55 SERVICE DEVELOPMENT IN VIRTUAL ENTERPRISES

Günther Schuh[1], Heiko Dirlenbach[2], Laura Georgi[3]

Research Institute for Operations Management
at Aachen University of Technology
Pontdriesch 14/16
D-52062 Aachen, GERMANY
Tel: +49 (0241) 4 77 05-0
Fax: +49 (0241) 4 77 05-199
{1,2,3}@fir.rwth-aachen.de

In most European countries a structural change from a production dominated towards a service oriented society is progressing. Companies increasingly consider services as means to gain competitive advantages in a global competition. In order to provide holistic, value-adding solutions while simultaneously guaranteeing high quality standards, production companies increasingly join forces with external services' providers. Models, methods and tools for service development are rare and in most cases immature. In the context of virtual services' development this leads to a dual set of simultaneous challenges: an alignment of systematic services' and product development and the coordination of distributed R&D partners. The objective is to provide a meta-process that identifies all steps and decision points necessary to successfully develop innovative services. It is a result of combined service development and virtual enterprises'/ networks' research.

1. CHALLENGES IN COLLABORATIVE SERVICE DEVELOPMENT

On the macro-economic levels, most European countries realized a shift from agricultural to production and increasingly services' dominated economies (Ahlert, Evanschitzky 2003). On the micro-level individual companies – not only pure service providers but also production companies – use services as means to gain competitive advantages over a global competition. Innovative services are thus a prerequisite for economic success (Schuh et al. 2004; Luczak 2004).

A simple transfer of production oriented R&D models to the challenges of service innovation is not feasible. Holistic and repeatable approaches for developing and implementing new services are rare and on a low level (Scheer et al. 2003). Obstacles encountered can be deducted from services' characteristics of being intangible, of supply and consumption being simultaneously, of customers being directly involved in the production process, and of being perishable (Gill 2004;

Schuh et al. 2004). Services were and still are developed in unsystematic ways. The trigger for development is usually demand-driven. The company re-acts. As a consequence, the development results in complex service portfolios that are characterised by inefficient production, duplication of service development, cost-intensity and not meeting customers' demands (Luczak 2004; Scheer et al. 2003).

In the scope of this article service innovation is defined as results, procedures and processes that are of high quality and which are distinguishable from previous. The novelty has to be perceivable and marketable. An invention is not satisfactory, only sales or objective efficiency gains distinguish real innovations (Hauschild 1993). Based on this definition, service engineering is perceived as the systematic planning and development of technical services, making extensive use of engineering methods and tools as well as considering marketing issues at an early stage of the development process. A stepwise approach and the use of methods and models are the main characteristics, allowing for efficiency and efficacy as well as for high quality services (Schuh et al. 2004; Gill 2004). The company acts.

Hence, the intangible services are considered to be developable objects by using systematic methods and models in the creation process. Latest research shows several procedure models of varying details and foci (Bullinger, Schreiner 2006). In most models three phases are defined: Analysis, Concept, and Implementation.

An era characterized by re-organization, cost-cutting, shorter product life cycles and globalization demands companies for drastic re-orientation and focusing on core competencies. Yet, consumers request on one hand full-service solutions and on the other hand customization. As a consequence companies tend to set up breeding environments (BE) enabling cooperation in virtual enterprises (Afsarmanesh, Camarinha-Matos 2005). Thus, service providers and product suppliers joining forces in form of virtual enterprises (VE) lead to new ways of collaborative services' or extended products' development in order to satisfy customer requirements efficiently. This development is supported by the high-speed progress in information and communication technologies, allowing collaborative companies for specialization on core competencies, division of responsibility, reducing complexities but also for control and easy information exchange.

2. THE META-PROCESS FOR COLLABORATIVE SERVICES' DEVELOPMENT

To solve the dual and simultaneous challenges of developing services while maintaining good virtual enterprising, a meta-process has been defined. The process is deducted from the models of Jaschinski (1998) and Cooper, Edgett (1999); both focusing on service development in a single company. Moreover, findings of ongoing cooperative R&D projects on the development of innovative after-sales services are used to modify the existing approaches with regards to requirements arising from breeding environments in general and virtual enterprises in particular.

Based on the definition of service innovation, special emphasize has been put on business modelling as well as initiating marketing activities in early development stages. Thus, the meta-process shall support in generating not only inventions but real innovations by integrating the customer as early as possible in the analysis and design phases of new services; merging engineering disciplines with business

administration. Thereby, a user-centric approach in virtual development environments is guaranteed.

The meta-process consists of four phases: Activation has been added prior to the three phases described above in order to cover the organizational set up. Individual activities per phase lead to a decision gate on continuation, repetition of single steps or complete termination of R&D activities. While setting up a project work plan, these can be considered as milestones. Each single step further consists of individual elements that are considered to be interim decision points. In the following, graphics visualise the process and further provide the envisaged process result per element on the right hand column. The individual elements are numbered as follows: Phase (0, I, II, III), Participants (N=Network, C=Company), Gate (0-5), Step (0-8).

Organisational Set up

Phase 0 Activation adds setting up a breeding environment to subsequent steps in service development. Central elements are decision of a strategy, definition of virtual enterprise goals, mutually accepted rules and procedures as well as a framework contract (Zahn, Stanik 2006; Afsarmanesh, Camarinha-Matos 2005). These could be set by one single company, by a task force initialized by some companies or all participants of a breeding environment. The individual constellation strongly depends on the general organisational set up. Based on this definition the further partner and team selection starts.

Service Requirement specification

The core service development process starts in the individual company with **Phase I Analysis**, where idea generation as well as the initial evaluation takes place and leads to the first decision gate. As innovations in distinction to inventions are sought the new service has to comply with the company's/ BE's strategy and shall fit into the existing products and services' portfolio (Cooper 2002). In case of generating several ideas in parallel, the first step leads to a prioritisation and is the starting point for subsequent activities.

Two scenarios concerning the described steps from idea creation to initial resources' planning are possible: one company conducts these steps or the BE partners perform all necessary steps collaboratively. The decision on an active cooperation – a virtual enterprise – is being taken after the initial resources' planning, see Figure 1 step I.C.24. By assumption, the subsequent description starts with idea generation in one company. Referencing to Figure 1, the process starts in the middle column (company) and after the decision on cooperation the further process is being described in the left hand column (virtual enterprise).

If the first and rough description of a service idea is satisfying and passes the first decision gate, it is used to conduct preliminary analysis of the target market, filtering out the basic user-requirements and leads to a first positioning strategy of the new service. Based on the latter, new requirements might emerge and shall be incorporated in the evolving concept. A technical feasibility study shall result in a rough process definition for the future service supply. This will be subsequently used for a preliminary resources estimate, i.e. human, financial resources as well as machines. The study might show that the single company will not be able to provide the service or an extended product, i.e. a product plus value-adding services, efficiently. In initializing a virtual enterprise the chance of opening up promising

market opportunities by further developing and supplying the services collaboratively can be taken. After deciding on joint activities, the resource planning has to be further detailed with regards to the networked solution. The results will lead to a project work plan, reflecting costs, time, and resource allocation. The project work plan shall also be the starting point for a requirement description of plannable modules that are assigned to individual project partners.

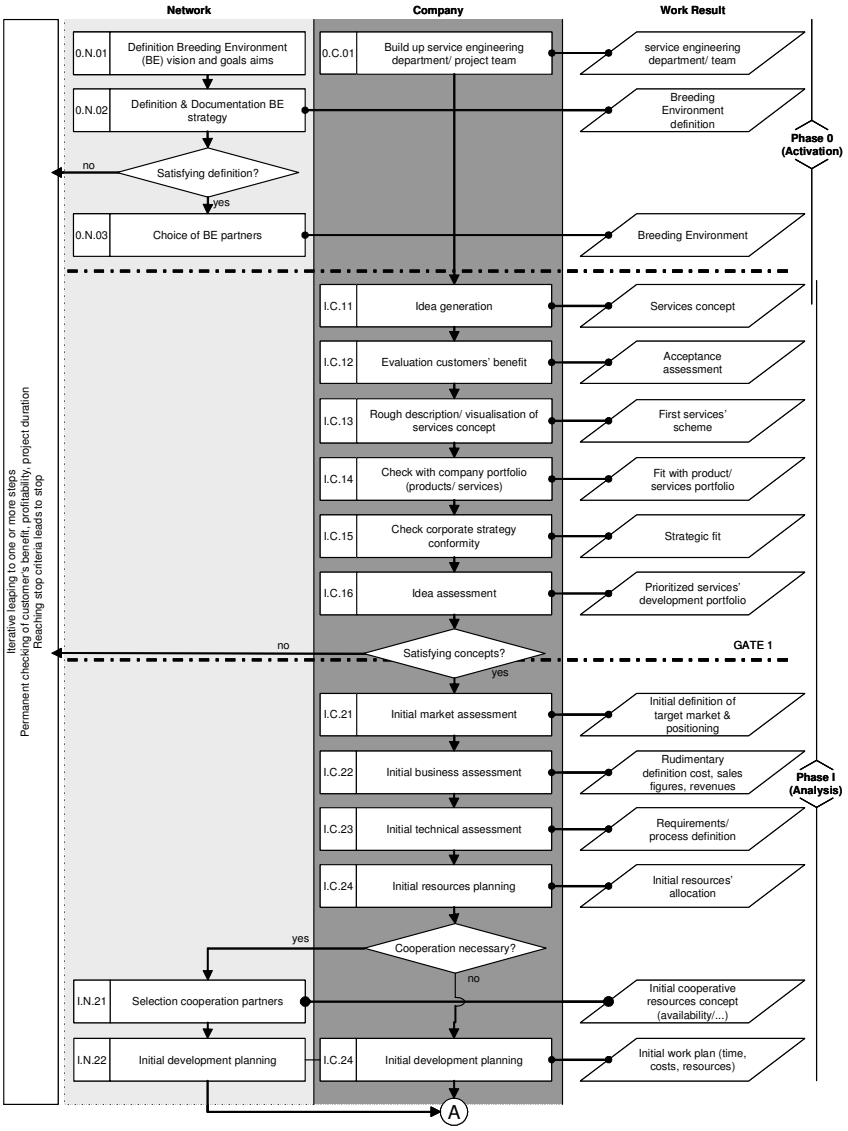

Figure 1: Meta-process of collaborative service development (Part I)

Service Concept definition

Phase II Concept induces the crossing from a breeding environment to a virtual enterprise, i.e. an active and goal oriented cooperation. Especially in case of extensive multi-player projects standards shall be defined, e.g. standardized status reports, work plans or data structures. A more detailed market assessment of the initial concept or prototype tests with customers allows for a better basis for further planning or refinement by repeating the last steps or could cause the termination.

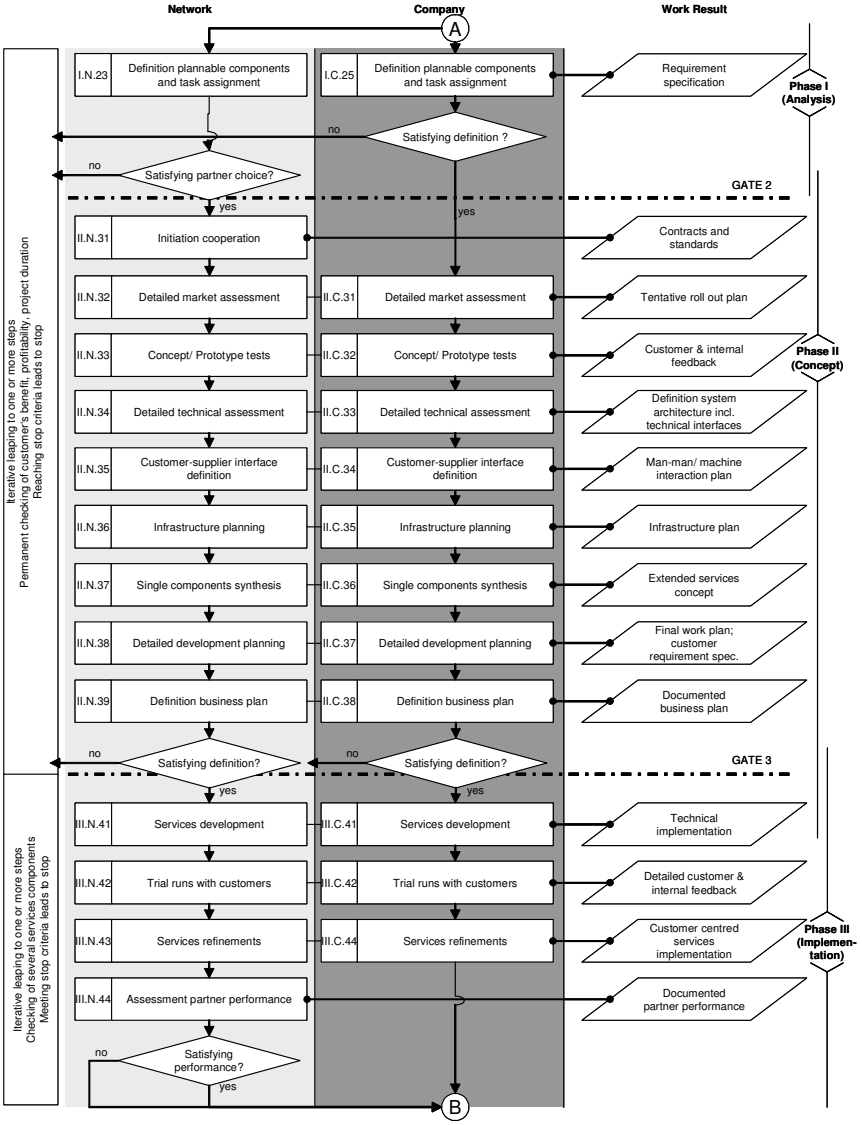

Figure 2: Meta-process of collaborative service development (Part II)

A system architecture defines all interfaces, i.e. technical, and customer-supplier interfaces in case of services, as well as infrastructure plans. The first service concept enables the VE to design a detailed project work plan as well as detailed and comprehensive requirement specifications, including specific activity allocation on partner level.

Customers generally prefer one face, i.e. one contact person they can address. Moreover, if services are being supplied by several partners, customers require uniform and stringent solutions that are being accounted for a single step, i.e. as if they are dealing with one supplier only. It is thus of utmost importance to define a business model that on the one hand reflects and satisfies the customers' requirements but also the individual partners' contribution. Process as well as documentation standards will further support a consistent service performance encompassing partner companies' boarders.

With a satisfying business model, the third gate leads to the final **Phase III Implementation**. The technical implementation includes the final definition of service supply processes between virtual enterprise partners and the customers as well as objective quality check criteria.

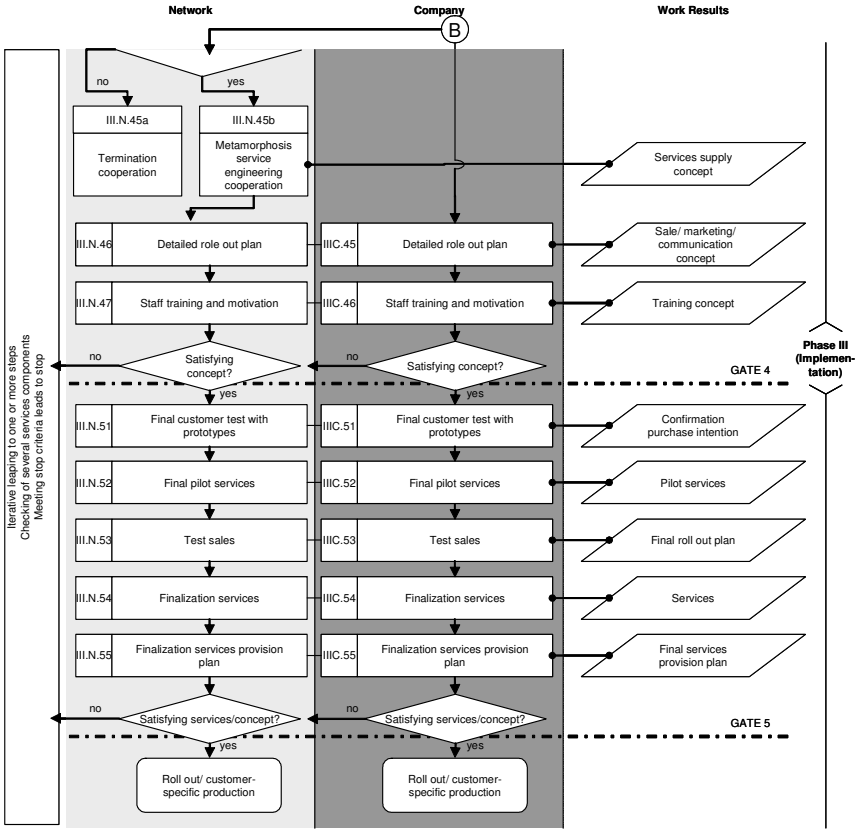

Figure 3: Meta-process of collaborative service development (Part III)

In test bed demonstrations detailed feedback of customers shall be acquired and mirrored with network internal testing procedures. These joint test results shall lead to a final and user-centred refinement of the services' concept.

As the final implementation of the newly developed service is at close hands, each partner's contribution during the development as well as – potentially – during the implementation is to be evaluated with regards to ability, capability and effectiveness. Based on this evaluation and well before actual market entry, it shall be decided which partners are part of the supply virtual enterprise and which shall move back to or out of the virtual breeding environment. Developing and supplying partners are not compulsively the same. A case is considered, in which a company jointly develops new services with non-profit research institutes. The service finally is only offered by the industrial partner. This is being depicted as metamorphosis of the development cooperation (Afsarmanesh, Camarinha-Matos 2005), the final stage that leads to sales, distribution, marketing and communiciation as well as training concepts. The latter not only evaluate qualification needs but shall also support motivation among virtual enterprise partners. The final gate before actual market entry shall be positively taken.

Final tests with specifically selected target customers, shall finally affirm the customers' willingness to buy. Based on a pilot service the decisive market entry plan will be the basis for the final top management decision on customer oriented production of the newly developed service.

3. CONCLUSION

A meta-process for the development of services in virtual enterprises has been introduced. The goal of this contribution is on the one hand to offer the practitioner guidelines for the collaborative development. On the other hand, it is envisaged to further contribute to the academically oriented discussions on holistic service engineering models and methods.

The results are based on several collaborative research projects. The validation will be conducted in the EC-funded integrated project MYCAREVENT (004202), in which 20 partners develop innovative IT-services and man-made services for the automotive after-sales market. Significant feedback from this project lead to further modification of the original meta-process and resulted in the described version. Most important conclusions with reference to discussions within the service engineering community are the more stringent combination of engineering and marketing activities.

Further research will be conducted on identifying the specific methods and tools needed to derive each element's results, see also Gill (2004). Moreover, critical success factors that allow for a competitive use of the proposed meta-process in daily business as well as to further refinements shall be empirically deducted. Finally, the success factors are basis for the definition of steering and control mechanisms that will be reflected in future versions.

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