

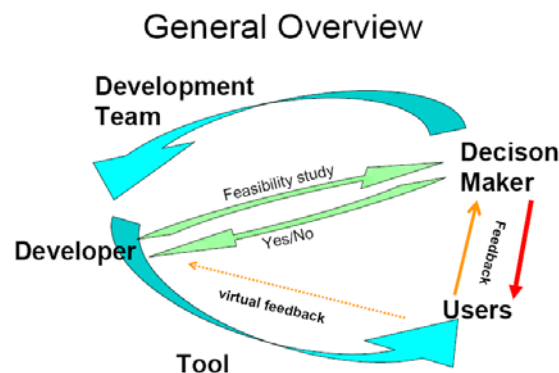
# A Technology Enhanced Learning Case from Birth to Deployment: Critical Analysis of the ALaRI Intranet Platform (Case Study)

Carola Salvioni

University of Lugano, Switzerland  
carola.salvioni@lu.unisi.ch

**Abstract.** This paper aims at illustrating the necessities that led to the decision of building a technological learning platform for the ALaRI (Advanced Learning and Research Institute) academic institute, at University of Lugano (Università della Svizzera italiana), Switzerland. Following that, the paper will analyse the development of this platform, the difficulties met, the unforeseen events, the requested changes and modifications, pointing out the achieved successes, as well as the errors and failures occurred. The goal is that of learning also from the wrong experiences and not only from the best practice cases. In particular, what this article would like to put in evidence is how technology and communication are strongly joined and how only the good performance of both can contribute to provide the users of the platform with a really efficient and effective artefact enhancing the remote learning interactions.

From this perspective, I will investigate how failures that are apparently of technical nature may actually stem from lack of communication, or misunderstanding and incomprehension, among the persons responsible of the development of the platform (the principal stakeholders/the decision maker, and the developers team), and also between them and the final users. The following loop stands out how the phases of design, development and use involve different actors, often with different backgrounds as well as different cultures, who should be able to collaborate together to realize an efficient and effective elearning platform.



**Fig. 1** General Overview

Figure 1, starting from the decision maker, shows the communication flows and the working groups taking place at ALaRI environment. Basically, it represents two principal loops: the first one describes a technical and locked loop, where the technical aspects of the intranet platform are defined and developed by the decision maker and the development team, taking into consideration the ALaRI actors' requirements, their activities, and the specifications of the system. The second loop is wider, in the sense that decision maker, and also the developers, should consider the impact of the intranet release on the final users. This means to verify how the platform is really used, observing how the ALaRI actors interact with the intranet and moreover through it among themselves, and asking them explicitly through usability tests (task scenarios, interviews, and questionnaires) to get a feedback. The feedback from the final users should be of interest not only to the decision maker, but also to the developers in charge of the implementation of the platform. Then, further modifications and implementations should take into account what it went wrong and why final users are not satisfied.

Sometimes it is the communication flow in place (or its lack) inside each one of the two loops and between the two loops themselves that has generated incomprehension affecting the optimal realization of the platform.

According to this scheme (*figure 1*), it becomes necessary to learn to negotiate in order to reach a common agreement and arrive to a co-shared result, where it is clear that the final goal is the benefit of the entire ALaRI community and not only the personal or particular interest of one or a limited group.

In the following paragraphs I will illustrate the **ALaRI challenging approach**, and how the ALaRI platform would enhance the remote learning, together with a brief description of the ALaRI institute, its mission, its environment, the principal actors and their roles. Then, there will be an **analysis of the occurred risks about the ALaRI intranet** development and its use. Further **what did not work and why** will be explained, providing also **some general aspects from the occurred problems** in this specific case. Some considerations about **what it is possible to learn** from this experience **and how it is possible to benefit** from the occurred failures will follow. The successive object will be **instead what did work and the achieved successes**. Finally a set of **overall recommendations that can apply to other situations** to achieve satisfactory results will complete the analysis. The **conclusions** will close my reflections.

## The ALaRI challenging approach

The ALaRI institute is active from 1999 at the University of Lugano, Switzerland, with the aim of promoting research, education and training in the field of the embedded systems design, through the synergic interaction of three principal actors: European academia, American academia and international high-tech industry.

Since 2000 ALaRI offers a master program in embedded systems design (the *Master of Advanced Studies in Embedded Systems Design*). This master program lasts one year, from September until July, and it finishes with the final workshop where the participants present their master research projects, developed during the year with the

support of teachers, tutors, and industrial experts or other academic mentors. Since 2004 ALaRI has also introduced a new master program in embedded systems design (the *Master of Science in Embedded Systems Design*). It is a two-year graduate program (following the so-called *Bologna model* for European University studies).

The peculiar characteristic of the ALaRI institute is its plan of learning: an innovative approach to the working organization and learning environment.

Participants in the master's programs come from all over the world and during their stay at the institute have the possibility to explore and to study in depth the subjects related to embedded systems design, acquiring theoretical background and practice with design tools. Teaching is organized into teaching units ("modules") whose length may go from 24 to 50 hours, inclusive of theory, exercises and practice. Modules end with an individual evaluation that may include home assignments and a module project. With very few exceptions, lecturers (about thirty) are present at the institute in Lugano only during their period of teaching (normally distributed over 1 or 2 weeks). This last fact is one of the basic factors that guided towards introduction of particular remote-teaching solutions for ALaRI.

Research projects run in parallel with conventional studies and complete the students' training, leading to the final master theses. The applied-research projects relate in general to actual industrial research, design activities and technological needs; they are assigned to each participant early in the academic year<sup>1</sup>, and checked periodically through remote interactions by the Industrial Partners of the ALaRI community as well as by lecturers from the (remote) Faculty, who act as advisors. Both academic and industrial experts tutor the development of each project.

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.

Thus, during the master's programs, students are trained both to work on their own (and in team work) and to interact remotely with their supervisors (academic members and industrial collaborators) to develop research projects leading to their final master's theses. In this context, two main difficulties have been tackled. One has been the interaction between students and international lecturers, because of the limited physical presence of the lecturers at the Institute. The other has been the need to coordinate the workflows among the several actors at ALaRI during the academic year.

The above problems led to designing and building the ALaRI intranet: a web-based remote application accessible from the ALaRI web site – [www.ALaRI.ch/intranet](http://www.ALaRI.ch/intranet) – with the aim of supporting and managing the relationships among the different actors around ALaRI community. Through the intranet, new social and technological dynamics have been developing at the institute, integrating learning in presence with remote cooperation in a complex and truly distributed reality (Dillenbourg & Schneider, 1995)<sup>2</sup>.

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<sup>1</sup> In the first academic year for MSc students.

<sup>2</sup> Within remote learning, a distinction has been made in the literature between a *collaborative learning* model and a *cooperative learning* one. The former addresses situations "in which two or more subjects build synchronously and interactively a joint solution to some problem" whereas the latter is "a protocol in which the task is in advance split into subtasks that the partners solve independently" (Dillenbourg & Schneider, 1995).

Further, this information system offers heterogeneous services integrated within several areas, accessible from remote places and in an asynchronous way (Negri & Bondi, 2004).

The main difficulties met during the development of this platform stem from the very fast and sudden growth of the institute together with its entire environment. In fact this led the decision maker and the designers to re-think very quickly the entire organization of the platform, extending the application, and facing the many different demands of the institute and of its actors, as they appeared, with the purpose of broadening and boosting the management of all the ALaRI activities on a unique remote platform. Further, when the ALaRI intranet building began (during the academic year 2002-03) there was no *ad hoc* application complying with ALaRI requirements; moreover the existing tools were neither modular nor integrateable, and interfacing them with each other was far from easily and efficiently feasible, if at all. So it was decided to create a new *ad hoc* intranet for the ALaRI institute.

In order to better understand the demands of the ALaRI institute, it is useful to have an overview of the seven principal profiles of the actors involved in the learning programs (i.e. *Scientific Council*; *ALaRI Staff*; *Faculty members*; *Industrial Sponsors*; *Students*; *Alumni*; and *Guests*), and of their mutual interactions by means of the ALaRI intranet.

The *Scientific Council*, consisting of the ALaRI stakeholders, is basically in charge of the ALaRI strategies, and it is responsible for the remotely supervising of all the research projects ongoing at the institute. Together with the *ALaRI Staff* (i.e. PhD students supervising some students' master projects, and intranet administrators who maintain and update the system) they have access to all documents (private and public) and to all ALaRI intranet data.

The *Faculty members* are professors and experts from academic and industrial environment who hold courses and whose materials are available on the ALaRI intranet. In some cases they also provide academic supervision for master projects, checking and evaluating – through the intranet platform – only the reports of those projects they are involved in.

*Industrial Sponsors* are academic or external collaborators interacting with the students during all the period of the project development, defining the milestones and the deliverables of their supported projects, and working with the team from remote places.

*Students* attending the two master's programs can perform different activities on intranet, working alone with the available teaching materials of the courses, or working with their team, supervisors and tutors about the master project they are assigned to. They can share together the ongoing results of the projects and upload new reports. Further, they have access to the intranet area with public documents of previous projects, where they can also upload other relevant materials interesting for the development of their research projects. In this way the intranet aims at being the main instrument for building the research projects. There is also a career area, where students can upload their *curricula vitae* and letters of intent, making them visible to the faculty members and sponsors. Finally, through the part-time job area, students have the possibility of applying for little on campus part-time jobs, posted by ALaRI staff, with the aim to cover basic living expenses during their stay away from the family.

*Alumni* (ALaRI former graduated students) have access the most recent public materials on intranet and private reports of their former master projects for a few years after their graduation. Moreover, they can also keep visible their *curricula vitae* and keep consulting possible job offers.

Finally, *Guests* are persons outside the ALaRI institute and its network, who may be interested in some research activities at ALaRI, and may find some opportunities accessing the public reports of master projects and other public documents.

This interactive information system wants to allow ALaRI actors with different roles to carry out asynchronous communications from remote places, supported also by an advanced data filtering system (logging in the own username and password) that assures different views of the data and of the several services according to user's profile.

These heterogeneous services in the intranet system are based on seven main general areas, concerning: *People* (the ALaRI actors directory, where several data, such as e-mails or *curricula vitae* can be visible to all or kept private), *Projects and Research* and *My project* pages (about the master's projects management), *Courses* (where all the learning material is collected, including professors' slides, references, suggested books, etc.), a knowledge repository called *ReSearch* (where it is possible to collect and to store the ALaRI know-how, i.e. theses, publications, articles, studies, and so on), *Library*, *Career Centre* (where jobs or internships are posted by faculty members or industrial sponsors, and applied by students), and *ALaRI Jobs* (about ALaRI part-time jobs). Further, each of these areas is subdivided in specific and peculiar sections. Finally, *Policies* and *Help Index* online are available to illustrate to the user the whole structure of the application, the services offered and how access them, such as a sort of electronic manual.

In this way, the ALaRI intranet answers the problem of creating a virtual operative workplace, ensuring an interactive participation of all its members within a steady and secure environment.

### **Risks analysis of the ALaRI intranet**

Such a technical learning system, in order to work properly, needs the active cooperation and methodical interaction of all its actors who, in turn, require easiness of use and immediate understanding of the available services.

The very quick development of the ALaRI intranet, although it has been focused on the building of useful technical functionalities, did not let to pay enough attention to the way in which these functionalities have been offered and to "the effectiveness, efficiency and satisfaction with which specified users can achieve specified goals in particular environments" (ISO 9241-11).

Thus, during the time of development and then of use, several elements have affected the proper and correct use of the e-learning system. The main tackled risks concern the following aspects:

- the necessity of creating, developing and implementing an *ad hoc* tailored platform, following the continual incoming requirements of the ALaRI actors;

- the goal to realize a functional and active platform as soon as possible, in order to improve the workflows within the ALaRI learning environment, reducing the necessity of e-mailing and enhancing the asynchronous interactions on the platform to bridge the acquired knowledge;
- the continuous updating and revisions of the initial specifications and requirements, due to the increasing number of users (students, teachers, and other profiles not strictly connected with the learning) and of organized activities – in fact the specifications phase, at the beginning of the project, and before starting the development of the intranet system, is very delicate, and it can never be totally definitive;
- a “home made” platform, created by young ALaRI internal developers, sometimes helped by some ALaRI students interested in this project. Thus, it has been necessary to motivate young developers and students to work on a tool from which experience they can resell their acquired knowledge;
- the staff turnover: persons working on the platform changed during the time, making it necessary to hand over intermediate products to somebody else, in order to go on with the implementation of the intranet;
- and consequently work has been performed in a broken/irregular way (in fact the intranet building started in the academic year 2002-03, and now it is still under implementation), so opening another problem:
- the traceability of the tool, i.e. the possibility to document each phase of building and implementation of the intranet;
- moreover, the increasing complexity of the project required a continuous and punctual supervision of the development of the platform (also valuating the limits of the tool itself), but the person in charge of this had also to follow several other activities. As a consequence, difficulties in the intranet use were noticed and discovered late, when the user was not able to perform some tasks and the specific activity could not be carried out;
- finally, the initial difficulty in involving all the ALaRI actors in the use of the platform, making them aware of its services and really facilitating their interactive activities, was a further problem. In fact at the beginning only the students after a brief training seemed to be disposed to use the platform; while professors and other actors did not use it, and in the worst case they did not even know the existence of it.

### **What Did not Work out as Hoped and Why**

Here I would like to analyze what did not work out, and try to understand why. During the summer 2004, it was performed a first usability test, since the use of the platform did not achieved the hoped results. From it and a successive my research (then published in Salvioni, 2005) it was clear that, especially during its first release, the ALaRI intranet was very few used compared to the offered services to the students, faculty members, and industrial sponsors: only some of all the services on the intranet were really known, and few services were really used.

From the users' point of view, two main difficulties concerned on one hand the practical approach to the intranet system, and on the other hand the lack of consciousness about sharing the use of the platform with the other ALaRI actors to increase the know-how of the community.

The analysis conducted showed that, while the technical part of the platform was generally well developed (just few strictly technical problems), limited attention was paid to its interface, because not enough customized according to the final users' demands. In fact, as here below listed, several aspects of usability did not work, generating drawback and disappointment. Such aspects regard:

- semiotic issues, such as the meaning of labels, headings or keywords that should synthesize the contents to which they refer; or the interaction images, i.e. the meaning of any non-textual sign or symbol used for navigation purpose. For instance, some label names do not help users understand their contents, such as the title *ReSearch* that should suggest the whole ALaRI repository, but it is not clear at all; so also the labels *Main Projects* and *Master Projects* (section of *Projects and Research* area) do not explain the difference of the contents they cover, running the risk of losing confidence in the site. Then, about the interaction images issue, there are troubles stemming from the lack of conventional and intuitive symbols, as instead we are used to recognize on web pages: such as the click buttons here represented as little blue triangles in little white squares; or the difficulty presented by underlined words that sometimes are links, and sometimes not
- cognitive problems about the arrangement of information and the user's cognitive effort to read an intranet page overloaded or with redundant terms, but also an intranet page lacking of information that prevents from efficiently completing a specific activity or a task. This can lead to compromise the efficacy of the intranet communication. For instance, on *Projects Search* page (sub-menu of *Projects and Research* area) there are too much information crowding the page, so that it looks like a book page to be read carefully rather than an intranet page with immediate and intuitive services; also on *Library* and *ReSearch* areas there are long list of mixed documents, not divided by subject or type of text, or by author. On the contrary sometimes the lack of details or definite deadlines (about an activity), like on *Part-time Job* area, can prevent from the completion of a task
- graphic elements such as the limit (due to the tool) of getting only square or rectangular areas
- navigation, when it hampers the easy access to some information of interest. For instance, on *Guiding Themes* page (in *Projects and Research* area) four clicks are needed to reach public documents; whereas this path could be simply reduced to two clicks. Then, on intranet pages there is not any backward button to make easier the navigation to the previous visited page (there is only the back functionality offered by the browser)
- technical difficulties about the lack of clear feedback messages, such as error messages that are not in a natural language, but in code, hampering in this way the user to understand how to repair it; and also the lack of messages confirming the successful conclusion of an operation (e.g. the correct uploading of a document-on private or public area-and its availability to the

right addressees). Or the difficulty to remember passwords that must have specific characters, such as an upper case, a number, a specific length, etc.

Then, some errors, that might seem to come from technical troubles, really show failures during the first specifications phase, such as the denied access to read documents of interest. In fact, for instance the second supervisors (the so Italian called *contro-relatore*) found to have no access to read student's theses, just few days before the final discussion – the reason was that during the specifications phase this particular profile was not considered as an ALaRI intranet actor.

Really these troubles slowed down the adoption and the use of the intranet, especially at the beginning, because users were prevented from completing the execution of tasks (in fact, during the first usability test - summer 2004 - just one user out of eight was able to complete his task).

The principal reason was a not suitable attention to the customization of the user interface; but it would have been important also to valuating the limits of the tool itself in advance. Thus, inopportune choices for the realization of the interface would have been avoided.

Other problems are about the maintenance and updating of data and educational materials on the intranet system, for instance when there are personal data to change (about a lecturer, or a student) or course materials to update. This problem was crucial especially at the beginning, because of two reasons: first, developers had not enough time to control all the critical information; second the users were not enough made aware about the necessity of controlling the data of their competence, e.g. the staff users should check administrative data and details about part-time job or master projects; students should upload their profiles, curricula vitae, and the reports of projects according to the milestones; lecturers should provide course materials and assign marks to the students in due time, respecting the intranet policies.

The necessity of making aware the actors about the use of the intranet is an aspect very important that was not enough considered either by technical developers or by the decision makers. In fact this has also had an influence not only on the intranet use, but also on the consciousness of its role for the ALaRI community. For this reason, later online manuals for students and also for lecturers and sponsors were prepared and uploaded on the intranet; and now they are also considering inviting users to attend *ad hoc* training sessions, specific and tailored to the different users' profiles.

According to this perspective, technical developers should have the responsibility to capture how the product is perceived, learned and used, and the requirements that the product can fulfil. This leads to make three considerations: allowing the development of representation models in accordance with the user conceptual model; using cognitive theories in order to build understandable interfaces for information and data display; and evaluating final products also in terms of aesthetics features.

On this subject, the previous *figure 1* can help to understand what did not work out in terms of effective communication among all the ALaRI actors. In fact, while, since the beginning, the first technical loop has showed the good will of building a technical useful artefact for the community; the awareness of the necessity of collaborating and having good communication flows between the two loops, to get a very satisfactory intranet platform, came later, maybe too later.

It is enough to think over the gap between the development of the platform and its test of accessibility and use: during the academic year 2002/03 the intranet building



started, but only during the summer 2004 a questionnaire and a usability test have been provided to the users, since the use of the platform did not achieved the hoped results. In fact at the beginning, in order to get the main necessary requirements, it was just provided a questionnaire via e-mail to some users, and the outcomes were discussed only among the technicians, while the users were not more involved in the development of the platform.

The lack of communication has also had repercussions on the display of some courses data on intranet, when for instance some important details were missing about the association of master programs courses and year of course; about credits associated to specific program and courses; or about the pre-definition of elective and fundamental courses according to the master program. Or when the designer considered valid some previous data, he made by himself decisions regarding a particular course, but without asking any details to the decision maker or to the responsible lecturer. This particular situation can occur in ALaRI because the intranet platform is developed by persons inside the institute, who were former ALaRI students. So it can happen that they take for granted some information about courses they already attended, whereas they should verify it.

Another issue concerns the policies and the rules decided by the ALaRI steering committee that are uploaded and implemented on the intranet platform. These policies affect all the educational organization and involve in also lecturers and sponsors. If ALaRI actors do not comply with these policies, all the educational system is compromised. For instance, it is important to respect the deadlines to perform several activities, e.g. the uploading of the master thesis on behalf of the student; or the reading and the evaluation of the thesis, or the uploading of the learning materials on behalf of the lecturer; and so on. But it must be clear that the policies on the intranet are established by the steering committee and they must not be perceived as constraints of the sytem. So it is crucial also to understand how to put the policies on the intranet in order to not discourage the users to work on it.

All these considerations underline that the occurred problems were not only around the user interface, but also about the maintenance and updating of the data on the intranet, the promotion of its use, and the relationships within the institute.

In short, the problems occurred in practice affect several perspectives:

**a) the users' point of view about:**

- the practical approach, i.e. interfaces not intuitive, lack of customization according to the different users' profiles, problems of usability aspects
- the awareness of being part of a community

**b) the communication point of view:**

- lack of deep analysis of the users' requirements
- belated request of feedback from the users
- lack of communications among all the ALaRI actors (developers, decision makers, final users)
- lack of suitable promotion of the platform and its services

**c) the technical point of view:**

- lack of previous identification of tool limits

### **What is it possible to learn from this experience? How is it possible to benefit from the occurred failures?**

Negative consequences imply not only that users cannot achieve their goals with satisfaction, but also compromise the development of a real community identity whose principle of organization is based on the information system itself (Wenger 1998).

Thus, from this analysis three considerations arise, namely:

1. the possibility to create a very general and extensible model of the application, considering all the possible features and prerogatives, in order to have a flexible environment, broader than the first specifications, where it is possible to make changes and modifications without running into insuperable difficulties;
2. the development team should have a deep knowledge of the tool and it should be well coordinated and supervised;
3. and finally, more attention should be paid to the user interface, its maintenance and the promotion of the platform.

The first consideration highlights the crucial problem of the flexibility and of the amenability to modifications of a product, moreover when it is new and just born.

The second point involves two main aspects in ALaRI case. One is the necessity to motivate young developers and students to learn a software language, persuading them that it can always be a work experience to resell. The other concerns the methodology and difficulties proper of the system development that requires the need of portioning the application, subdividing the work in several blocks in order to run the developing phases of the projects in parallel. So doing, it would be easier to take into account users' feedback, and improving the platform step by step, finding possible failures in due time.

The last consideration points out the necessity of working closer with the final users, starting from the design of the application, through the accurate definition of the users' tasks, till the organization of training sessions to promote and enhance the use of the intranet. Then, these sessions should be organized in accordance with the user's profile, reminding that faculty members, students and industrial sponsors have very different features, and consequently they need different approaches to properly use the technology enhanced learning system.

The engagement of heterogeneous human and technical resources in the restoration of a working order can successfully bring to problem dissolution, but it needs a great effort to overcome possible incomprehension and disagreement. Using an own jargon, quarrelling about priorities, and an excessive assertion of own peculiarity become dangerous whenever drive the community of specialists to the isolation and estrangement from giving the waiting answers to a larger community of users (Scott, in Laurel, 1990).

It becomes also worth of value to estimate a costs preview, considering, besides a money budget, the human resources to dedicate on the activity, and the time spent both on the building and on the maintenance of the platform, and on the learning of its use.

Last, but not least, formulating a contingency plan can avoid being naïve in case of difficulty. In fact it aims at valuating the possibility that something does not work as planned, and thus, it helps to be aware of possible troubles that might occur during the development or the use of the system; in a dynamic environment such as ALaRI, it is extremely important to try to foresee changes and modifications that can have strong impacts, especially speaking about e-learning platform.

More generally, from the human and communication point of view, other elements may affect the use of the system, such as the users' habits and resistance behaviour.

It is not easy to change the habits of other persons, especially when they are well with the already existing technical tool (e.g. the simple e-mails). The individual resistant behaviour to adopt and use something new involves the matter about the comfort of the existing habit, the *status quo*; perceiving also associated risks (Szmigin I., 2003), as the here below scheme illustrates (*figure 2*).

<b>Risk</b>		<i>HIGH</i>	<i>LOW</i>
<i>HABITS</i>	<i>STRONG</i>	<b>a) Dual Resistance</b> (Social change)	<b>b) Habit Resistance</b> (Evolution –continuous- and replacement innovations)
	<i>WEAK</i>	<b>c) Risk Resistance</b> (Radical –discontinuous- technological innovations)	No Resistance (Fads and Fashion)

**Fig. 2**

Three types of risks are here above considered:

- a) the dual resistance involves physical, social or economic adverse consequences, and it occurs when there are strong habit and high risk due to the introduction of innovation. This kind of risk is often found in the area of social change, e.g. e-business or internet shopping; or it occurs when the use of innovation, not yet fully tested, may not work effectively, or when its price is very high, but it should come down over time;
- b) the habit resistance underlines performance uncertainty, because the stress is on changes in existing habits and practices rather than on innovation risk (and this is also the case of the adoption and use of the ALaRI intranet). This type of risk may also include resistance due to conflicts with a previous belief and cultural structure;
- c) the risk resistance highlights side affects associated with the innovation: here the matter is not much of changing existing habit but more of introducing new ones. Often radical and revolution innovations generate new forms of habits that have a high risk perception, at least initially, e.g. the microwave oven.

When there is neither risk nor habit change the innovation is very welcome, e.g. the *Swatch* fashion. Thus the resistance in adoption may meet functional or psychological

barriers. Functional barriers include product usage patterns, product value and risks associated with product usage, reflecting the ideas of complexity and relative advantage. While psychological barriers arise from existing habits, prior beliefs, traditions, and they can reflect the idea of a compatible technology. The barriers entailed by this above mentioned ideas are here below briefly described.

The complexity of a product implies the need of special training to use it. And in ALaRI case it is relevant both for the developers and for the final users. In fact, on one hand the developers had to learn a particular software language, standard but not very used, in order to build the ALaRI intranet platform; and on the other hand the final users found an interface not intuitive, with some usability troubles, that did not make easy its use.

The perception of the relative advantage has greatly affected the use of the ALaRI e-learning systems, especially on behalf of the faculty members. In fact some of them not only did not use the platform, but often did not even care to know it existed, while students (and alumni) appear to be more inclined to become familiar with the platform, perceiving its utility.

The introduction of a new system requires to change previous habits and learning a new model of communication with the students and with the other ALaRI actors, whereas faculty members were used to write simple e-mails to them, or to delegate work that now they can accomplish by themselves using the ALaRI intranet platform (such as providing students with pre-defined marks from a scroll menu). Thus, on one hand the intranet allows a more autonomous and independent management of several information, but on the other hand it also engage more strictly all the users to make such a system a real value for the whole ALaRI community.

Since the relative advantage is something extremely subjective, it becomes a critical activity also to identify the relative advantage that faculty members are disposed to value, and make it well visible and tangible, also long-term.

The compatible technology refers to the context of adoption and to the possibility of integrating the innovation within both the social and technological system already existent, verifying if the new product is consistent with the users' values and past experience. The ALaRI case is particularly interesting because its e-learning intranet system is mainly developed by and for people with engineering, technical and scientific background. Further it has been built for this specific and particular community. So at first sight it seems to be totally compatible with its social and technological system, where apparently in terms of conceptual model there is not any difference between who build and implement the system and who use it. Nevertheless, the resistances to use it show difficulties of usability and communication.

### **What did work successfully and the achieved results**

What instead did work successfully around the ALaRI technology enhanced learning is here below described:

- the ***advanced data filtering*** based on user type and status has granted filtered access to shared information, protecting sensitive data and documents.

Navigational patterns are limited for a certain user by the access rules imposed on his/her account. For example, a sponsor cannot see actors associations for projects he/she is not involved in, whereas the scientific council or the ALaRI staff can.

- the intranet has proved to be the best solution to **keep important documents long-term**; whereas the short-term information are put on a *wiki* platform, more suitable for this purpose

- the **persistent storage** of project deliverables, achieved results and other documents **into the repository** has avoided losing ALaRI know-how acquired during these last seven years (the problem instead is to find the best way to visualize all this know-how to the users)

- on the platform, **policies and rules** are **well issued and accessible**, so that ALaRI actors have to respect and to comply with them, as for instance the uploading of report within defined milestones; or the uploading of master thesis within deadlines to allow the reading and the evaluation of it. And thanks to the policies and rules, a level of formality among the users, also working from remote places, is supported

- the system **makes easier the management of the ALaRI back office**, acting as a sort of “electronic secretary”

- **the ALaRI alumni** (the former ALaRI students) **follow-up** has been successfully managed through the intranet, offering them career opportunities and the access to the project results also after the finish of their master’s courses

- the promotion of several services, besides the pure educational ones (the strictly e-learning platform)

- the physical closeness (of place and of age) has allowed developers to improve the customization of the staff’s and student’s interface more quickly and easier rather than the lecturer’s and sponsor’s ones, thanks also to the possibility to speak with them directly and have immediate feedback.

Consequently staff and students have met less difficulty in the adoption and use of the system (but it is true that the interface is not intuitive and it is necessary to take more into considerations the different users’ requirements)

Further, improvements of usability on the intranet have allowed:

- all users to **send suggestions**, critics, and recommendations to the intranet administrators for any requests or questions about the services of the intranet system. And, in this sense, the intranet home page and others particular pages are provided with the technicians’ emails to contact

- to **send messages to the employer’s private e-mail box**, informing when somebody applies for a job posted. This faces up to the problem to not check the intranet regularly, and so to not see students’ applications for some time

- to **up load students’ photos** near their names. This helps to recognize the students, associating their faces with the proper names more quickly. And in multi-cultural and multi-ethnic classes with students coming from all over the world, this little expedient gains a considerable importance, making easier the interpersonal relations

## General recommendations

Abstracting from this concrete case, in my opinion some overall recommendations could include the following aspects to achieve satisfactory results:

**a) About the technical building of the platform:**

- the specifications phase is very delicate, and it can never be definitive
- it is necessary to create a very general and extensible model of the application to have a flexible environment, broader than the first specifications
- it is necessary to coordinate and supervise the development team
- the developers have to acquire a deep knowledge of the tool
- it is important to design the whole platform, but then to split the development phases, building one section at a time (e.g. first developing one user section, testing it and starting to use it, and then reviewing and redefining requirements not considered previously)

**b) About the users' requirements:**

- try to work close to the final users, if possible
- analyse carefully the several users' profiles
- customize the user interfaces according to the different users' site-views
- do not underestimate the usability aspects (such as cognitive, semiotic, navigational, technical, and graphical issues)
- maintain and up date data and information on the platform
- try to meet the user's expectation at first - negative experience discourages user
- provide the platform with online help manual, tailored for each profile

**c) About the users' feedback:**

- find user available to test the platform internally, before its release – identifying the critical users and trying to comply with their requirements
- request the users feedback through usability tests assigning tasks within specific scenarios, and observing and then evaluating how users perform them
- review and redefine requirements not considered previously
- improve the following phases of development with the provided feedback and make the suitable modifications
- consider users' resistance and habits, such as functional barriers, i.e. the complexity of the product and the perception of the relative advantage; and psychological barriers, i.e. the compatibility of the technology with the user's background and culture
- promote the use of the platform – at all levels through several actions (e.g. tailored training sessions)

**d) About the financial issues:**

- estimate a costs preview, i.e. efforts of money, human resources, time spent on learning the tool and building the system, the use of the platform, the maintenance of the data
- formulate a contingency plan, i.e. valueate the possibility that something does not work as planned.

Maybe these suggestions can apply to other situations and help to avoid the problems occurred in ALaRI community.

## Conclusions

The ALaRI intranet was principally thought to create an educational platform, able to enhance the elearning also from remote places, to develop the asynchronous communication - reducing the necessity of e-mailing - and with the goal of providing the ALaRI actors with a knowledge repository, where they can collect and increase the know-how acquired.

According to this analysis, it is clear that several difficulties have taken part in the complete adoption and use of the ALaRI intranet by the whole ALaRI community. These difficulties range from a not well customized interface, also due to a limited attention to the users' needs, to the time spent on building and implementation and to a lack of proper management of internal communication.

Consequently, in the production phase, various problems occurred to hand over intermediate products to new developers and to control and coordinate the ongoing activities.

Therefore a complex network of communications and relationships has affected the optimal realization of the product, but the originally intended outcome is not compromised, and the particular academic environment of ALaRI allows going on with the technology enhanced learning, trying to benefit from the previous failures.

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