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# **E-portfolio : a pedagogical tool for the design of personal and professional student project**

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The quality of teaching via ergonomic analysis of the tools integrated in the pedagogical device is evaluated. Tools may be adapted to the user's needs, actors of the device, and in particular the student and the teacher. This study aims at evaluating whether the integration of the design of a E-Portfolio by students, within a specific courses framework on the personal and professional project, can answer some identified needs. On the one hand, the students claim a better visibility of their personal and professional project without precise objective. On the other, the teachers consider that the student is the actor of his own curriculum. He must be autonomous and build his project himself. The E-Portfolio is regarded here as an adaptive tool to answer this contradiction. It allows the student, while being guided by the process of design of a multi-media document, to develop in an autonomous way his project. To check the adaptation of this tool to the problems of construction of a personalized project, a study was undertaken over a two-year period: a sampling of one hundred students in their first and second year of bachelor's degree in computer science. We analyze here the answers of questionnaires which enable us to open our analysis towards several recommendations of E-Portfolio functionalities.

**Keywords** e-portfolio; teaching resource; design; scenarisation; ergonomic process; reflexive approach

## **1- Introduction**

Our study focuses on the problem of the construction of Personal Learning Environments (PLE) for students. Indeed, it allows the development of a digital identity that the student will use for his path throughout all his life. The means that getting to know, and predicting the future, are ways of coping with errors in orientation and failure. Many tools exist and are used to achieve this goal. The E-Portfolio is one of those tools, and we would like to illustrate its utility to justify its inclusion in the Technological Digital Environments (TDE) of the universities.

We consider here that the student follows a design approach for the construction of the PLE. This approach is well-known and commonly used in ergonomics. This discipline aims devices adaptability to human needs, and offers a number of recommendations to meet the standard of quality. In particular, it is recommended that the design process be based on an analysis of users needs, often not explicit.

To explore these issues and achieve our objectives, we present, first, a brief state of the art on the ergonomic design field and its relationship with the training tools. We then discuss a particular educational situation on the emergence of a personal approach by the student to design a support to his path throughout life, the E-Portfolio. Finally, the discussion allows us to pose hypotheses of a pedagogical scenario for the appropriation of e-portfolio by students..

## **2- Theoretical framework**

### **2.1- The design process in ergonomics**

The design can be defined as an individual and collective activity, finalized by a project to develop a physical and symbolic artefact [1]. Its peculiarity is that it always starts with not well defined problems [2]. Recommendations are proposed to guide the actors in the process. According to the French standardization body [3], for recommendations of ergonomic design, quality is defined as "the ability of a product or service to satisfy the needs of a user". This concept is used and applies particularly in the industrial design process to put the user at the center of the process of building products that are intended to be used by the user. It is the user-centric design considered by Norman [4] and others [5]. The main idea is the participation of the end user of the product design process: the user is somehow incorporated into the design team. The researches led to the introduction of ISO standards [6] that define the stages of the process: the planning process, understand and specify context of use, then the user and organizational requirements, produce design solutions, and finally, assess solutions in terms of pre-defined requirements. For each step, methods are recommended to define better the characteristics of users. This brief description of work around the design shows the complexity of both the work of designers as to the effectiveness of the approach. We will now discuss the uniqueness of the design in training.

## 2.2- The design of an instrumented training

Training has not always been recognized as a work environment by ergonomics whose interest has long focused on improving mental and physical labor. Nevertheless, renowned authors Leplat [7], Dufresne [8], Samurçay and Rogalski [9] have shown the importance, at different levels of training in life and work, of the operator, and it is necessary to study the emergence of knowledge and skills in the work to reflect on their assistance. Tricot and Plégat-Soutjis [10] have analyzed this problem and present a complete text on the subject. They underlined the value of the use of a method in the design to reflect the goal in terms of utility, usability and acceptability. As part of engineering education, the utility is to ensure that the designed device allows real learning prescribed; usability is to arrive at what the device designed to be used by learners and the acceptability can develop a device compatible with the practices, resources, constraints, and objectives of the actors. Two methods can be envisaged to achieve these goals: the straight-line method in which designers solve the problem according to steps one after the other, and opportunistic method in which designers do not solve the problem of steps according to a pre-order determined but with a feedback-loop [11].

## 2.3- The instrumentation for training: the case of e-portfolio

Training tools have evolved considerably since the development of new technologies. Indeed, each training, as soon as it is digitalized, may be accompanied by a variety of tools chosen by the trainers and / or deciders based on their features: distance communication (chat, forum ...), collaborative work (virtual office, ...), construction and customization of information (mental map, a portal web ...), storage of data (remote servers, ...). Each tool is dedicated to one or more activities in the educational scenario. Some studies show that prescription of these tools use is not always followed by learners [12]. Indeed, we find that, despite the use of precise scenarios of use tools, users often modify, and divert their use to achieve a compromise between objectives and level of effort of appropriation.

The E-Portfolio is one of those tools. It is a structured collection of data chosen by the author according to the objectives. It is not necessarily shared with others, its main function is the reflexive analysis by the author on its own activities [13]. The digital feature not only helps to achieve a hierarchical structure but also allows designing of hyperlink structure to incorporate changes. Literature abounds on the types of E-Portfolio and learning benefits [14-16]. The authors distinguish between types of portfolio according to the objective of the author learning (a collection of knowledge that the personal structure provides a better understanding of their learning and understanding), presentation (collection of personal achievements and / or professional), evaluation (collection of production-related skills), professional development (compilation and construction of documents for the selection of a career path). This last task is complex because it demands integrated thinking linked to three others, and to establish links between different topics.

The E-Portfolio may take various forms: a presentation software like Microsoft PowerPoint, website, video clip ... Further the complexity of approach relates to the choice of form. It helps to accentuate certain features: eg , a presentation may not be shared and is therefore more a reflection on itself, a website is more a presentation to others, a video clip may integrate some creativity but does not allow changes ... Hence, the content and form are closely linked. It is therefore essential to work upstream on the personal goals of e-portfolio to select the appropriate support.

## 3- Situation

Many educational programs provide training course on the professional and personal student's project (PPP). In this context, the Computer Department of our university includes this type of course in the program for students on two years of the course for graduation from university of technology (DUT), two years after high school.

The train of thought that helped design the educational approach is summarized by the phrase: "the student is the actor of his path." The aim is to bring the student to find himself and a method for use in projecting himself in the future, and use it throughout his life.

The student is, with the teacher, an actor of design of the training, since he participates in the product development. Here, we find the user-centric design mentioned above.

Like many work situations, the user - the learner in this case - knows about his needs. Indeed, it is difficult for many students to have a concrete and comprehensive representation of what they have to learn (knowledge, know-how and skills) in their training and how they should proceed to achieve this goal. Thus, the idea to build a project for a specific evolutionary pathway should allow the student to refine his goals and make the training a better consequence of his needs.

The pedagogical scenario design is therefore thought to make the needs of learners emerging in designing themselves an assistance. They take part in the design process by developing their own method of construction of the project: a "meta-design".

Ergonomics recommends various methods for the analysis of needs such as their expression through verbalization such as written and oral interviews. For this, the teaching team provides the students the resources and tools for a reflexive analysis of these needs. The scenario is divided into four objectives:

knowledge of various pathways: students work in groups of 4 or 5 in search of documents and experiences (interviews with professionals) on a job they have chosen to analyze. They then produce an oral presentation;

increased self-knowledge: students fill out a form (with open questions) on their skills, experiences, ..., can use other resources such as Proust questionnaire (list of questions very different and about personal belief: What is your favorite color ...) and interviews with other students. The production is the realization of a video clip of one to two minutes in which they present themselves on the form of their choice.

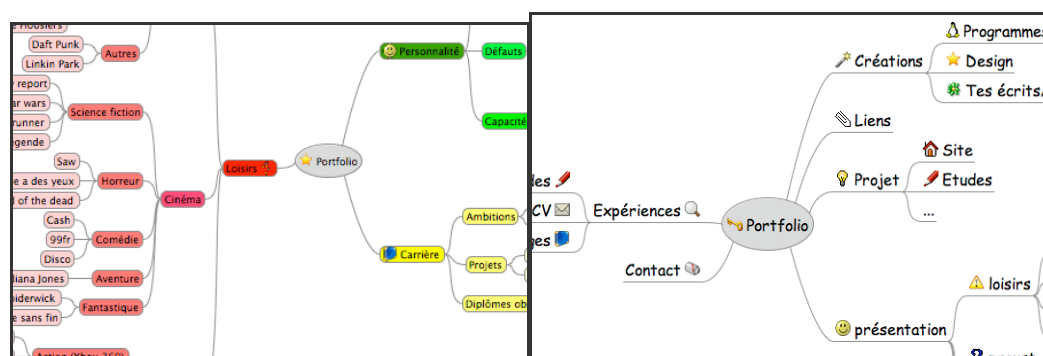
design of a personal method for the construction of the project: structuring of information gathered in previous steps. It requires students to carry out a mental map which is the hierarchical structure of the e-portfolio. Students must then produce the e-portfolio with the support of their choice.

reuse of the process for project development: recovery of e-portfolio one year after training and improvement.

Students benefit from several months teaching and a work experience of two months that they can structure and adapt to their e-portfolio.

## 4- Results

The results are from one part of an analysis of responses to a questionnaire completed anonymously and optionally at the end of the course and, secondly a qualitative analysis of the productions of a hundred students. All of first, we note that, despite some resistance to this form of education, students follow the instructions step by step and make all their e-portfolio. Students also seem to have understood the benefits of establishing a research methodology issue of their work on a trade: half of them plan reuse their e-portfolio. In addition, a large majority is not satisfied with the creation of maps for a better understanding of themselves and the structuring of their e-portfolio. However, the maps are very different and seem to support the design of E-Portfolio (Figure 1). We assume that these difficulties are related to the mental maps software appropriation rather than the interests of such a design. Regarding the video clip, the result is also very varied: from the magistral presentation to an in-depth and lively scenario setting the link of the video with the content of the presented information. Finally, the e-portfolio may be a slideshow presentation, a website or the use of pre-formatted tools. According to students, the reason for these choices is varied: technology choice (unknown, motivation to learn a new one), safety criterion to maintain its own data and not share them ... There is a wide variety structures and tools. When interviewing students at the end of second year, which must reuse their e-portfolio and modify it, they uphold the interests of this achievement and the majority say they will re-use whether for professional or personal reasons.



**Fig. 1** Example of two maps produced by two students in 1st year of Computer degree, reflection for the realization of an e-portfolio.

This scenario led the past two years and the variety of products is always all this. It seems to represent inter-individual variability which suggests that everyone speaks freely. We may therefore conclude that this choice allows teacher to create individual needs for achieving a PLE. The E-Portfolio supports work for a reflexive meta design course of the student, i.e. the design of its own design model. Figure 2 shows how the learner-centric design can be extended to the standard user-centered design.

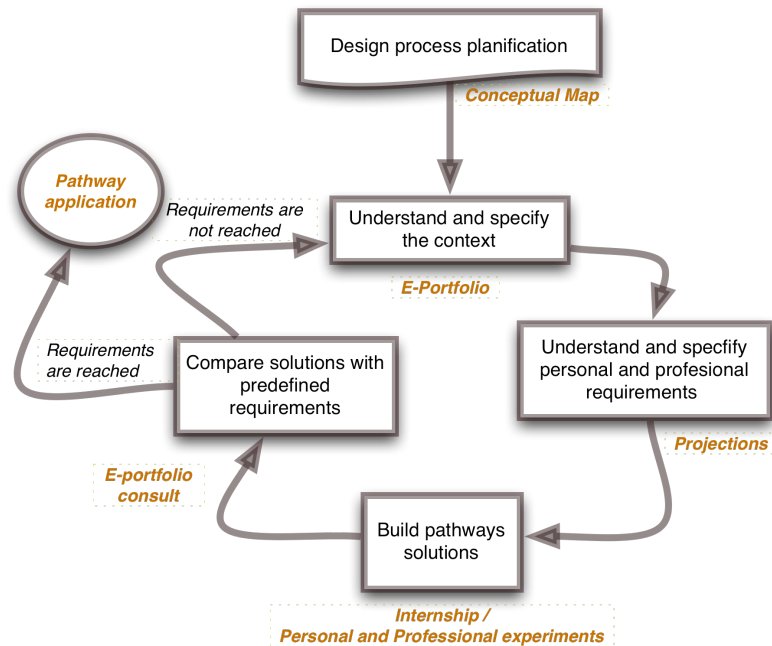


Fig. 2 Implementation of ISO [13407] user-centered design to a "meta-design" of the learner.

## Conclusion

From a global point of view, and to return to the criteria of Tricot and Plegat-Soutjis [10] mentioned above, we can consider that the proposed scheme is useful seems to be required for learning, it is usable - it is within the reach of students. However, acceptability is not complete since the establishment of the TDE does not offer the products requested: slide show, mind map and e-portfolio.

This study has limitations because it was primarily exploratory. However, we were able to report on the feasibility of the pedagogical scenario and its interest. We plan to use this scheme to establish a more formalized scenario suited to the TDE. However, the observation of the great variability of productions, and so students' needs, requires us to be aware to the value of previously structured tools. Therefore, it is necessary to formalize without restricting the range of opportunities needed to design an e-portfolio and a PLE. The digital identity will be respected and rewarding for the owner.

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