizzo e-mail cui far pervenire le richieste, così se ha un'assistente le può indirizzare a lui

Problema attuale: discreto traffico di e-mail che arrivano singolarmente, ma chiedono tutti stessa cosa, hanno stessi problemi sul tool, fanno domande molto simili. Con un board su cui mettere domande e risposte, anche gli studenti risparmiano tempo, perché vedono se c'è già la risposta che cercano – visto che spesso le domande sono simili

Change password: problema baco perché compare pw in chiaro, ma non dovrebbe essere così

3. (13Feb07)

Please, before entering the intranet, answer the following questions.

1. Since when have you been teaching at ALaRI? Academic year 2001 – beginning of ALaRI master
2. When have you known about the ALaRI intranet the first time? in 2003 – exactly when David started the development of the intranet and released the first system
 - a. Have you never asked for an interview about the intranet requirements that can be necessary and important for you? No, nobody asked me about my needs on an intranet system
 - b. Have you never received the document here enclosed (please, see the file Faculty_requirem_dec2002)? Yes, probably I got it, but I do not remember it, I did not pay so much attention – this document is more oriented to inform about some functionalities, than to investigate if these ones or others could be of interest for a lecturer
 - c. Have you never received any kind of communication (via e-mail or other) about the first release of the intranet system and its functionalities? I received the e-mail announcing the intranet release with my username and password, but from that date I have not received any updating about the intranet functionalities – prof kept the first email received from David in 2003 – but then he was not more informed about other services, such as the Courses platform

- d. *In your opinion, the ALaRI intranet system has been promoted in a sufficient way?*
No
- e. *Do you know what services and functionalities are offered on the current ALaRI intranet? I am interested only in updating my personal data, and get information about my students class (see the names of the students and their photos, this latter very useful)*
- f. *What services are you expected to find on the intranet? Upload my course material, assign marks*
- g. *In your opinion, what important services and information should be present?*

It is not important to follow the development of a master project from the intranet: it is useful only for store final documents/reports about the projects (not all the steps – for this operation I prefer to use the e-mail to interact with the students)

Please, now enter the intranet system with your log-in and password

See and browse the services offered:

-
- *Have you seen and read the alari policy to be accepted on the intranet home page?*
Yes
 - *Please, scroll the page down and accept it. Now you will have a shorter and clear home page.*
 - *Please, tell me your first impact and considerations (if you have something to say):* -
listen to the registration
 - *Do you think that you will have any problem/trouble in order to remind your log-in and password? – it does not seem*

Now, please, try to carry out some actions/tasks in specific areas/scenarios:

- *check your data, and if necessary update them* ok
- *try to check any student's cv – he tried from career center area, but no curricula appear searching by student name*
- *post a new job offer*
 - b. *Have you met any difficulty?* yes
 - c. *Which ones?* Students' cv do not appear searching them by student's name on career area. **Too complicated: it is a jungle of pages and links, not user friendly for a person entering the system two times a year**

He suggests that the system would be easier to access, such as other web platform like iss_aachen.de or hipecac

Entering the Courses platform from the ALaRI web site home page – bottom menu (please, note that log-in and pw are the same of the intranet), you should try to:

- *check your course information – ok*
- *Have you met any difficulty?* Course presented are not in chronological order, it is not easy to understand the logic of info organization.
- *Upload your teaching material resources - difficult to understand how to do, it is better to have somebody to whom send the material that will be uploaded.*
- *Have you met any difficulty? Which ones?* *area about assigning marks to students: too complicated*

At the end,

- *Do you think that could be useful an intranet training to use this information system?*
Persons, like me, do not have time to spend on learning about use the systems. The current hel index is too long to read; it should be better be informed by a staff person or a student at ALaRI who can show quickly the activities necessary that I can do – consequently the systems should be more intuitive
 - o if yes, how would you like the intranet training to occur? Providing a detailed Help Index online (both for the intranet and for the Course platform) - No

Questionnaire about the ALaRI intranet platform (13Feb07)

The professor interviewed refused the questionnaire, *saying that he does not want to waste time on this questionnaire, since it is useless to answer questions about a system he does not use regularly*

Interviews with ALaRI Students

Dear student, the questionnaire here below would like to investigate how to improve the use of the intranet system among ALaRI actors, making light of the main critical aspects, and taking into account your considerations and suggestions.

The questionnaire will help to focus on what are up to now and what could be in the next future the role and the benefits or drawback of the intranet within the ALaRI institute.

At the beginning, there are some general questions about your knowledge of the alari intranet. Then, more specific questions about the use, the usability, and the usefulness of the intranet services follow. Please, note that for intranet I always mean the ALaRI intranet.

This interview and all your answers will remain anonymous.

Thank you in advance for you time and collaboration.

Please, before entering the intranet, answer the following questions.

1. Which master are you attending? (please, if Msc, specify the year) 1 from MAS; 3 from MSc 1st year (2006-07)

Who have spoken or shown you the ALaRI intranet the first time? and When?

Have you never received any training or information about the use and the role of the ALaRI intranet and the provided services?

At the beginning of the academic year 2006-07, there was a brief introductory seminar, held by a student from the MSc 2nd year, but it was very few useful both for the general illustration and for the specific functionalities. In fact, students prefer to explore by themselves intranet services, discovering the various functionalities.

They simply need and require user id and pw, and a very overall panoramic about the services included – in few minutes, and not taking hours (or nearly).

No any info given about the course platform

2. Have you never asked for suggestion or feedback for improving the intranet services? *Yes, from Dante and Franz*
3. Have you never sent any comment or complaining about any intranet functionalities?
 - a. If yes, what was it about? *about some errors into the Transcript and exams list that have been then corrected*
 - b. And to whom did you write or speak? *To Dante and Franz, and it was ok*
4. What do you think about the features presented in the document here enclosed (Student_requirem_dec2002)? – Is it clear for you this presentation of services? *Yes*
5. Have you never received any communication (via e-mail or other) about new services or changes on the intranet system? *Yes from Dante and Franz*
6. Do you think that the intranet Help Index is useful? *Students do not read the help manual online, they prefer directly experiencing the various services*
7. Have you never consulted or read it? If not, why?

Please, now enter the intranet system with your log-in and password

See and browse the services offered:

- Have you seen and read the alari policy to be accepted on the intranet home page?
- Do you think that it is annoying to scroll the page down to accept the policy?

Ok the policy, it is long but it is necessary, and it is seen as element of guarantee and security

- Do you think that you will have any problem/trouble in order to remind your log-in and password?

No problem for the password. It is necessary and guarantees different levels of access and of management

- Do the services you have found satisfy or meet your needs? *YES*
- What services would you like to add?

e.g. a **forum** to ask information about the lesson to the professor

or a forum where exchange opinions and advice with your classmates

or you would rather a chat

- o What services would you like to improve?*request management*.....
- o What services would you like to remove? ...*NO one*.....

What do you think about the service “Request Mng (management)”? Is it useful for you?

Have you never used it?

Now, please, try to carry out some actions/tasks in specific areas/scenarios:

The aim of the following questions is: a) see whether the more important tasks on the intranet are clearly understandable and easy to perform or not; b) identify the main lacks of data/information and what does not work on the intranet; c) verify the utility and efficiency of some services; d) if useful, add other functionalities.

In My CV

6. check your data and cv, and if necessary update them

in MyCV it is not clear the difference between current email and permanently email.

Then for example there are problems for filling in the own data when you write but you have not the possibility to start a new paragraph, because the technical system was not prepared to allow this function.

In ALaRI People (people directory)

7. try to check any cv of your interest

it would be useful to add near the name the nationality of the student (moreover on the public web site, since it can give a wider idea of a very international environment, since it is difficult to understand only from the name the country where the student comes from)

In Part-time Job area

8. Do you use it? Try to check if there is any part-time job you may want to apply for

In Career area

9. Do you use it? Try to check if there is any job offer of your interest and apply for it
10. What other data/information you would like to see on the Career area?

It used about at the finish of the master, but it could be more exploited if it were really used also by ALaRI collaborators (academic and industrial)

In MP Proposal area

11. Do you think that the MP Proposal area is useful? Yes, but the titles of the various classified activities are not very clear
 - a. Have you used it to select a project of your interest? What the advantage? What was wrong?

In All Projects area

12. Search a project of your interest. Have you met any difficulty? Which ones?

It is difficult the research path. Then, once the document is found, there is not any contact name to have more info about the project of interest

In My Project area

13. check the milestones assigned to your project
 - a. when a milestone is completed?
 - b. when a milestones is accepted?
 - c. From the intranet interface, is it clear for you the difference?
 - d. Have you met any difficulty?
 - e. Which ones?
14. upload your report in your project virtual space. Have you met any difficulty? Which ones?
15. check the report reviewed and corrected by your tutor/mentor/professor. Have you met any difficulty? Which ones?

In ReSearch area

16. Search a document of your interest and create your virtual folder. Have you met any difficulty? Which ones?

Difficulty in searching the documents, since the interface with the masks for the research is very complex. It is suggested to make the research following several levels, e.g. first: simple research, second, advanced research. The paradox was that in order to find a document authored by an ALaRI doctor, it was easier from google than from the intranet repository (the Ferrante publication on VLIW)

17. have you never add a document thinking that it could be useful for all the students?
18. upload a new document on the intranet repository. Have you met any difficulty?
Which ones?

Entering the Courses platform from the ALaRI web site home page – bottom menu (please, note that log-in and pw are the same of the intranet), you should try to:

19. check the information about the courses you attend
 - a. is it clear?
 - b. What does lack? Or what do you like to add?
20. Find the teaching material you need for your lesson
 - a. What kind of problems do you meet?
21. Please, check, if possible, your marks transcript status.
 - a. Is it updated?
 - b. Have you never found mistake to point out?
 - c. Have you never had technical problems while you were performing any actions?
 - i. If yes, which ones?

GENERALLY SPEAKING – the most relevant aspects regard:

- the fragmentation of services, as in Career Center
- complex and long path to reach the intranet service. Usually it is enough from the public web site to fill in the own id and password to access the own private area
- ok the contents
- ok the access policy
- very ok the different levels of accessibility (public – private but not modification access – private with modification access)
- it would be improved the information system as container, -> improve the arrangements of the info, the way to access them, clarify some label titles, etc.
- problem at the graphic level: for example
 - o for the visualization of the upper menu that should be displayed on two lines (whereas now it is on one line but it is too long, and it forces to scroll the page in the horizontal line)
 - o the menu should also appear according to a hierarchy organization
 - o on the left menu, the features not used should disappear, improving the general arrangement and layout of the menu
- main graphical problem are due to the use of image and not characters, and this is not allow the use of the system on behalf of disable persons.

Field notes from ALaRI *students*

Students' considerations

- **What about general introduction to the intranet use**

It can be useful, if made at the beginning, as this year 06-07, but it should include information also about the course platform

At the beginning of the academic year 2006-07 there was a brief introductory seminar, held by a student from the MSc 2nd year, but it was very few useful both for the general illustration and for the specific functionalities. In fact, students prefer to explore by themselves intranet services, discovering the various functionalities.

They simply need and require user id and pw, and a very overall panoramic about the services included – in few minutes, and not taking hours (or nearly).

No any info was given about the course platform.

- **From 2006, designers *Dante* and *Franz* ask for suggestions to students by emails; they are more active in the relationships with the students in order to improve the use of the intranet system.**

They send us (ndr. students) communications about new functionalities

Some of students answered the invitation and send their feedback in order to correct possible errors occurring, for example about some errors into the Transcript and exams list that then have been corrected.

Students do not read the help manual online, they prefer directly experiencing the various services.

- **Ok the policy**, it is long but it is necessary, and it is seen as element of guarantee and security
- **No problem for the password**. It is necessary and guarantees different levels of access and of management

About the intranet services:

Generally, the services are good, but often they are not very accurate: lack clear definition due to labels not very explanatory (there are communication lacks).

For instance, in MyCV it is not clear the difference between current email and permanently email

Then for example there are problems for filling in the own data when you write but you have not the possibility to start a new paragraph, because the technical system was not prepared to allow this function.

Generally, students are very willing to give their contributions, often provide very useful suggestions also to improve the already present services, as the research of the documents

- **What do you thing useful to add?**

yes, the forum, but it is important that it is well structured

no, the chat: it is disorganized, not useful. It maybe added only as link into the personal profile, if somebody wants to indicate he has a chat.

Improve the Request management. Now it is not clear how to use it, but it could be useful

In ALaRI people (People directory): add near the name the nationality of the student (it can give a wider idea of a very international environment, since it is difficult to understand only from the name the country where the student comes from)

- **in Courses platform:**

The table with the list of the courses should present more than 10 courses per page, because in this way students complain to have to click a lot of time to scroll all the courses. Students mean that the table should present up to 30 lines per each online page

Interview with other ALaRI intranet users

Marisa is the secretary of the Faculty of Informatics at the USI, and moreover she takes care of some ALaRI internal activities since the spring 2006 (before was Katya helping in ALaRI administration management). In fact, Marisa is also in charge of the ALaRI administration relative to the students' dossier and ALaRI staff and lecturers' refunds.

The students' dossier ranges from their registration as USI – ALaRI students and consequently the release of their stay permits, until the realization of their final diploma, and during the year the assignment of the earned tokens. In order to manage these and other tasks, Marisa has an own access to the ALaRI intranet, in particular to her site view where she can find all the documents of her interest.

This site view dedicated to her should be enough efficient to allow her to accomplish her tasks without wasting time but better still making clearer and easier her activities, and consequently improving her relationships and communications with the ALaRI actors, in particular with the students and the staff.

Here follow the results from an interview with her (30 october 2006), and from a usability test based on specific scenarios and tasks to perform.

Si, uso l'intranet

Ok, si ricorda la password x entrare (perché pw scelta direttamente dall'utente)

Questions for the interview:

1. please, describe your role and activity in ALaRI:

segretaria amministrativa; compiti: rimborsi, prenotazioni online x staff, con studenti: attestati, richieste permessi, visti, cassa malati, token,
- conosce sua attività su internet: token e alcuni formulari che prende dal template per eseguire le pratiche

2. intervista con scenario d'uso davanti all'intranet

-> si accorge ora che la visione delle info è cambiata, ciò provoca un po' di disorientamento, difficoltà nel ritrovare per es. l'attestato per il master (master certificate) nella pag. template Template: attualmente non tutti divisi per categoria, ma si trovano tutti insieme – siamo nella fase ancora di organizzazione del materiale (la sez. Template non c'era nella prima release del sito, ma è stata aggiunta successivamente). Ma se prova a cercarli nella categoria Administration, compaiono solo in fondo alla pagina web, e senza scrollare verso il basso non si vedono!!! -> i developer non sono riusciti a posizionare nel modo migliore per l'utente le informazioni che compaiono dopo una specifica richiesta con selezione di dati (le info richieste che il tool pesca dal db non sono ben visualizzate sull'interfaccia – ci sono ma non ben visibili x l'utente)

uso dell'intranet per cercare info sugli studenti, tipo data di nascita che serve da inserire nel certificato Master. Abbiamo fatto una prova, ma la maggior parte degli studenti non ha inserito la sua data di nascita nel cv pubblico.

- Cosa è successo?
- Il developer ha messo il campo di data di nascita, ma 1) non è stato detto agli studenti che era importante riempire il campo;
- 2) non risulta obbligatorio riempire il campo, così se qualcuno non lo fa, va avanti e salva tutto lo stesso;
- 3) non è stato spiegato a nessuno il fine principale per cui veniva richiesta la data di nascita (ossia la necessità di aver quel dato da inserire sul certificato master)

Marisa chiede se era suo compito dover inserire le date di nascita (lei ha anche tutti i folder cartacei degli studenti con la loro application form) -> cio' fa pensare come alcuni suoi compiti non siano ancor ben definiti e se manca qualcosa lei è la prima a farsi degli scrupoli (".... Ma lo devo fare io?!!..", proprio col tono di dire "scusate non sapevo se dovevo farlo") Infatti **ogni studente deve aggiornarsi i dati sulla intranet, ma loro lo sanno?**

Utilizzo intranet per token, commenti di Marisa:

- "mi sa che hanno invertito le due voci" -> Marisa si aspetta una certa vista (*student to pay*, ossia i token da pagare agli studenti per il mese in corso), e invece gliene compare un'altra (*payment history*, ossia lo storico dei pagamenti effettuati agli utenti), ma si accorge che nel menu a sinistra ci sono i vari link alle pagine dei token che possono interessarle. Andiamo a vederle insieme:
- **Marisa confonde il significato di alcune label sui token perché per es. dove compare amount lei pensa che siano ancora i token da pagare,** invece amount indica tutti i token già assegnati agli studenti

cosa Marisa chiederebbe al developer che vorrebbe che l'intranet potesse offrirle (analisi requisiti chiedendo direttamente all'utente):

- **chiedere agli studenti di compilare obbligatoriamente i campi di interesse** per Marisa, tipo data di nascita
- **avere una migliore disposizione dell'alari people directory:** ora ci sono troppe info con molti gruppi e sottogruppi e creano disorientamento, per cui Marisa chiede prima di vedere solo il gruppo studenti, poi però pensa che potrebbe servirle avere anche visione sulla directory della faculty, poiché spesso chiedono rimborsi e pagamenti, ma non completano le info necessarie sul template e in questo modo marisa potrebbe integrarle, o meglio ancora le servirebbe per verificare se tale persona è effettivamente lecturer ad alari –

[ne consegue che anche **la faculty** dovrebbe avere un cv pubblico pre-definito in cui inserire dati di **interesse per l'amministrazione, tipo nome, titolo del corso che insegna, periodo di insegnamento** – anche se quest'ultimo dato è più difficile da richiedere visto la breve presenza del lecturer durante l'anno e dato che ogni anno lo schedule delle lezioni varia, e talvolta anche i docenti di uno stesso corso!]

- **avere visione dei dottorandi** (Marisa non sa dove siano, e non è automatico sapere che si trovano elencati nel gruppo staff)
- marisa chiede **di avere una maggiore customizzazione della sua site view**

Alla fine Marisa chiede informazioni sulla intranet, si mostra attiva anche per collaborare a una migliore realizzazione dell'interfaccia – bastava chiederglielo! -, ci dirà man mano cosa non va e cosa ha bisogno.

Poi le vengono in mente altre funzionalità che potrebbero aiutarla nel suo lavoro (si nota come sia importante anche il clima distensivo in cui si fa un'intervista, poiché permette di parlare liberamente e spontaneamente e in questo modo è anche più facile che si realizzi una buona collaborazione):

- **Avere le date di quando scadono i vari permessi degli studenti**, in modo da avere un alarm che avverta della scadenza (home page con grande calendario, tipo il calendar di outlook) – Franz conferma che è possibile, e Marisa che così sarebbe anche stimolata ad utilizzare di più l'intranet perché sa che offre servizi a lei utili

Cio' sarebbe possibile anche dicendo agli studenti di inserire in una certa area (tipo sul cv pubblico) le scadenze dei loro permessi, così che 1 mese prima della scadenza arrivi un reminder a Marisa

Franz nota che marisa non ha ancora accettato la policy alari: un messaggio che compare la prima volta che l'utente si logga (con alcune definizioni generali sull'intranet di alari e il suo utilizzo) e che deve essere accettato e poi scompare lasciando il posto alla home page dedicata al profile utente. Il problema è che essendo questo messaggio molto lungo 1. non lo si legge mai tutto, 2. non ci si accorge che alla fine c'è un click per l'accettazione, 3. non si viene avvertiti in nessun modo circa l'operazione da completare (all'inizio del messaggio o con un pop-up che avverta circa l'operazione da fare)

Avere elenco delle conferenze cui i dottorandi alari partecipano, **così da agevolare il procedimento dei rimborsi da parte di Marisa**, che può visualizzare velocemente **chi** è andato **dove** (a quale conferenza) e **quando**

Avere l'associazione prof-corso di insegnamento – periodo di insegnamento per fare più velocemente il rimborso, visto che spesso i prof stessi si dimenticano di inserire i dati necessari per i loro rimborsi – organizzar meglio formulario rimborso per prof.