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BIO4C: Cooperation Engineering in the Biotechnology Industry

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SUMMARY

This research-in-progress paper focuses on "cooperation engineering", i. e. the development of a method and its web-based tools to support virtual cooperations between small and medium-sized biotechnology enterprises. The result will be the electronic industry portal platform BIO4C. This portal will not only provide biotechnology relevant content but also commerce, community, and cooperation functionalities. The research is sponsored by the "Stiftung Industrieforschung", Cologne, Germany, under the number S 509.

STARTING POINT: BENEFITS OF COOPERATIONS IN THE BIOTECHNOLOGY INDUSTRY WITH A SPECIAL VIEW OF GERMANY

Electronic cooperations (partnerships, networks, virtual organizations) offer the opportunity for small and medium-sized enterprises (SMEs) in general, and specially for SMEs of the biotechnology industry to virtually cope with the demands of the new competitive landscape. Two main aspects of the new competition are globalization and the increasing importance of new information and communication technologies (ICTs), like the internet or world wide web (WWW), respectively. Both, competition and ICT create the need for cooperation on the one hand side and especially ICT are also a means to deal with these challenges, on the other hand side.

In the U.S.A. as well as in Europe the biotechnology industry is one of the most booming industries besides the new media industry, for example. Although European companies are at least about five up to eight years behind the U.S., e. g. in terms of products in the clinical phase or the number of employees the prerequisites for instance in Germany (and especially also in England) are comparable good today due to the following "events":

- The German Federal Gene Technology Law which passed in 1990 was amended in 1994 in order to facilitate administrative processes;
- diverse national initiatives supported by the federal government were implemented (like "BioRegio" in 1997 or "BioProfile" in 2000);
- venture capital became more and more available in the late 80ies and early 90ies; the European Agency for the Evaluation of Medicinal Products was implemented in 1995 in order to improve application procedures;
- and in 1998 the European Parliament accepted the guideline "Legal Protection of Biotechnological Inventions" which focuses on the protection by patent for genetically changed animals, plants and (under certain conditions) also human genes.

Coming back to the cooperation aspect, the biotechnology industry stands for about 20 percent of all strategic alliances across all industries. That means that the biotechnology industry is very cooperation-experienced. These alliances however are mainly between major pharmaceutical combines and small and medium-sized biotechnology enterprises. Gene-Alliance however, is an exception for example here because it is an European cooperation between biotechnology SMEs only: "Gene Alliance is one of the leading European genomics companies designed to address large-scale genome analysis projects. The founding members of this alliance, AGOWA, Biomax Informatics, GATC, MediGenomix and QIAGEN, have joined their expertise and core competencies to institute a long-term and successful cooperation (see http://www.gene-alliance.com)".

Cooperation advantages for SMEs result out of the possibility for example to outsource certain activities of the internal value chain in bottleneck situations in order to improve throughput time. In case of idle capacities insourcing on the other side can result in additional marginal returns and learning curve effects due to higher volume. Having the access to resources of cooperation partners additional capacities can be offered in existing markets and new markets can be developed via innovative products. Cooperations also offer loci where learning or knowledge creation respectively occur permanently because of the need to always deal with new situations. Finally risk can be distributed in cooperations on many "shoulders".

Bringing together core competencies within the scope of biotechnology cooperations results in a "virtual magnitude" for the cooperating biotechnology SMEs, so that they are potentially able to compete with major chemistry or pharmaceutical combines on a global basis. Additional – national or international – cooperation partners apart from SMEs and the mentioned combines can be universities, research institutes, venture capitalists, non-for-profit organizations, pharmacies and/or hospitals, for example.

COOPERATION ENGINEERING

In the biotechnology industry as well as in other knowledge-intensive industries the "traditional" success factor for cooperations is trust primarily. During our first interviews it became clear that the anxiety of loosing independence and know-how is big in this industry. Also fear can be observed that partners might strive for market power. Another problem is the orientation on short-term profits. These problems result in the refusal of cooperations because suitable partners cannot be found, or they result in too cost- or time-intensive cooperations, or in negative outputs of cooperation attempts.

Against this background *cooperation engineering* – in analogy to approaches like e. g. software engineering – aims at providing a method and respective ICT on the basis of internet technolo-

gies in order to support a systematic and efficient procedure for the establishment, realization and post processing of electronic, ICT-supported virtual cooperations in knowledge-intensive, innovative industries like the biotechnology industry. In general, this will result in a virtual business-to-business community and cooperation platform on the web, or especially in the case of the biotechnology industry within our project in the so-called BIO4C prototype, respectively.

Within this approach the use of ICT to support coordination and communication and also trust-building within the cooperation life cycle is a critical aspect. The prerequisite for a successful design of such a community is the fittingness of ICT and process interdependencies at the organizational intersections between the collaborating partners. Different kinds of process interdependencies require at each case certain adequate technological solutions.

RESEARCH OBJECTIVES

This research aims at to develop demands and solutions for the engineering of electronic virtual cooperations between SMEs of the biotechnology industry. Out of this result four sub-objectives:

1. Determination of specific problems with regard to potential electronic, ICT-supported cooperations between SMEs in the biotechnology industry.
2. Investigation of demands for a method in order to support a systematic procedure for electronic cooperations in the biotechnology industry – in particular in view of the contact phase, but also with regard to the identification, agreement, operation, and post cooperation phase – and design of a specific phases scheme.
3. Determination of organizational-technological demands for the adequate use of ICTs in order to support electronic cooperations and demonstration of problem solutions.
4. Investigation of generic demands for a virtual community and cooperation platform on the basis of the internet and realization of the BIO4C prototype.

PROCEDURE

The procedure for this research project is closely related to the objectives mentioned above, i. e. it consists of four main working packages (WPs) where WP 3 consists of three sub-packages (see figure 1 below).

In WP 1 the SMEs of the German biotechnology industry will be investigated with regard to problems concerning current or potential virtual cooperations and support needs. Here, quantitative research based on written questionnaires will be complemented by personal interviews. Also, another general survey based on written questionnaires concerning the status quo of e-business in SEMs of other industries will add information within WP 1.

In WP 2 core processes within the cooperation life cycle will be determined. Together with the results of WP 1 the results of this WP will be the basis for working out specific demands for a method in order to systematically guide cooperation processes. Theoretical concepts which will be stressed are engineering and life cycle approaches.

In WP 3 organizational-technological concepts for the ICT-support of cooperative business processes will be worked out based on "coordination theory". First of all, specific interdependencies at the intersections of cooperative business processes will be evaluated and put into a systematics (3.1). Interdependencies which will be distinguished are:

- the COMBINATION of certain activities with regard to a certain resource;
- the SEQUENCE of activities where a certain resource is the result of the one activity and at the same time the input for the following activity;
- the common SHARING of a resource by two activities.

Following, on the basis of this systematics of interdependencies the demands for ICT-support will be determined and available "coordination technologies" will be investigated with regard to their efficient fit (3.2). Here, a concept or an understanding of efficiency respectively has to be developed, rather than to construct a certain fit using empirical phenomena. Efficiency criteria are certain communication demands of the interdependencies for:

- TIME OF COMPLETION (moment or period of time);
- SPACIAL AVAILABILITY (real or virtual);
- USEFULNESS (in terms of quality/correctness, knowledge content, trustworthyness);
- COSTS.

Examples of potentially efficient coordination mechanisms which have to be implemented in respective ICT than are:

- Synchronization, planning data (for COMBINATION);
- just-in-time principle, kanban, standard succession (for SEQUENCE);
- first comes – first serves (FCFS), management decision (with regard to budget, e. g.); auction (for SHARING).

Finally and simultaneously, organizational implications of the potential use of ICT in terms of opportunities and restrictions have to be considered for the design of electronic cooperation relationships (3.3).

In WP 4 generic demands for the virtual community and cooperation platform Bio4C, which will be realized as a prototype, will be worked out by specifying the results of the methodical (WP 2) and organizational-technological demands (WP 3) for the biotechnology industry.

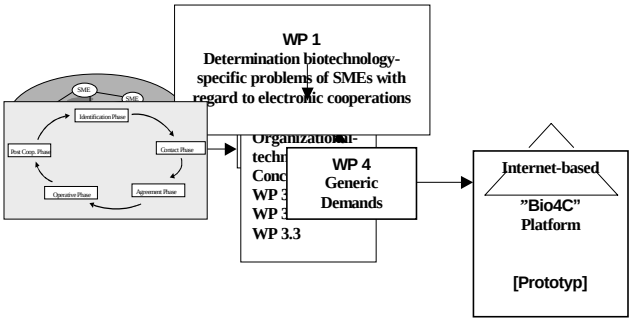

Figure 1: Procedure for the research project

EXPECTED RESULTS

Bio4C logically will consist of four layers (see figure 2). The first layer (1) offers non-restricted access to content information on the biotechnology industry. Besides links to industry news or calendar of events for example this will for the most part include information on diverse biotechnology SMEs which have registered with Bio4C. Firm profiles showing expertise and/or companies' products are in the center of the data base. On the second layer (2) electronic commerce functionalities are available. These functionalities have access to the product and/or expert knowledge data bases which are in the center of the second layer. The third layer (3) offers virtual space for closed user groups in the community spirit of clubs. Especially knowledge management systems

with a special focus on realized projects and related experiences support the community activities besides voting or project planning systems and/or discussion groups. Finally, on the top layer (4) a shared workspace in the sense of "cooperative rooms" supports the collaboration of virtual teams, again as closed user groups.

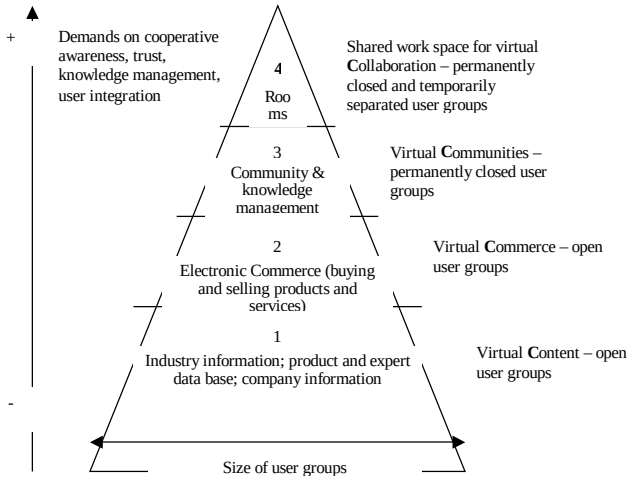

Figure 2: The conceptual logic of Bio4C

ENDNOTE:

For further information, especially on the relevant literature please write an email to one of the authors. Information on BIO4C will soon be found on the following web pages: http://www.bio4c.com or http://www.bio4C.de