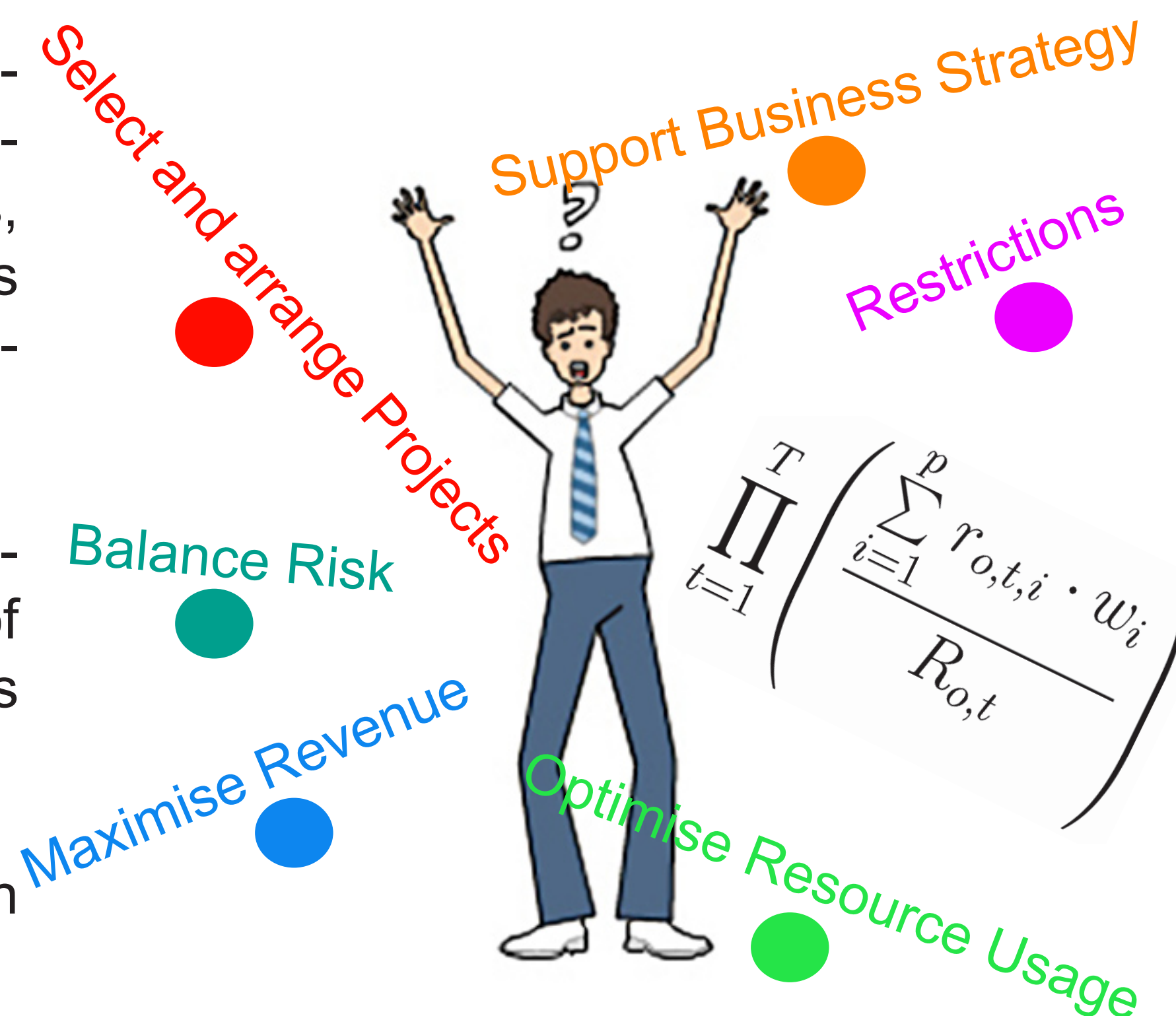


## Motivation

Project Portfolios are a composition of all projects an organisation conduct or plan to conduct. Purpose of the management field **Project Portfolio Management** (PPM) is the management of these portfolios. Creation and the sequencing of an optimal project mix is the main task of this management domain. Because of a lot of constraints, various sequencing possibilities and numerous objectives which have to be optimised, the selection of projects is a demanding decision problem. Especially because the complexity of the selection problem is exponentially growing with the number of candidate projects.

For a project pool with 50 candidates there are theoretically about  $10^{40}$  options to create a portfolio. The approach presented reduces the size of the solution space through mathematical optimisation to an efficient set of approximately  $10^3$  alternatives. This set of portfolio alternatives is called the pareto-optimal front, and portfolios on this front are equivalent in terms of multi-objective optimisation.

Since the selection of one portfolio out of  $10^3$  portfolios is still a demanding decision problem, a Group Decision Process is presented, which guide decision makers through the task of selecting one portfolio.



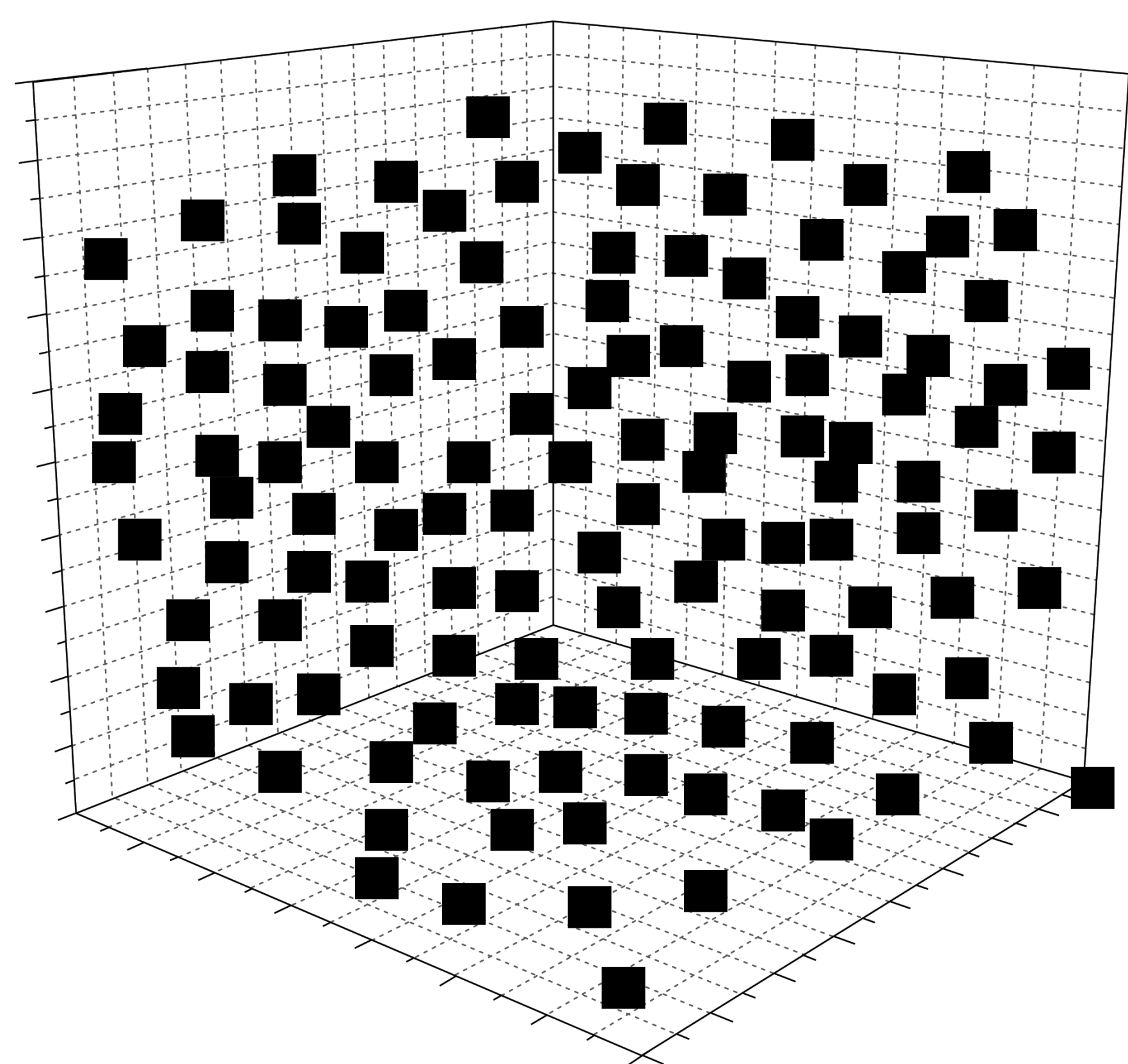
## Approach

A two phase framework for a decision support system is presented to support the portfolio management in selecting projects, and optimising portfolios.

In **phase one** the optimisation and search algorithm mPOEMS, is applied to the project selection problem.

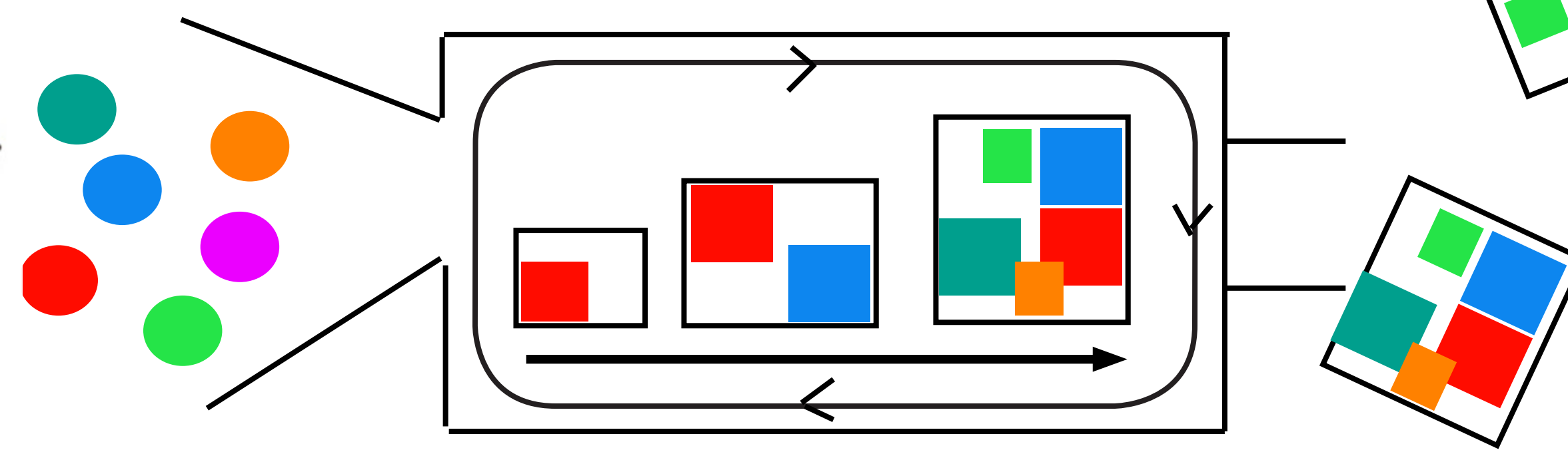
In **phase two** a Group Decision Process to select one portfolio out of the pareto-optimal front is presented.

### Phase One

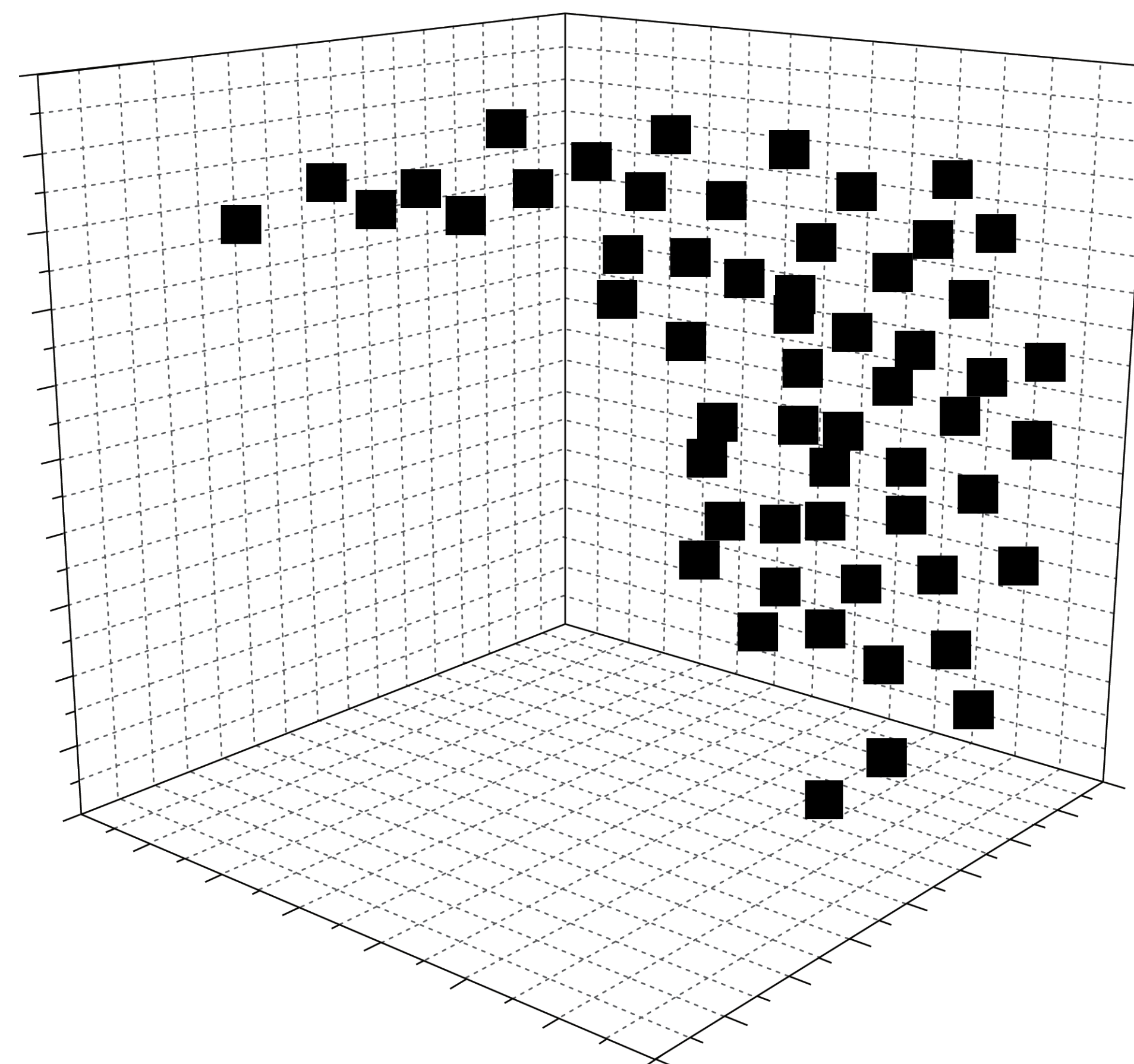


mPOEMS is a search and optimisation algorithm in the field of evolutionary algorithms. This multi-objective optimisation algorithm have been applied to the project selection problem.

The implementation is able to reduce the solution space significantly, and presents the user a manageable size of portfolios, optimised in a theoretically not restricted number of objectives. Furthermore the implementation is able to handle a vast number of project candidates, whilst adhering to various restrictions and constraints.

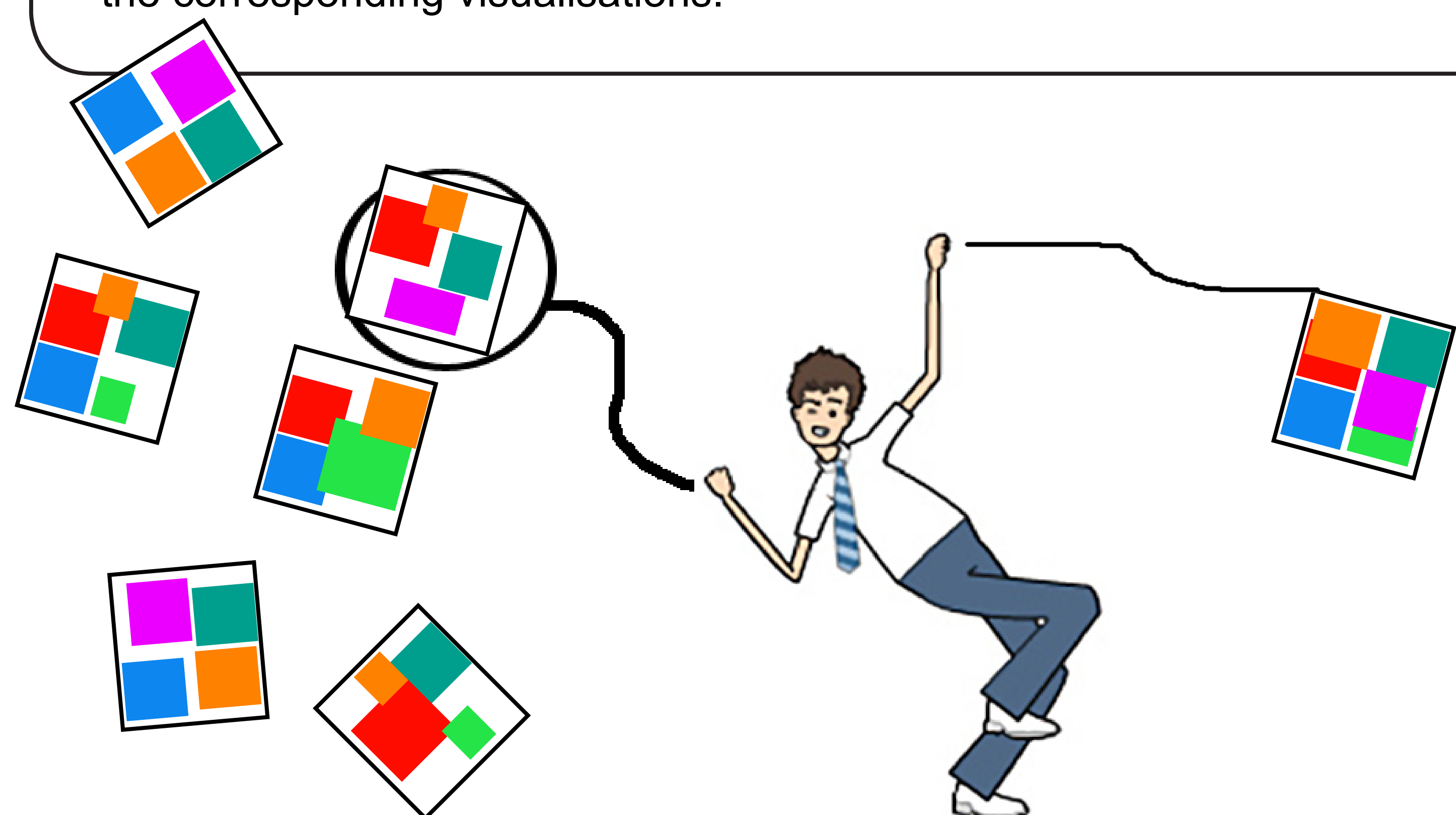


### Phase Two



After the reduction of the solution space to an efficient set of portfolios, a Group Decision Process is used, to select one portfolio out of this set. In using sophisticated visualisation and data exploration techniques the search for a portfolio candidate is facilitated.

The search for consent is conducted by calculating subjective preference values for each portfolio, and encoding these values as colour and size in the visualisations used. Thus decision makers are given an easy-to-use tool to search for a portfolio candidate which fits all individual preferences, by choosing portfolios based on the colour and size of the corresponding visualisations.



## Results

\_Combination of multi-objective optimisation, with subjective preference visualisation

\_Comparison of mPOEMS for the presented optimisation problem with the two state-of-the-art algorithms NSGA-2 and SPEA-2 showed that mPOEMS performs better with respect to two out of three metrics

\_Proposed a new method to not only optimise the selection of projects, but as well to optimise the sequencing of the selected projects