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Active Co-operation Networks – Key to a Competitive Advantage in a Global Marketplace ?

Michael Wieser, Armin Schulz, Andreas Vollerthun
Division of Astronautics
Technische Universtaet Muenchen
Boltzmannstr. 15, 85748 Garching
M.Wieser@Lrt.mw.tum.de

Abstract. In recent years rapid developments in information technology have dramatically changed the availability of information. It is now almost possible to get any information at any place in the world at any time. The economy has adapted to these changes and will continue to do so in the future. To keep up with competitors strategic alliances can be observed in many markets. Virtual enterprises and communities are the consequence. Due to the globalisation of markets the economy is getting increasingly networked and consequently complex. It will be significant in future to analyse and model these processes and it must be clarified to what extent systems engineering methods/tools can be used to handle this complexity.

The strategy how to initiate and scale modern networking is described on the basis of two projects in the European satellite business.

INTRODUCTION

Development in space business. In recent years there has been a clear re-orientation in the satellite industry. The world-wide market of commercial space business achieved a turnover of US$ 37 billion, which corresponded to about 50% of the total space market turnover in 1997. The demand for satellite services grows further, whereby two trends are obvious:

(a) Services, which are offered direct to the final consumer
(b) Services, which are developed in combination of different services

In addition to these tendencies, which can be observed particularly in satellite communication, Europe will to set up its own global satellite navigation system (Galileo), in order to reduce the dependency of the European Union on the American GPS-system for strategic and economic reasons.

In view of a world market volume of 9 billion Euro at present ([Sampathkumar et al., 1999], [Vollerthun et al., 1998]) for sales of services and terminals in the area of satellite-based navigation and a predicted volume of 19 billion Euro in 2005, the challenge for Europe is to guarantee that it can achieve an appropriate proportion of the world market and the jobs involved (Vollerthun and Wieser, 1999).

Activities in Germany. In considering these international developments the question arises, how this can benefit individual regions? On the basis of a concept investigation on behalf of the Bavarian Ministry for Economic Affairs, Transport and Technology, the first steps were taken towards the establishment of an application centre. This concept investigation recommends the implementation of an application centre as seed, both for the development of new applications and multimedia products by integration of satellite navigation with communication and geo information, and for their market exploitation and development. The centre will include all levels of the value chain, from research and development to services of various applications. This centre is designed to bring together both manufacturers and service providers within the field of satellite-navigation, communication and earth observation, to generate new products and services by linking those currently separate areas.

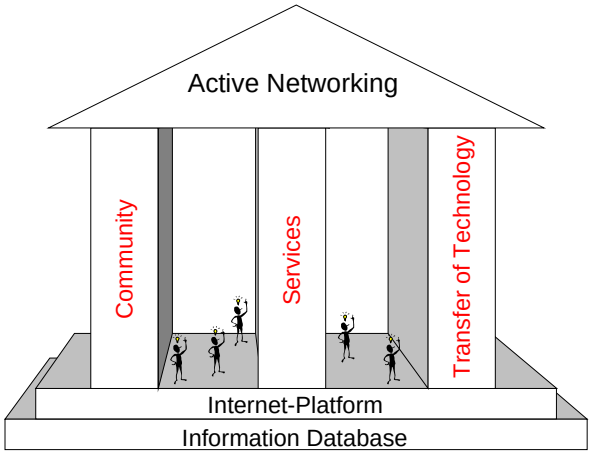

Figure 1: The architecture of active networking

With presentation of the results of the concept investigation in August 1999, the business conversion had already begun as the second step when a new formed team developed the results in the business concept 'MercatorPark'.

These two steps result in a virtual application centre based on an www platform as the third step for networking the private-economical customers. A co-operation, consisting of the companies SUN Microsystems, Liquid Vision, eCircle, WH-International Project Development (IPD), German Aerospace Centre DLR, AFM publisher and Division of Astronautics of Technische Universitaet Muenchen was formed to ensure benefits for the Bavarian region from this European development. This team, under management of the Division of Astronautics, suggested the project 'virtual application centre' to the BStMWVT, which has now a volume of 500.000 Euro and is supported by the BStMWVT with more than 200.000 Euro. After a one year period the project MercatorPark is supposed to fund itself in a private-economical way.

At the same time a project was launched by the German Ministry for Research and Education (BMB+F), called 'Best-in-Space', which aims at analysing the European satellite industry and providing a web-based database, supporting European enterprises looking for potential co-operation partners.

ACTIVE COOPERATION NETWORKS

Approach. Affected by enormous improvements in the information technology and increasing globalisation of the markets, the economy is becoming increasingly networked, but also more complex. It will be important to analyse and model these processes in the future, in order to handle their complexity.

The companies can't resist these developments, in fact it is important for areas and branches to push networking activities even more to maintain their competitiveness. The question arises, how can these networks be initiated and co-ordinated?

Three steps are introduced to set-up active co-operation networks (see also fig. 2):

(1) Provision of **Information**
(2) Installation of a **communication platform** for interactions
(3) Build-up of a real environment in order to **network**

To initiate networking it is necessary to have a detailed overview of a relevant branch. A comprehensive database with all kinds of information on market participants and their know-how in technology (components, subsystems, systems, services, etc.) and in process (research & development, systems engineering, manufacturing, sales, marketing, etc.) is essential and enables the initiation of networking.

As second step, a communication platform must be installed to make this information available at any time to every interested party.

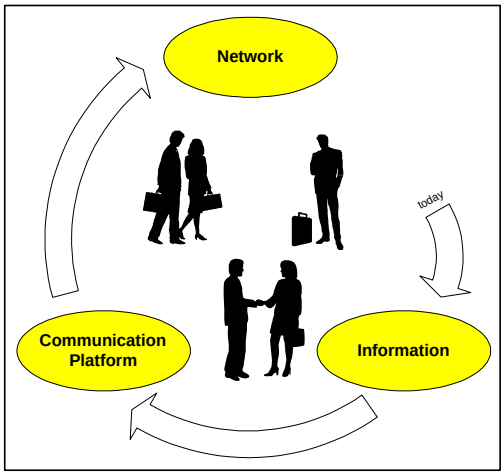

Figure 2: Process of networking

Last but not least, it is necessary to bring the before virtual formed community together in a real environment, where it takes advantage of synergetic co-operations

The medium Internet meets the requirements of the preliminary stages. A Internet portal combined with a comprehensive knowledge data base provides interested users with all kind of information they need and enables all parties involved to look effectively and efficiently for appropriate partners they match (Match-Making). Via this platform all companies can exchange their know-how and communicate their current supply or demand of knowledge or resources (see also fig. 3) A fast and direct communication between potential partners is stimulated by this information service.

Apart from the role of a business directory this

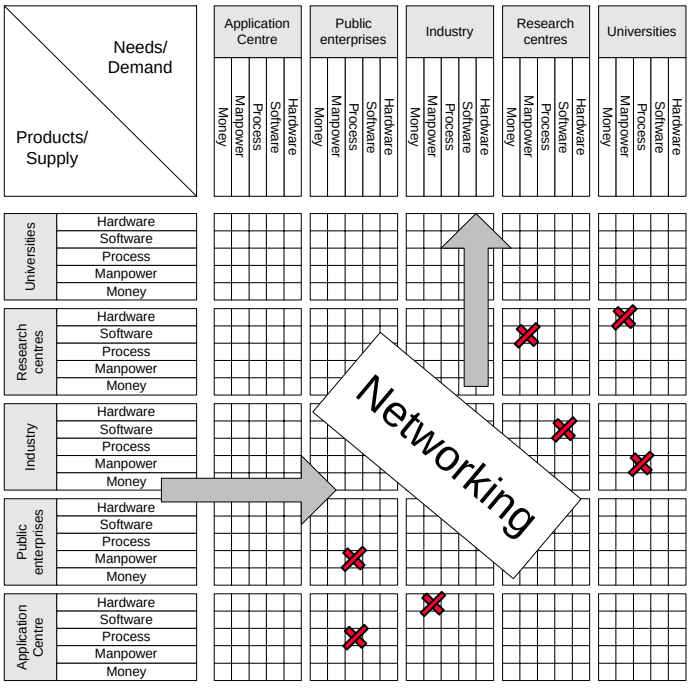

Figure 3: Match-Making

Michael Wieser
M.Wieser@lrt.mw.tum.de

communication platform can also be used for many other business-to-business-features which also stimulate actively networking. The business-to-business market is about to undergo enormous change as businesses begin to use the Internet to not only market and sell products and services, but for a variety of communications and commerce needs with other businesses. Companies can buy and sell products internationally on a virtual market place, can interact with business executives in their industry, state, profession or anywhere in the world, and are provided with business management news and kept updated on news as it happens

The stabilisation of this network by the continuous acquisition of further enterprises and research centres for a market-focused co-operation stimulates new impulses, particularly in terms of future innovations and ensures competitiveness.

The Division of Astronautics at the Technische Universitaet Muenchen is analysing the opportunities, but also the complexity effected by capable information technology systems of that kind. In the following, two current relevant projects are described:

THE 'BEST-IN-SPACE' – PROJECT

The Division of Astronautics is developing a web-based database on behalf of the DLR, which aims at providing insights and transparency about all know-how available in different institutions or companies in the area of satellite navigation, communication, and earth observation. This network will be the nucleus for the development of new, value adding applications and services in the field of the satellite navigation, communication and earth observation. (Igenbergs et al., 2000)

The starting point for this co-operation network is the establishment of an Internet portal, which will be used both by industry (small, medium, large entrepreneurs) and research centres to get information on areas of competence of all enterprises, institutions and organisations. The provision of this information rapidly enables users to get links to potential and appropriate partners (networking) and thus to get new opportunities for business development (market potential).

This information service is the basis for the successful development of an active co-operation network in Germany and Europe. It represents all companies and research centres, which have know-how within the fields of satellite navigation, -communication and earth observation.

In the first phase of implementation and data acquisition the focus is on national institutions, enterprises and organisations in the field of satellite navigation. In latter phases the view will be successively expanded on Europe as well as on applications in the area of satellite communication and earth observation.

This virtual community combines all stages of the value chain, both in the vertical dimension (research and development, satellite system, satellite operation, products, and services) and in the horizontal dimension (navigation, communication, and earth observation) (see also fig. 4). The very presence of participants of so many different fields increases the chance for new applications dramatically.

The supply of information on potential partners results in the establishment of co-operation and joint projects of different partners. Germany and Europe will benefit along the entire value chain in terms of new products and services. The formation and development of active co-operation networks will strengthen the position of Germany and Europe in increasing international competition in the strategic field of the satellite industry in particular.

Further and current information about the project can be found on the Internet: http://www.Best-In-Space.com.

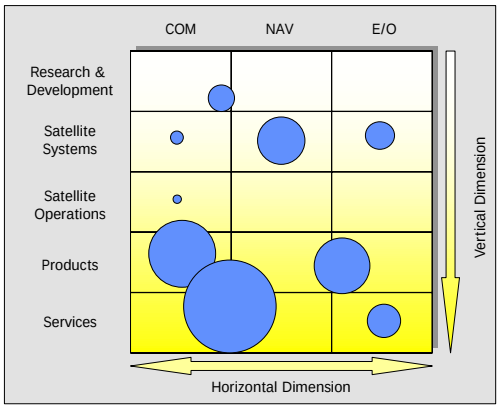

Figure 4: Portfolio of virtual community

THE 'VIRTUAL APPLICATION CENTRE' - PROJECT

Objectives. Compared to Best-in-Space, the virtual application centre goes one step further. Whilst Best-in-Space acts only as a knowledge database, the objective of the project "virtual application centre" is providing users from very different fields with a business and development centre as well as a marketing platform for actually making their product idea a success. It is supposed to act as an international contact platform for companies and thus to enable partnership among users of different enterprises. As a preliminary stage of building an infrastructure. the establishment of a virtual application centre takes place on the basis of an Internet platform with the objective to implement an electronical market place in which industry and research centres come together and supplement each other synergistically. The resultant network of companies represents the basis

for new products and services, those developed from the innovative combination of the fields navigation, communication and geo information (viz. [Igenbergs and Vollerthun, 2000]).
In particular, three areas are to be emphasised:

(1) Extension and consolidation of the research and technology network developed during all activities of the working group MercatorPark
(2) Implementation of a virtual market place where both industry and research (large-scale research and university) take part.
(3) Stabilisation of the region Bavaria in satellite navigation and its network with the fields of communication and geo information

The main focus of the project 'virtual application centre' is on three building blocks:

(1) network formation (online presence, marketing and national and international events)
(2) proposal centre (providing a service to prepare for small and medium-size enterprises in particular)
(3) transfer of technology (representation of DLR research and development potential)

The three building blocks are described more precisely in the following.

Network formation. The application centre is supposed to provide efficient networking of universities, research centres, industry, and public authorities. To prepare and set-up this network is the major objective of the project. The community of over 250 companies (small, medium and large enterprises, institutions and organisations) formed by regular user conferences has to be brought together to form a suitable network and to create new products and services. Two media are used to achieve that objective:

The print medium 'journal', which is arranged and supplied by the AFM publishing house, and the Internet portals Best-in-Space and MercatorPark.

The Internet portal MercatorPark is implemented by the companies Sun Microsystems, which has sponsored both hardware and software, by the company LiquidVision, which is in charge of the design of the web-pages and by the company eCircle, which creates suitable communication solutions for the users in the virtual application centre. The Division of Astronautics is in charge of co-ordinating all these activities and contents.

Marketing. On this basis, the business development and marketing platform MercatorPark emerges. It is vital to bring national and international companies together continuously. In addition, regular national conferences for potential users will take place and an international conference will be organised at the beginning of 2001.

Networking. The developed network accompanying the project is to be quantified. With methods, developed at the Division of Astronautics of Technische Universitaet Muenchen, it is possible, e.g. in matrix procedures (see also fig. 3), not only to record and visualise the networking, but also to quantify by means of an algorithm. It reflects the change of the network over time in particular. This allows for promotion of identified areas with low network activities. Therefore the status quo of the current network is recorded and analysed in the context of the project primarily. The measures taken in this project (e.g. virtual application centre, national/international conferences) will increase the extent of networking. At the end of the project the present network can be recorded again and compared with the one at the beginning. Thus it is possible to measure the success of the project**.**

Proposal Centre. The second aspect of the virtual application centre are the services, the community makes a use of. Services offered to all members of the community save resources and time for each company/institution. Many services are possible e.g. joint trade shows, joint advertising, legal advice, etc. (see also fig. 1)

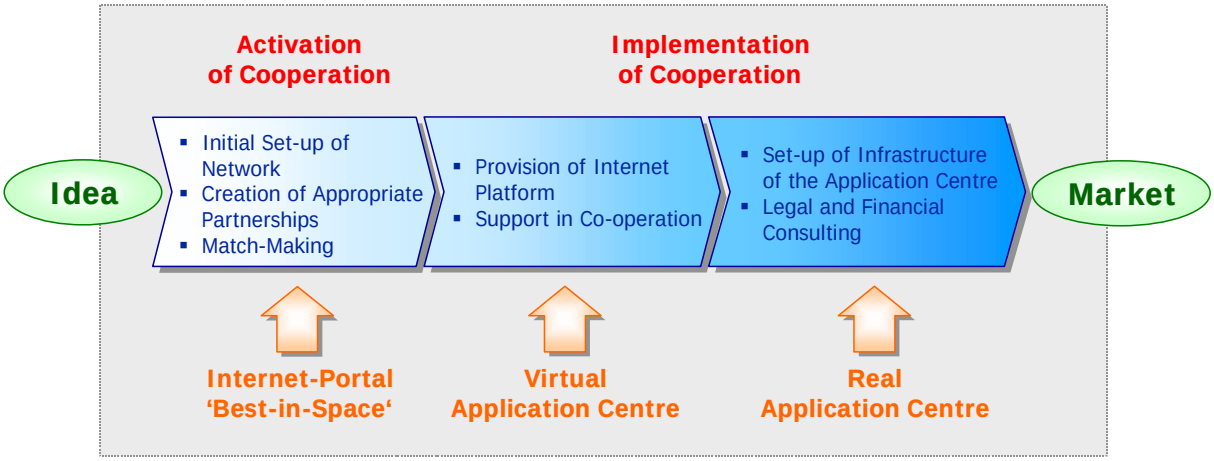

Figure 5: The 3 stages of active cooperation networks

As preparation for the operational phase of the real application centre, the Division of Astronautics develops the service 'proposal centre', which supports especially small and medium enterprises in preparing proposals (Froer and Vollerthun, 2000). It strengthens the competitiveness of these enterprises, which can concentrate on their core business and get these usually personal and cost-intensive procedures performed by the application centre. A strategic concept for the operational phase of the proposal centre is drawn up, which will be verified in an operational test with interested companies. Additionally, all invitations to tender of e.g. ESA, EU, DLR, and other relevant European institutions to topics of satellite navigation, satellite communication and earth observation will be identified and listed transparently.

In general, the success of a proposal depends on the team that the proposal submits. If a company wishes to submit a proposal the proposal centre will analyse the existing team in terms of chances of acceptance, and in cases will complete the existing team with appropriate partners to have a successful consortium. To find the right and appropriate partner the proposal centre makes a use of the comprehensive database "Best-in-Space", which gives them all information they need to decide which company matches the existing team.

The service facility proposal centre in the MercatorPark consequently aims to prepare proposals for high-tech products, studies, or services which are required in the specialised business of communication, navigation and geo information industry. The focus of the proposal centre is characterised by the following aspects:

- Experience in preparing professional proposals
- Meeting deadlines by means of standardised, effective and efficient processes
- Continual information exchange with the customer
- State-of-the-art technology and infrastructure (e.g. multimedia communication channels, access to data bases)
- Ensuring confidential handling of information

Enterprises which make use of services of the proposal centre will notice how concentration on core business – the enterprise on the development of the applicable product, the proposal centre on the preparing of the proposal – can positively affect the chances for the acceptance of tender, cost, and time. This raises confidence and forms a basis for further co-operations. Only if advantages arise for both partners in a balanced relationship ('Win-Win-Situation'), the "Proposal centre" will establish itself on a long-term basis.

The more enterprises have assured themselves of the accurate, customer oriented, and successful work of the proposal centre, the quicker it reaches the intended objective to establish an expert centre in preparing proposals specialised in enterprises of MercatorPark.

At present an approach for the preparation of proposal is being developed with aid of potential customers, which is described in the following briefly:

The preparation process begins with the input of invitation to tender. On the part of the potential contractor activities start which are connected with a decision-making process (bid/no bid decision). Both requirements made for the system and the performance, which the potential contractor has to provide, can be filtered from the tender documents. Additionally they contain important information regarding the type of contract and particularly the time of final distribution.

Subsequently the invitation to tender will be analysed. Supporting methods are provided for that. Cost/invest-analyses and risk/attractiveness-analyses help to estimate roughly the quality of the task. Simultaneously the technical and cost-related requirements to the potential contractor are verified. The concept studies are designed and calculated by means of parametric cost estimation (PCE). At this stage exact expense budgeting on the basis of defined activity packages is not yet possible or would go beyond the scope of determined time frame for a first rough estimation. A restriction is available however also for the PCE. It is applicable only if similar projects have already been carried out in the past to be able to draw the necessary conclusions at the current expense.

Based on gained data, in particular the comparison of cost-related requirements and the results of the cost estimations, a bid/no bid decision can be made. In case of a positive decision different activities begin, e.g. EDP, CAD, process and systems engineering, estimate. The concept study is refined and forms the base for the technical section. The estimate is divided up for expense budgeting and all activities are split up in work packages. Adding up all items (total cost) and a surcharge results in total price.

After collecting all finished elements of the proposal, they are co-ordinated and combined into one document and reviewed by the management.

Transfer of technology. Third, but not least, aspect (see also fig. 1) of the virtual network is the transfer of technology. Due to a mix of know-how from all kind of businesses it is especially interesting for small and medium enterprises to get all know-how they need without having employed these experts. Short term contracts can be made on demand. Universities and other research centres in particular get the chance to transfer their know-how and technologies to industry. The virtual marketplace serves as a bridge between research and industry.

At first the German Aerospace Centre (DLR) provides its technology and development potential as well as its scientific authority in the areas navigation, communication and geo information in a customised form in the virtual application centre. For it the DLR describes all relevant current research projects and

those in the past, points out their potential of industrial applications and make them available to all companies interested in.

Further and current information to the project you can find in the Internet:
http://www.MercatorPark.com

SCALABILITY OF VIRTUAL COMMUNITES

The question comes up, how to measure the success/failure of virtual communities. In a fundamental way, one way is to add up the revenues of participating companies, they wouldn't have gained without the platforms. But there is also a more abstract way to evaluate the interactions made possible by a communication platform like Best-in-Space or Virtual Application Centre.

First of all you have to consider the maximum possible interactions of all participants in the virtual environment. The entire value of the network is consequently the product of all possible interactions and the value of one single interaction:

$$V_i = [n \times (n-1)]v$$

V_i : ideal value of network
n : number of users
v : value of interaction

In a realistic way it is not possible to interact with all users in the community. Therefore the value of the community will be less. If all members of a community have n_r connections in average to other members of the community the value will be

$$V_r = [n_r \times (n_r - 1) \times n]v$$

V_r : realistic value of network
n : number of users
n_r : average numbers connections of each user
v : value of interaction

If you look at each individual interactions you might notice that some of them have no interaction with other members of the community at all ($x_{ij} = 0$). Furthermore, it has to be considered that some interactions are more frequent, therefore have a higher value v_{ij}. To determine the exact value of the network the values of each individual interaction has to be added up:

$$V_e = \Sigma_i \Sigma_j v_{ij} \times x_{ij}$$

V_e : exact value of network
v_{ij} : value of a single interaction
x_{ij} = 1: interaction between $user_i$ and $user_j$
x_{ij} = 0: no interaction between $user_i$ and $user_j$

Another interesting aspect worth reviewing is the adding value of a new member to an already existing community (ideal case)

$$V_a = [2 \times (n_{n+1} - 1)]v$$

V_a : added value of network
n_{n+1} : number of users (incl. new user)

The bigger the existing community the higher is the additional value of a new member to the community.

OUTLOOK: REAL APPLICATION CENTRE

When the virtual application centre succeeds and reaches a critical mass of members, the next step can be taken: building up a real application centre.

To build up a real community 4 ingredients are a necessary (Stuchtey, 2001):

1. Talent
2. Idea flow
3. Existing value chain
4. Smart capital

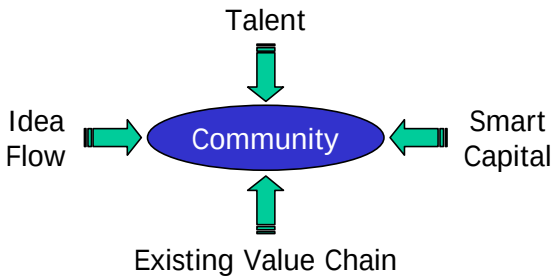

Figure 6: The 4 ingredients of a community

Innovation is nothing you can force, but you can manage it in a certain way. If you bring together all theses ingredients at one place, it will be a good basis for new innovations.

The beginning of all innovations are people with new ideas, new technologies, new solutions to meet the users's needs (Talent). These people have to be brought together with other talented people and supported how to take the first steps to realise their ideas, e.g. business plan competition (Idea flow).

Michael Wieser
M.Wieser@lrt.mw.tum.de

Then strategic location for the business has to be found, where a network of suppliers and distribution for your business field already exists (existing value chain). Last but not least, innovations need to have money to be realised, e.g. venture capital, business angels, etc. (Smart capital)

The real application centre will provide all those and will go one step further providing for new start-ups infrastructure that is shared by all members of the community. This will save costs for all participants. Small and medium enterprises are usually the more innovative players in the industry, but often can't afford expensive research facilities and other infrastructure. Giving them the opportunity to use those shared by the community ensures that new ideas will be realised more easily. The exchange of knowledge on-site and the synergetic effects due to the mix of different businesses will be the community's advantage.

In addition, services can be shared. Proposal centre, financial and legal consulting, joint procurement, marketing, and public relations are only some examples. Many other services are conceivable that will privilege the members of the community in comparison to other competitors.

CONCLUSION

Active co-operation networks – a key to competitive advantage in a global market place?

There is no question about the limits of such networks, but they can lay the foundations to bring new business partners together to initiate new co-operations and therefore new businesses. The combination of a comprehensive knowledge base and infrastructure enables companies/institutions to find appropriate partners more quickly and at lower cost. It gives them the opportunity to co-operate with previously unknown business partners whom otherwise they would not have contacted. This will affect specially the fact, that companies of different domains are not used to communicate, although there would be a high potential of knowledge transfer between them. Additionally, joint activities within a community save both time and cost and will lead to a competitive advantage for all companies in the community over other competitors not part of the network.

In future networks will be due to globalisation even more important to maintain the competitiveness of regions. Therefore it will be a major issue what political and industrial measures are to be taken to do manage innovations. One of those will be active co-operation networks.

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BIOGRAPHIES

Michael Wieser is assistant lecturer at the Division of Astronautics at the Technical University of Munich. He received his master's degree in aerospace engineering from the Technical University of Munich in 1998 after completing his master's thesis at the Division of Astronautics at Technical University of Munich. His research focuses on virtual business communities, information management, and combined service-product-systems.

Armin P. Schulz is assistant lecturer at the Division of Astronautics at the Technical University of Munich. He received his master's degree in aerospace engineering from the Technical University of Munich in 1998, after completing his master's thesis at the Center for Innovation in Product Development (CIPD) at MIT. His research focuses on technology management and development, systems architecting, and information management. He is co-founder of the German Chapter of INCOSE.

Andreas Vollerthun is Ph.D. candidate and research scientist at the Institute of Astronautics at the Technical University of Munich. He received his master's degree in aerospace engineering in 1997 after completing his master thesis at NASA's Jet Propulsion Laboratory (Pasadena, Ca., USA). His Research focuses on the model driven design process and the significance of economical aspects in early design phases.