In the 1980’s, project management has grown exceptionally and many companies have adopted principles and methods of project management. These methods (WBS, Gantt, PERT…) addressed individual projects and project management focus on the performance of individual projects. In the 1990’s (Leroy, 2004; Gareis, 1990; Turner, 1993), researchers will broaden their investigations to all ongoing projects and focus, in addition to the management and the performance of individual projects, on the project portfolio considered as a unit of global management and on the interactions between projects. Today, more and more companies are moving towards a project-oriented way of managing their businesses. So, if the most common type of a project was a large project with an external client, nowadays, companies face more commonly to multiple internal product development projects with internal clients. It sets certain challenges to companies. How to make sure that the selected projects are implementing the strategy of the company? Are the scarce resources (financial, human capital) allocated to the right projects? Which projects to select, which projects to pursue and which to kill? Project portfolio management tackles these problems and has become an important topic in recent years. In fact, project portfolio management is, from a strategic point of view, the same as project management for a tactical point of view. So, we observe a growing interest to the management of project portfolios and today, many organizations are faced with the problem of project selection and allocation of resources to build a portfolio of projects.

Project portfolio management consists of three stages after the important one which consists to the development of the strategy through guidelines and resource allocation constraints. The first stage, individual analysis of the projects, is carried out through pre-feasibility and feasibility studies. At the end of this stage, we obtain a subset of the set of proposed projects. The next stage is the project portfolio selection (PPS) considering guidelines and resources allocation defined in the strategy of the organisation. It is this stage we will focus thereafter. The next stage is the adjustment, in time, of the portfolio. The PPS problem involves mostly multiple and conflicting objectives and only a subset of proposed projects can be financed with available resources. Note that portfolio management in the financial sector generally involves continuous decision variables (projects can be partially subsidized) and is therefore close while being different than the project portfolio selection (PPS) where the choices are binary (yes/no).

Many theoretical works have been published in the last 30 years but, in general, these methods relate more to project selection than to project portfolio selection (the decision unit being the project and not the portfolio). This point is important because, in practice, there are interactions between projects and thus, the value of a portfolio is not necessary equal to the sum of the values of the different projects of the portfolio. So, practitioners still consider this problem to be unsolved and there is a call for developing innovative methods that provide effective and user-friendly support to PPS problems. In the last years, some PPS methods have been proposed and one can consider two broad approaches. In the first approach, one can aggregate all criteria in a scalar using a value
function (implicit or explicit). This approach is the most widespread because, once a global score is established for each project, we can use an optimization model (integer linear programming or integer goal programming) to obtain the optimal portfolio. In fact, almost all the project portfolio selection methods proposed in the scientific literature rely on the first approach (Mavrotas et al., 2003; Lee and Kim, 2001; Stewart, 1991). In the second approach, no assumption about the decision maker’s preferences are made and it consists to determine the subset of ‘good’ portfolios and to analyse this subset in order to obtain a ranking of the ‘good’ portfolios or to choose the best compromise portfolio. The notion of ‘good’ portfolio relates generally to non-dominated portfolio (Urli and Terrien, 2010) but it can also be understood as a feasible portfolio and obtained with a branch and bound approach. It’s the approach we chose in order to provide an efficient and user-friendly projects portfolio selection model.

In this paper, we'll present the proposed multicriteria project portfolio selection model and to illustrate our approach, we’ll use, as didactical example, a modified version of the problem tackled by Eilat et al. (2005). More specifically, our methodology relies on three steps. In a first step, using a multicriteria approach (PROMETHEE), a screening is done in order to keep a limited number of projects for the second step. In that step, preferences of the decision makers about criteria and relative importance of these criteria are included in the model. In a second step, efficient portfolios are generated using a metaheuristic. In fact, our problem can be directly formulated in the form of a multiobjective non linear integer program. But this problem is complex (nonlinearities in the objective functions and constraints, a possible large number of (0-1) variables) and as the application of exact techniques to complex multiobjective optimization problems has been considered impractical, researchers have relied on metaheuristic procedures (Ehrgott and Gandibleux, 2000). So, to solve this multiobjective non linear integer program, the SSPMO meta-heuristic is used as in a previous paper (Urli and Terrien, 2010). In a third step, the decision makers faced, one more time, a decision problem because in the previous step, there is no ranking of the efficient and feasible portfolios. So, in this final step, we propose to rank these portfolios in a two dimensional space (the portfolio core index and the performance index). Mild et al. (2004) proposed the core index of a project j ($CI_j$) which represents the percentage of non-dominated portfolios in which the project (j) is included. We propose to define a portfolio core index ($CI_k$) as the mean of the core indices of the projects included in the portfolio (k) and to rank the portfolios according to these indices. The portfolio performance index has been chosen as the scores generated by the DEA (data envelopment analysis) method. Finally, according this bi-dimensional analysis, the decision makers should choose among the best compromise portfolios.