SATW Working Paper

Framework for good interdisciplinary projects in the context of Industrie 4.0

Motivation

Industrie 4.0 is a topic that is classified a priori as interdisciplinary. The SATW working group Industrie 4.0 consists of experts from various Swiss educational and research institutions and disciplines. The group has taken on the task of explaining the necessity for an interdisciplinary approach and the appropriate design of research cooperation in the context of Industrie 4.0 with a few theses. They are intended to help the participants in such projects to decide to what extent an interdisciplinary approach to the problem is appropriate. This is because many issues in connection with Industrie 4.0 can also be approached in a monodisciplinary way.

The following circumstances can motivate interdisciplinary projects:
- The task requires different competences with research relevance.
- The partners want to expand their horizons.
- The opportunity for innovation should be increased.

Framework

1 Project Management

General project management aspects such as quality, costs, time or coordination skills also apply to interdisciplinary projects. Communication tends to be more complex in interdisciplinary projects. The question of project hierarchy arises more frequently in interdisciplinary projects, since a priori more partners are involved.

Action: Discipline in project development, clear understanding of all participants about their tasks, responsibilities and competencies, clean structure and good definition of work packages, objectives and allocated resources.

1.1 Quality, costs, time

Quality	- Achieving project goals in terms of content - Adequately present results - Meeting the demands of the specific domains
Costs	- Keeping to budgeted costs - If necessary, make timely budget adjustments and finance additional costs
Time	- Keep to schedule - Adjust the schedule if necessary

1.2 Project Coordination

A project organization must have the ability to decide on changes or termination. In case of a termination, the reasons can be very different. Better a justified termination than a continuation without any prospects of a valuable outcome.

1.3 Internal communication

Structured, regulated and efficient communication within the project. Definition of communication channels and platforms as well as responsibilities at the beginning of the project.

1.4 Project hierarchy

Normally, the project partners have equal rights; if a project involves too many partners, a hierarchy is imposed, e.g. the selective involvement of partners as experts, test users, suppliers, etc.

Problem: Integration into the IP regulation, which is the easiest to achieve with equal rights. Up to three equal partners are manageable in practice, but a gradation of participation should be considered, e.g. with two main partners, each involving a further partner.

2 Project success criteria

General project success criteria also apply to interdisciplinary projects. The assessment of the chances of success, the definition of objectives and partners is more difficult due to the lack of knowledge of the other disciplines. Interdisciplinary aspects make project applications and projects more demanding, more complex and riskier.

Measure: preliminary project.

2.1 Fertility of the approach

Assessment at the application stage to the best of their knowledge and belief, in particular with regard to the basic questions whether the project requires different competencies with research relevance. Involvement of an outside coach for critical feedback at the application stage.

2.2 Ambitious, realistic goals

Sensible balancing between the difficulty and scope of the tasks on the one hand and the competencies and quantity of the participants on the other. Interdisciplinary cooperation promises a higher innovation potential, but due to its complexity also encourages the participants to work more cautiously and to have moderate expectations.

2.3 Partner selection

The competences of the partners should touch each other and the topic, they should complement each other but not overlap substantially. Preferably the number of partners is kept small. The assessment of which competencies are necessary requires the involvement of partners at the application stage ("partner selection dilemma": who has once been invited should not be excluded). Partners have to fit together: SME or large company, geographical proximity, sectoral reference. In this context, "fit" means a balanced measure of similarity and complementarity. The same applies to research partners.

3 Project Dynamics

Interdisciplinary projects have more potential for surprises, more difficulties, and contain rather demotivating economic aspects. Interpersonal factors for coping with the uncertainties are becoming increasingly important. It makes sense to make room for growing together as a project team through mutual visits and an appropriate time frame. A common basic understanding and language must be consciously developed and are part of the project work.

3.1 Results

Good results motivate, positive surprises even more, as long as it does not lead to doing only what is instructed. The value of the results is different for different partners, which can lead to varying dissemination of the results by equal partners, for example by publications.

3.2 Interpersonal factors

Mutual acceptance and the willingness to overcome difficulties together motivates and increases the chances of success.

3.3 Economic incentives

Different institutions / companies have different cost structures and cost rates. Similar job functions can have very different salaries depending on the discipline (e.g. humanities vs. technical professions). Large differences can cause irritation and may demotivate. They must be addressed and clarified at the application stage.

3.4 Budget allocation

The allocation of funds must be appropriate to the roles in the project. In the case of equal participation, an equal distribution of the funds is desirable. In other cases, a common understanding of the partners' responsibilities and the extent of their performance in relation to the project objective must be developed in advance.

4 Arrangements

4.1 Arrangements by industry

It is important for industrial partners that the responsibility for the results is clearly evident from the project structure. This sets certain limits to the surprise aspect that is expected in interdisciplinary cooperation. Similarly, this will usually result in the research partners being responsible to varying degrees.

4.2 Arrangements by research institutions

Special incentives may encourage interdisciplinary projects. However, experiences with programs aiming at fostering interdisciplinary projects are very different. The question of the necessity of interdisciplinarity always needs to be addressed at the beginning of a project. Above all, the institutions must ensure that no obstacles are created to cooperation between researchers within or outside the institution, for example by reducing cost rates to compensate for the differences between project partners if necessary.

4.3 Precautions on the part of researchers

Interdisciplinarity forces all participants to perform their role and tasks in the project in such a way that they are comprehensible to the other participants. Communication and coordination with partners tend to require more time.