MATH-H-405 : Decision aid for a academic development plan

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1 Motivation

Universities are complex enterprises to manage because of the number and complexities of they products. As a good example of university is the ULB and their missions are multiple:

- High quality teaching and life-quality while studying
- Making breakthrough in research
- Civil engagement in moral objectives like diversity and practical like language information
- Services to the industry
- International aid in development

To better manage the ever so scarce resources given the ambitions of the different missions, the university are often made of a number of faculty that pooled they resources. One benefit of it is create an healthy environment where each project can compete for access to "large" pool of resources. To resolve this competition is often a good practice to establish by negotiation coherent objectives at each management level (University, Faculty, Service, ...). Based on this goal a strategy can be established and finally tactics can be compared, ranked and the best implementation plan proposed selected.

Such a tactical choice is the attribution of the resources for hiring a professor to each research group or service. The importance of a professor to a service can not be underestimated, he will have the role of supporting teaching activities, will perform research and will come in addition to an existing team. For good management practice the ULB ask to each faculty every 5 years what will they do with the resources that they have available. While the contract of a professor is not limited to 5 years and everything is not reshuffled each time, the decision is still required for example due to smooth changes in the faculty's resources and possible departures that have happen during the last 5 years period.

In that occasion the choice of the faculty at the ULB is called the Faculty development plan. And one of the way it have been determined is a competition between profiles of professors suggested by existing research groups. The choice

of this tactical plan is complex and will mobilize a good deal of strategic reflexion within each group to build a profile that will benefit at best the university. But the benefit space is large and possible categories of gain include research workforce, teaching activities attractiveness, industry synergy and also organization-based behavior like equity.

The faculty's management will face the elaboration of the tactical plan that will serve as a proposition on which voluntary elected stakeholders will debate. This debate is the occasion of correcting mistakes in some evaluations of profiles or the relative importance of criteria. To help with those debates using a multi-criteria decision aid is a must-have. And producing an aggregation of the strategy, the situation, the possibilities using a pertinent methodology is the work anyone should do when preparing a debate. It will guarantee both transparency, enabling efficient criticism and will dissociate what is best for the faculty (Strategic concern such as criteria weights) to the quality of a proposal something helping everyone to maintain a unbiased opinion.

2 Criteria

2.1 Quality

2.1.1 Contribution to teaching cost

Amount of reduction toward a specific degree cost,

- 3 = New program deliver a reduction of cost for a degree.
- 2 = Replacing existing courses, no change in the overall cost
- 1 = Developing a degree by adding new cost.

2.1.2 Student attractiveness

To represent the attractiveness of the courses proposed by the profile a 5 shade scale is proposed

- 5 = Will attract students worldwide.
- 4 = Concern a field of strong popularity
- 3 = Strengthen he general formation
- 2 = Concern a specialization which have a moderate popularity
- 1 = Reinforce fields of weak interest

2.1.3 Opinion of board of advisers

The boards of selected representatives have ranked each proposition

2.2 Content

2.2.1 Strategic importance of courses

The profile will positively impact the ongoing development strategy by proposing positive synergies with passed or planned investment.

- 5 = Strongly
- 1 = Not at all

2.2.2 Contractual obligation

The profile is design to palliate needs that are of a contractual nature.

- 3 = Yes and there is yet any other alternatives
- 2 = Yes but there are other alternatives
- 1 = No

2.3 Opportunity

2.3.1 Strategic partnership

The profile is designed to reinforce, develop or fulfill strategic partnership with other faculty or organization.

- 3 = Yes and the profile play an essential role in it.
- 2 = Yes but the profile is satellite around the partnership
- 1 = No

2.3.2 Use of existing equipment

The profile will capitalize on existing investments.

- 2 = Yes
- 1 = No

2.3.3 External funding

The profile is likely to attract external investments

- 3 = Very likely
- 2 = Likely
- 1 = Unlikely

2.4 Alternative Evaluation Table :

TC	SA	BA	SI	CO	SP	EQ	EF
1	2	3	3	1	1	1	1

3 Alternatives

A possible development is a selection of 5 profile amongst the candidates. Based on experiences, a faculty of polytechnic engineering can receive around 10 candidatures. Here are the received:

- **Mechanical and Aeronautical Engineering** with emphasis on Multi-physics problem. This profile would strengthen strategic relation with the Von Kerman Institute, will develop the faculty towards space science and will assure the well-being of the Aerodynamic master.

TC	SA	BA	SI	CO	SP	EQ	EF
1	2	3	3	1	1	1	1

- **Data-Driven Modeling of Multi-Scale Biological Processes Modeling**. A profile aimed a developing a trans-disciplinary resource used in cooperation with a number of existing initiatives, it will further develop the faculty of Bioengineer and will some of the bachelor's mathematical course.
- **Computational Quantum Mechanics**. Research profile in a historical domain of excellence at the ULB.
- **Data-Science and Engineering**. Ensure the continuation of a contractual EU-funded master and strengthen the position of another inter-faculty master. The research potential is highly supported by the industry and exploit planned investment in research equipment.
- **Structural Engineering**. Resource needed to fulfill a master. While research domain is pertinent no EU-funding in the research group and industry contract have been reported.
- **Mathematic for the engineer**. Pedagogic profile of critical importance in all the faculty formation and contract-enabler for the industry by association to existing reasearch resources.

- **Nanophotonics**. Fulfilling existing course that have lost resources in a master and possible teaching opportunity in bachelor. Aimed in response to European's intent to assume leadership in Quantum Technologies and exploiting existing precious research equipment.
- **Radiophysics**.