A HOLISTIC PROCEDURE FOR PROCESS INTEGRATION IN DESIGN COOPERATION

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ABSTRACT
In preparatory stages of an upcoming cross-company cooperation an integration project has the task to establish best possible connections between relevant organizational units. Therefore the integration of company sub-divisions willing to cooperate has to be accomplished under the conditions of insufficiently pre-evaluated management specifications, limited project time and resources as well as strongly diverging requirements of affected operating departments. Existing approaches of cooperation and process management support integration projects by delivering methodological proceedings and tools, but paying not enough attention to the explicit search for operative processes and their integration under specific project restrictions. Within this article on the one hand the need for strengthening the paradigm of process orientation in cooperation projects is pointed out, and on the other hand an additional, practical instrument for process integration is offered. The authors introduce a holistic proceeding, that enhances existing solutions of today's cooperation management by adding the key success components: inter-organizational process identification and process integration.

Keywords: cooperation, process identification, process integration, process integration ability

1 APPROACHING DESIGN COOPERATION
Organizations cooperate in order to create economically advantageous synergy effects, which they would never had realized doing it alone [4]. From a management perspective synergies as for instance market power, operative, financial and corporate management synergies [13] are quickly identified, talks initiated and inter-organizational cooperation agreements committed. Nevertheless a successful realization of expected synergies is never guaranteed and cooperation fail despite promising signs, due to preparative activities not being sufficiently considered in the decisive phase of planning and formation of the cooperation. Before actually starting the cooperative work in this early stage it is necessary for integration projects on the one hand to use their tightly calculated time and budget to full capacity for process integration and on the other hand designing these as efficient as possible. Every mistake in setting up or executing the specific cooperation causes a loss of aspired synergies and so deprives a cooperation of its actual legitimization. Figure 1 shows the described circumstances and puts them into relation.

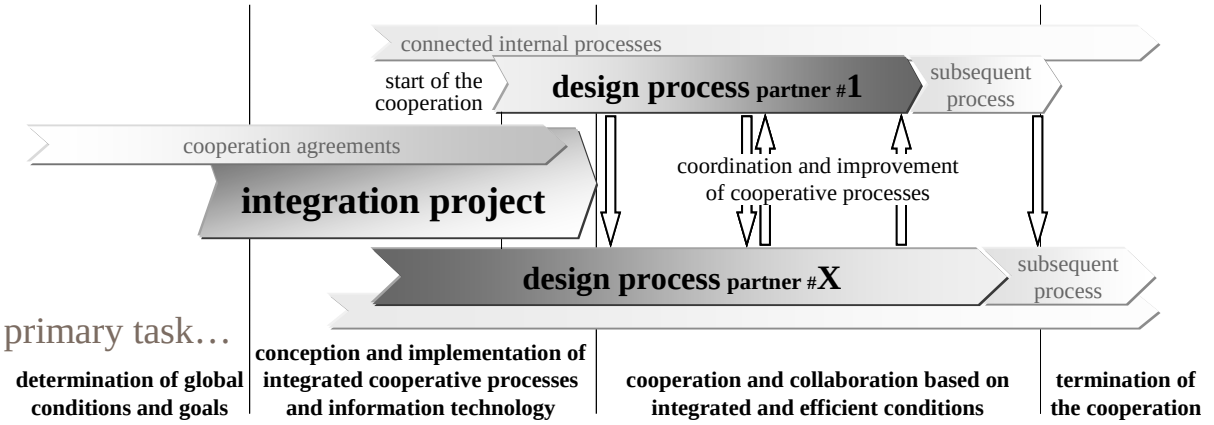

Figure 1. Integration projects and the need for process integration

In the context of this article an integration project is understood as the trailblazer in front of the underlying cooperation project, that realizes the integration of two or more organizational divisions planning to cooperate taking boundary conditions into account. Therefore management targets and parameters in the form of cooperation agreements have to get aligned with the operative, process and technology related requirements of affected cooperation processes, transformed into an overall consolidated draft of the later cooperation.
The integration project coordinates all related activities. Its members consist of a permanent integration team, composed of the project management and a small core team, as well as an extended project group, staffed with experts of operating and information technology departments of cooperating companies.

2 CHALLENGES OF INTER-ORGANIZATIONAL INTEGRATION OF COOPERATIVE PROCESSES

The abstract term of process integration not only includes the steering of inter-firm processes, it moreover combines the common coordination of designing, modeling, implementing and if necessary improving organization-crossing processes [9]. Following this advanced approach the integration phase of a cooperation continues to gain in importance. In this early stage agreed decisions and network concepts have enormous effects on performance and at least revenue of the whole cooperation project. Mistakes done integrating processes and information technology are usually identified late and lead to the implementation and working under inefficient cooperative conditions. In order to prevent this, integration projects have to meet challenges like dealing with diverging strategic and operative requirements as well as fulfilling its project goals. See figure 2 for an exemplary illustration.

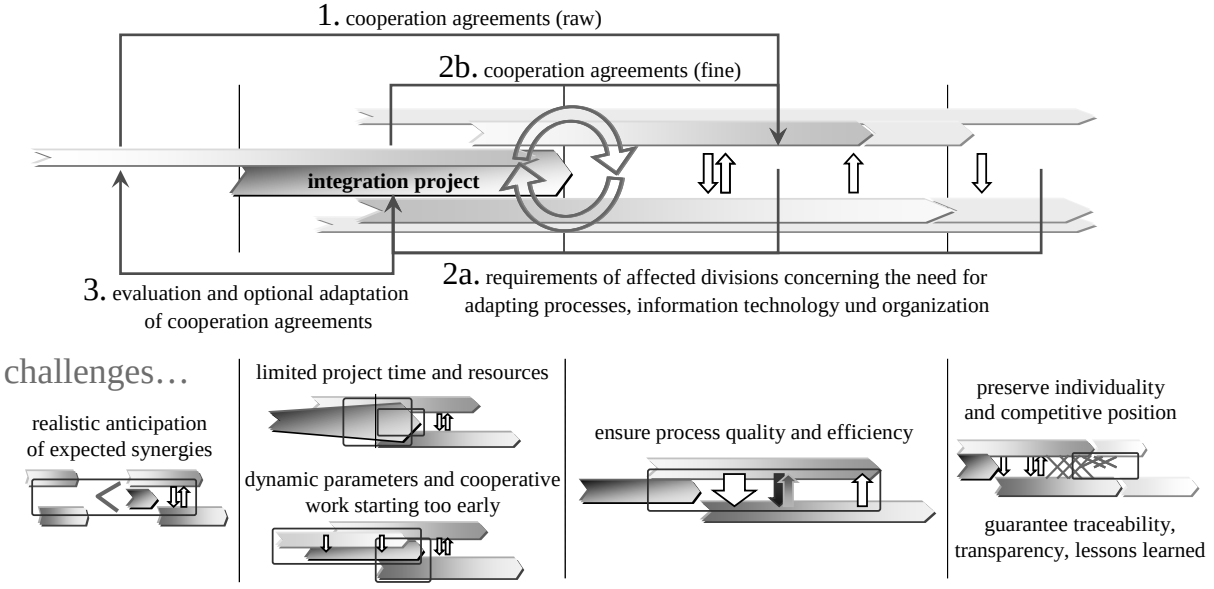

Figure 2. Divergent strategic and operative requirements and further challenges for integration projects

Chief subject of this paper is the question, whether today's integration projects are equipped with the necessary tools to answer all expectations referring to inter-organizational process integration. Analyses show, that cooperation and process management researches indeed offer a certain amount and variety of methods and procedural models, but at the same time disregard elementary issues [15]. Integration projects need more methodological support especially in terms of an explicit identification of cooperation processes in combination with the design, evaluation and implementation of appropriate integration scenarios under restricted, realistic conditions. As a consequence, fundamental problems of process integration can't be solved comprehensibly and above all independently from special experiences and know how of available project members:

- How can cooperation processes be identified without the existence of standardized, inter-

organizational and thereby comparable hierarchic process models?

- Which cooperation processes demand special attention of the integration project, due to high integration risks?
- Which realistic possibilities for integrating cooperation processes do exist and which one of them is the most efficient and economically feasible?
- How does an integration project continuously deal with dynamic changing cooperation agreements, and can adequate integration measures be implemented?

In the chapters below a holistic procedure is introduced by the authors, who addresses the described challenges and answers the outlined questions above.

3 A HOLISTIC PROCEEDING TO PROCESS INTEGRATION

3.1 Overview

In general, every possible type of organizational cooperation can be understood as a lifecycle. According to Hofer [1-3, 11] four abstract phases have to be considered as can be seen in figure 3. In addition to that idea, Hofer designs a procedural model for process orientated cooperation management, but her concept only insinuates the search and integration of operative processes, which might not be modeled in process hierarchies. In order to identify these processes, it is advisable to enhance the procedural model of Hofer et al. with the help of a subdivided proceeding, the way it is illustrated in figure 3. It is considered to be used in a very early phase of an integration project and has two primary functions: identifying critical inter-organizational processes as well as designing and planning of efficient integration scenarios.

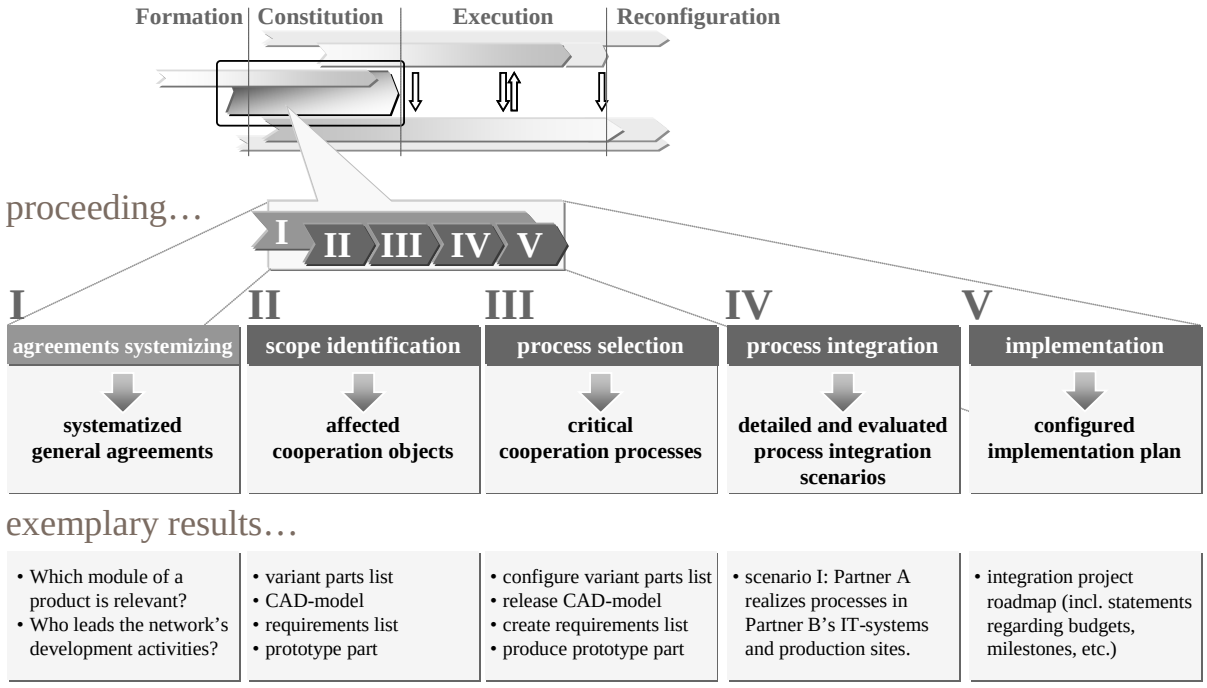

Figure 3. Holistic proceeding for process identification und integration in the context of an integration project

Additionally figure 3 shows the main results of each phase and gives examples. The approach of identifying cooperation related process objects on the basis of current cooperation agreements instead of trying to commit a direct search for common processes has to be emphasized (see chapter 3.2). With the help of that, an identification can take place, which delivers processes, that are critical for the integration project to a certain extent or jeopardize the cooperation efficiency or quality (see chapter 3.3 and 3.4). Thereupon for these critical processes differently shaped integration scenarios get constructed, that regard both the specific processual requirements of affected operating departments

and restrictions of cooperation partners according to information technology matters (see chapter 3.5). In the following, phases of the procedure are described in detail.

3.2 1st phase - agreements systemizing

The first phase 'agreements systemizing' is of a comprehensive character. It runs parallel to all four other phases. This corresponds to the fact, that cooperation agreements steadily win maturity as well as get more detailed and therefore often have to be changed. Poulymenakou and Klein point out [12]: *"Inter-firm networks […] are governed by relational contracts, which are - compared to contracts used in markets or in a firm setting - underspecified. This makes networks very flexible but at the same time precarious organizational arrangements."* Thus the intended purpose of an integration project must be the collection, systemizing and allocation of management boundary conditions related to process identification and integration. These can be subdivided into three categories and fine-grained over the course of the proceeding (see figure 4):

- cooperation matter: product or service, representing the actual cause for the cooperation,
- cooperative processes: general allocation of working processes on a very abstract level,
- cooperative systems: specified usage of certain information technology (IT),

This way integration teams and cooperation management together anticipate and fix broadly defined, provisional terms of the upcoming cooperation.

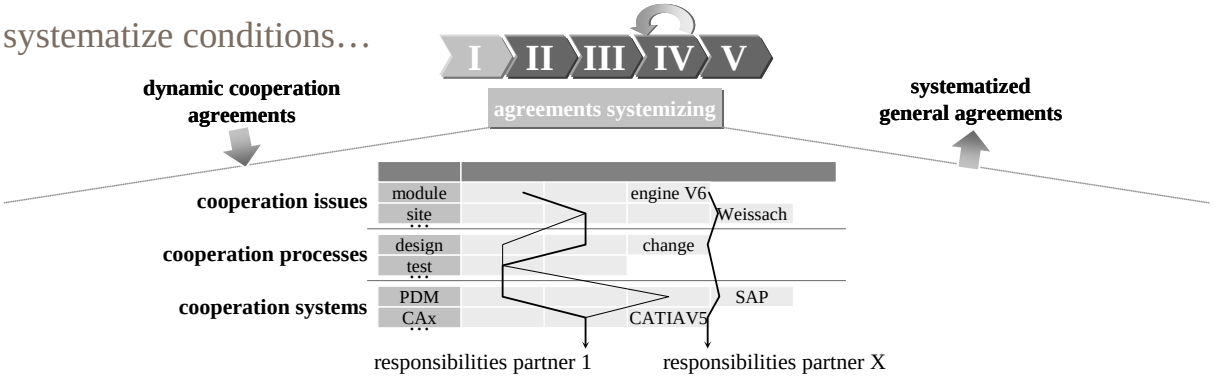

Figure 4. Collection, systemizing and allocation of raw cooperation agreements

A pre-configured but customizable morphological chart [17] serves to provide a methodical and creative instrument for collecting all communicated arrangements. It is a central source for the integration project.

3.3 2nd phase - scope identification

In large cooperation projects, like two original equipment manufacturers cooperating in designing and testing of complex, multipart modules, integration projects are exceedingly faced with the challenges illustrated in figure 2. Accompanied by an increasing product and process complexity, difficulties in finding the actually affected cooperative processes and their integration possibilities will rise to the same degree. As already mentioned in chapter 2, hierarchic process models do not represent an appropriate basis for the purpose of ad hoc process integration efforts. It can not be generally assumed that cooperating partners necessarily own the same understanding of process terminology and modeling. In this case paradigms collide, that have been developed separately in years. Funk et al. subsume current problems of process analyses based on firm-specific process models in the following way [8]: *"Modeling notations like WS-BPEL, BPMN or UML have a relative complex and very extensive syntax, that can lead to a complex and error-prone business process integration. […] Therefore transformation, integration and analysis of business processes in operational praxis still require a multitude of manual working steps, that increase the efforts for a realization of automated, integrated processes."* As a solution possibility, they suggest the creation of meta-models, e.g. ontologies, that increase the comparability of different process models by adding and interpreting additional, more abstract information.

So in order to speak about the same, especially in an early stage of getting to know to each partner, integration projects have to standardize before analyze cooperative processes. By defining a neutral level of inter-organizational communication by means of abstraction, the search for processes will capture the essence and be reduced to really common issues. The adequate way for detouring model incompatibilities is the use of process objects, as it is demonstrated in figure 5. Object meaning, extend, occurrence, amount etc. are well known to cooperation partners with a similar area of expertise. Even for an intercultural understanding objects appear to be a neutral basis for analyzing the upcoming cooperative work. A costly synchronization of different philosophies in the run-up of process identification is no longer needed.

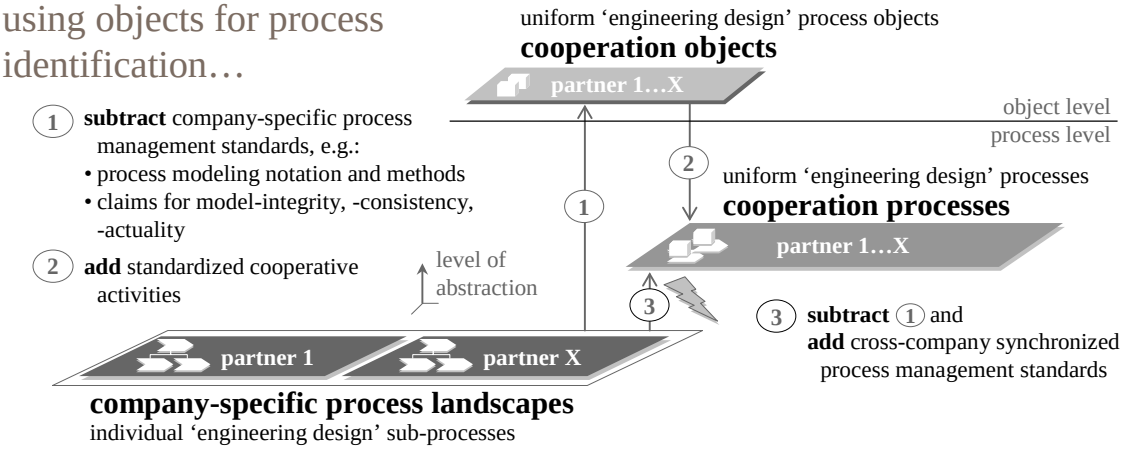

Figure 5. Avoiding the identification of cooperation processes in differing process models using a process object-oriented approach

To a certain extent definitions of cooperation objects and process objects [5, 6, 18-20] overlap. There is an agreed opinion about differentiating tangible from intangible assets like prototype part from product structure information. But for this concept's sake a further precise distinction is recommended. A process object only equals a cooperation object, if it is element of one inter-organizational cooperative process at the very least, e.g. 'functionally test prototype part' or 'configure product structure'. Of course the existence of a huge amount of potential operative cooperation objects has to be assumed. That makes an identification of processes not easier. So the most important job for an integration team in this second phase is the extraction of relevant objects from this indefinable object crowd.

One possible way of reducing the variety and complexity of this task, might be the consideration of system theory [7, 14, 18]. The general idea is to stepwise separate one environment from another until clearly defined and analyzable systems can be distinguished. Therefore system-internal elements and their mutual relations as well as entry and exit criteria for system boarders have to be clarified. Figure 6 shows, how this approach helps to extract relevant cooperation objects.

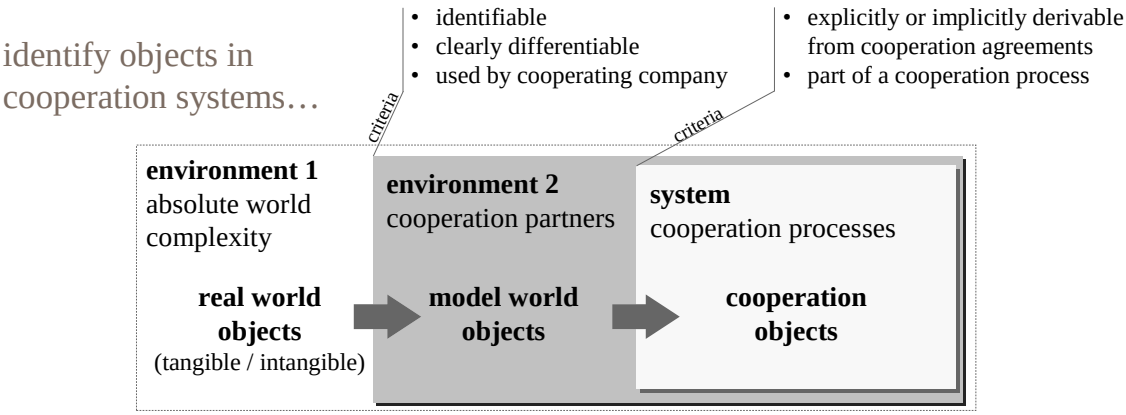

Figure 6. Identifying cooperation objects in a system theory-based approach

Cooperating companies with flexible object models offering the functionalities to describe such a system-bases view will find relevant objects easily. If a corresponding model is not available, it is the integration team's task to initially design that model of environments, systems and necessary criteria always concerning the so far communicated raw cooperation agreements. Having accomplished this, the actual search for cooperation objects can be proceeded. Whereby, it has to be pointed out, that until today developed scientific methods do not allow a formalized and automated tracing of objects [18]. Nevertheless there exist a couple of rudimentary approaches like the document-analysis [14], the issue-related use case imagination or the searching via checklists [18].
After extracting all relevant cooperation objects, the identification of cooperation processes is prepared. For that reason important information referring to every selected object have to be gathered. The goal of doing this is to get a detailed description of present cooperation object's situations from a very operative point of view. These information provide the following process identification. On the one hand this collection serves for identifying object related processes and on the other hand for a, ideally partly automated, determination of the process integration ability (see chapter 3.4). Therefore detailed information according to the following four dimensions and their mutual relationships should be brought together by both the integration team and chosen experts from the extended project group:

- activities: standardized operative action done with a process object, e.g. change, produce etc.,
- divisions: differentiated between creator and user of a process object and their headcount,
- systems: technology handling information about a process object,
- places of action: differentiated between geographic locations, sites, facilities etc.

and their mutual

- relations: real existing connections between collected information above, e.g.: 'change CAD-model' connected with 'Engineering Design of V6 engines, 123 employees' connected with 'CAD-Tool, Change Management System' connected with "Porsche-Weissach, Porsche-Zuffenhausen, Volkswagen-Salzgitter'.

In figure 7 the single steps of this second phase are summarized.

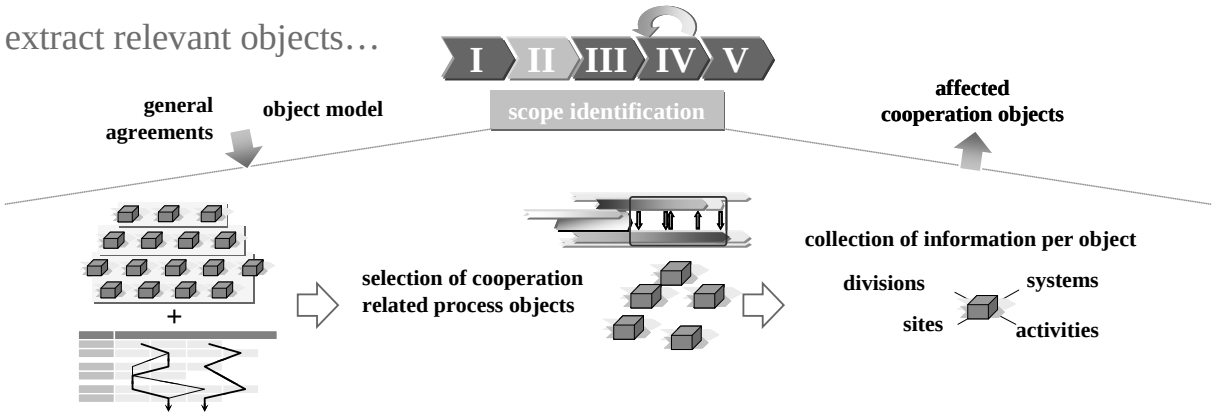

Figure 7. Selection of relevant cooperation objects and collection of descriptive information

3.4 3rd phase - process selection

Following the procedure, after a first scope reduction and a detailed description of the pre-cooperative situation with the help of cooperation objects, identifying cooperation processes is next. In context of the concept introduced, a cooperation process is defined as a combination of a cooperation process object (see chapter 3.3) and a cooperative activity. Within the information platform generated above all real existing combinations of objects and activities and meaningful relations to information technologies, divisions and sites are stored and ready for evaluation. Nevertheless it would mean an unjustifiable effort analyzing every single object-activity-combination according to their cooperation characteristics. In this early project phase in any case it seems more useful to filter and integrate those cooperation processes that show an increased criticality for the integration project or the aspired target-state of working together. So processes whose integration demands urgent decisions or the additional provision of project capacities have to be considered first for process integration.

To be able to prioritize processes this way, a standardized process related benchmark appears to be essential. The challenge in that is to evaluate the actual integration-ability of an object-activity-combination with the given information. So part of this article is the definition of such an index. With the Process Integration Ability index (PIA) hereby introduced, the expected effort of a cross-organizational process integration is measured. In this context integration includes design and implementation of processual and technological cross-linking regarding to cooperation arrangements. To calculate PIA the integration team internally analyzes the following factors per cooperation process using the information platform:

- number and spreading of involved process partners,
- geographic allocation and accessibility of affected sites and
- ratio of object creator to object user, who use information technology.

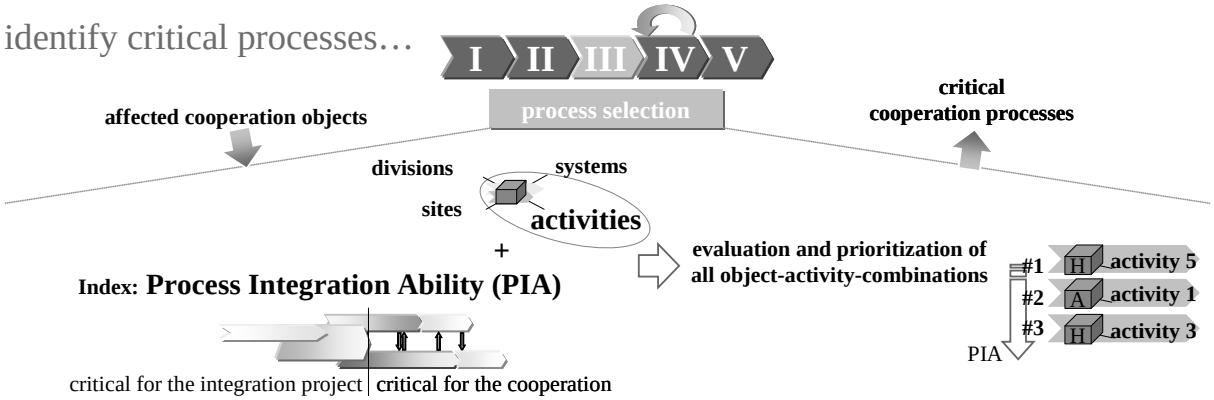

Figure 8. Calculation of the Process Integration Ability (PIA) and selection of critical cooperation processes

With knowing PIA whole new possibilities open. Through comparison of an index the integration project is capable of closely focusing on critical cooperation processes. Out of an undefined mass of organizational processes the mission-decisive ones are explicitly brought to integration.

3.5 4th phase - process integration

In the course of this fourth phase the design, evaluation and selection of possible ways of integrating chosen critical cooperation processes takes place.

Initially in order to go easy with resources three raw integration scenarios are internally and methodologically assisted designed by the integration team. At that time a differentiation between at most three extremely pronounced scenarios seems adequately. Main purpose of pre-configuring raw scenarios in cross-organizational teamwork is to develop generally imaginable allocations of processual and technological responsibilities and competencies. In addition to that, these scenarios provide first prospects on future integration efforts and give early feedback to the management regarding to feasibility and efficiency of cooperation agreements made so far (see figure 9). Considering an uneven distribution of decision power, scenarios are created from the perspective of one focal organization if existing but nevertheless taking wishes and constraints of all cooperation partners into account.

The scenario refinement starting now is proceeded under inclusion of the extended project group and thus costly in terms of time and budget. In agreement with affected process experts and process owners, belonging to operative or IT-departments, raw scenarios get adjusted finely by adding even more profound responsibilities and necessary processual [10], information technological or even organizational measures. After that the accomplished fine scenarios again get evaluated and prioritized according to feasibility and efficiency. In both the design and evaluation stage compatibility has to be guaranteed according to:

- all known management and operative requirements in connection with the suggested integration measures and
- revealed interdependencies between integration scenarios theirselves.

In cases of incompatibility, the developed fine scenarios have to be redesigned in another iteration loop (see figure 9). After all, best rated scenarios can be brought to implementation.

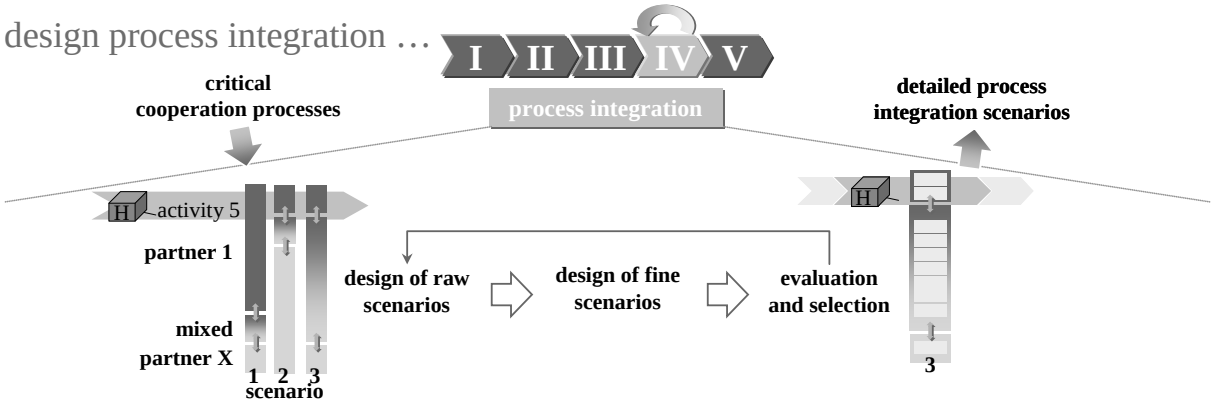

Figure 9. Designing fine integration scenarios for critical cooperation processes

3.6 5th phase - process implementation

On the one hand, cooperation process related integration scenarios describe detailed target-states of working together, on the other hand they imply further need for action for cooperation projects. Consequently, continuing the holistic integration approach desires an implementation planning under realistic circumstances, a planning that considers all process integration risks identified so far.

In coordination with all process owners involved, implementation packages are derived from selected integration scenarios. Under consideration of the current project's provision with time, budget, know how and resources, these packages now can be transferred into a detailed project roadmap and be realized (see figure 10).

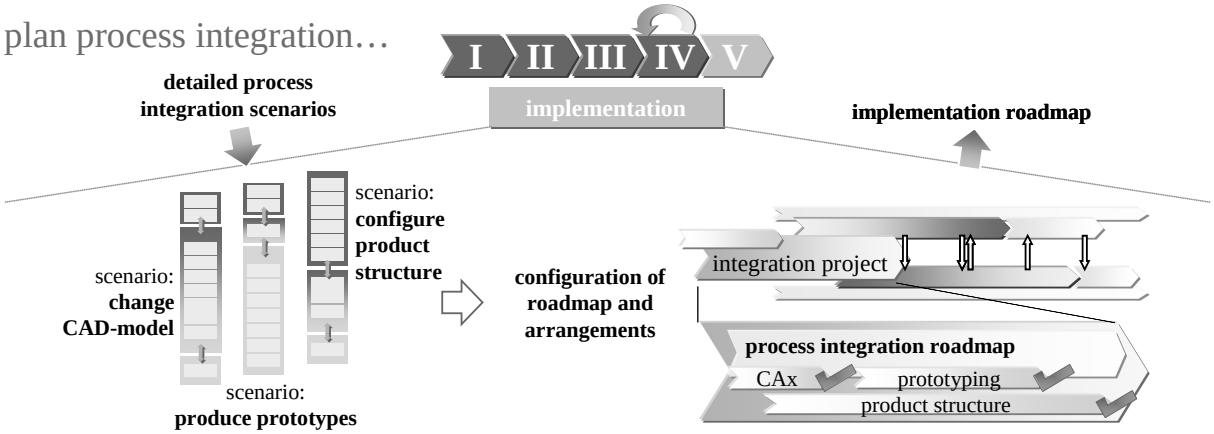

Figure 10. Deriving an integration roadmap for selected critical cooperation topics

4 CONCLUSION

The extent of actually realized synergies of cooperative work depends on the achieved quality of cross-organizational process integration. The usage of the methodical procedure introduced increases this quality by offering an additional support to integration projects.

Key to success lies within the procedure of firstly identifying cooperation processes with an object-oriented approach and secondly integrating them with the help of deductively designed integration scenarios. Identification and integration of critical cooperation processes are specially focused on. These processes show minor integration ability and in a consequence might jeopardize the success of the integration project as well as the profitability of the entire cooperation itself by potentially causing too high, unexpected integration efforts.

Table 1 outlines the advantages of a consequent usage of the proceeding introduced in projects having the order to establish an efficient network by integrating cooperation processes.

Table 1. Positive effects by using a holistic approach for process integration

Dimension	Integration project goals	Cooperation goals
time	• be able to fulfill project roadmaps • be able to create and fulfill plans for cooperation process and system integration	• be able to anticipate and reach the start line of the actual cooperative work
costs	• be able to fulfill project budgets • be able to verify necessary goal or budget adjustments	• be able to achieve planned cooperation yields • be able to verify necessary goal or budget adjustments • be able to decide early against the execution of the cooperation project because of initially unexpected high integration and coordination efforts
quality	• be able to minimize project risk by using a methodological procedure for identification and evaluation of integration circumstances • be able to reuse a transparent documentation in similar upcoming integration projects	• be able to use efficient and integrated inter-company processes • be able to clearly allocate and align clear responsibilities according to cooperation matters, processes and information technology within agreed detailed integration scenarios

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