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**Brick and Brain - A case study about the incorporation of knowledge architecture into the conception of a loveable science park building**

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**Executive Summary**

Wissenschaftszentrum Kiel, the core institution of the Science Park, and the Knowledge Architecture lab of TU Dresden have jointly developed a concept for a new STP building. The process of concept development was characterized by the intense participation of current tenants, thus presenting an open innovation process. This procedure provided new insights into tenants' demands, in particular with respect to working environment, soft factors and work-life-balance. We describe the procedure of assessing different user groups and their specific and joint demands and needs, resulting in detailed demand profiles. A programming process translated these requirements into the language of architecture and allowed spatial allocation of different functions. The concept provides combination of hard infrastructure with new services. The problem of convincing public shareholders to realize the concept is discussed in the light of traditional versus contemporary regional economic development strategies.

## Introduction

Wissenschaftszentrum Kiel is the core building of Science Park Kiel and also it's service center for knowledge and technology transfer activities, including a conference area. Kiel, the capital of the state of Schleswig-Holstein in Germany, is located at the Baltic Sea, forming the gateway to Scandinavia with major ferries running to Norway, Sweden, Denmark and Estonia. The city itself counts 240,000 inhabitants, whereas the whole region has a population of approximately 600,000. We have three universities: Christian-Albrechts-University, a full university with eight faculties, the Kiel University of Applied Science and the Muthesius University of Fine Arts and Design, altogether with about 30,000 students enrolled. The Science Park Kiel was opened in 2007 and covers an area of approximately 12 km<sup>2</sup> of former industrial wasteland adjacent to the Christian-Albrechts-University. Some of the buildings have been renovated and are now fully rented. Two new buildings had been erected; one of them the Wissenschaftszentrum, offering 2000 m<sup>2</sup> restricted to small and very small companies who put strong emphasis on close collaboration with the universities in the city. Already half a year after opening in 2008 the building was fully rented, yet the demand for relatively small office spaces in the center of activities remains unsettled. Therefore, we are currently planning the construction of a new building.

But what type of building will serve us best? What kind of built infrastructure do we need? And how does this influence the organizational infrastructure? Are there new approaches to generate synergies between organization, services and building space? How to create a place where people love to work?

With respect to the long standing debate which juxtaposes the relevance of the quality of buildings in STPs with to the importance of services and other organizational infrastructure, we chose this "brick-or-brain-discussion" as a starting point of our strategic considerations. A short but elucidating compendium of this discussion was published by Manchester Science Park in 2007<sup>1</sup>. We had used this practical description before as guidelines for the development of Wissenschaftszentrum Kiel.

As we are currently engaged in two EU-projects - one on user-driven innovation, another on knowledge management - we had the idea to put a strong focus on the users' needs and on constructional structures that actively support the generation, distribution and exchange of knowledge. These projects already resulted in several services that we can offer to the tenants free of charge, e.g. workshops to integrate open innovation approaches into business processes and product development, or a rather successful workshop series called "Knowledge Fishbowl", where we regularly discuss different aspects of knowledge management and knowledge culture using the fishbowl method to allow for participation of all guests.

Based on these premises and experiences we decided to dissolve the *brick or brain* dichotomy and start thinking of *brick and brain* instead for the purpose of extending the existing facility. In order to put this vision into practical operation we introduced a "Phase Zero" to precede the first conceptual design activities, as conventionalized by the standard process of planning and constructing a building. The aim of this phase was

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<sup>1</sup> Allan, J.; Davies, J. (2007): Third Generation Science Parks. A report by Professor John Allan. Manchester Science Parks. URL: <http://www.mspl.co.uk/view-document-details/8-msp-third-generation-science-parks.html> (accessed on 2013-06-04).

- providing significant facts and data specifying the requirements, i.e. user groups, joint and diverging demands of different user groups,
- facilitating a participation process and invite tenants and stakeholders, including city representatives, to actively shape the future of the science park,
- developing suggestions for technical and constructional features that directly or indirectly support knowledge culture,
- elaborating a solid basis for the future architectural design development and construction documents.

## Approach

To achieve these goals we initiated two workshops with “experienced” tenants and different stakeholders. The sessions resulted in a large collection of (occasionally very specific) demands and features of the ideal work place. These workshops were organized as a “Creative Lunches” and lasted only two hours each. The relatively short duration in combination with a lunch break allowed all tenants to participate without investing too much extra time. In addition to hard results they generated a lot of fun for the participants and acted as a communication platform for the tenants. This first step was documented in detail. For a week we installed the “Stairs of Ideas” (see figure 1) and put all results along the wall of the central stairs of the building. Everybody was asked to read them, add comments or place further ideas. Afterwards we concluded all results and prepared a summary for all tenants. The general approach was very similar to the open innovation consultancy that we offer as a service to our tenants. It is based on an understanding of the changing role of customers who are no longer acting as consumers but can contribute to product development (see figure 2<sup>2</sup>). In this case the customers were our tenants and the product was our own building including services and organizational infrastructure.

As a second step, the laboratory of Knowledge Architecture of the Dresden University of Technology (TU Dresden) was invited to accompany the Phase Zero with appropriate measures. During a period of four months, the project team assessed the literature, carried out additional workshops, developed and analyzed a questionnaire, made business visits and interviews with many tenants and prepared a detailed illustration of the “knowledge ecosystem” of the Science Park and the surrounding city. Finally, a thorough report on user profiles, single and joint needs, and a first scheme of a room program was supplied. The general process consisted of different steps that are illustrated in figure 3.

## User groups

The tenants of STPs are special in many ways. And they are heterogeneous in many aspects. We classified the “classical” target group of innovative, knowledge- or technology-based companies according to the specific phase of a company’s life cycle. There are three subgroups: spin-offs, young successfully growing companies, and established successfully growing companies. STP managers are familiar with their different demands as regards consultancy and services. We wanted to find out if they are also different in regards to their requisite building environment. In addition we considered three further user groups. One of these is the management team of the STP itself, which has highly specified tasks and might, therefore, also require a special building environment to support their activities. Another group are so called Competence Centers, which can best be described as topic-orientated R&D alliances between several universities and companies who all receive regional funding to develop their joint expertise. During the process of conception we identified one more user group which is particularly interesting, because it has as yet not been in the focus of STP’s: highly specialized professionals who are generally self-employed freelancers, working in different dynamic project-teams and sometimes in different cities or even countries. We will develop flexible space including co-working space to offer specific working conditions for this user group and other “work nomads”. They are generally smart networkers and prefer a climate of

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<sup>2</sup> Figure 2 was redrawn according to Elizabeth B.-N. Sanders: Scaffolds for Building Everyday Creativity. In: Jorge Frascara (ed): Design for Effective Communications: Creating Contexts for Clarity and Meaning. Allworth Press, New York, New York, 2006

good knowledge culture. Therefore, we consider them to effectively contribute to our general connectivity<sup>3</sup> and thus to the attractiveness of an STP as a liveable working place. A study of the think tank group of Deutsche Bank<sup>4</sup> has predicted that value creation and other competitive advantages will increasingly depend on new types of work organization and collaborative network structures. Single enterprises will be unable to cope with the complexity of tasks; solutions have to be developed within networks of partners, including other companies, universities, research institutions and public organizations. Figure 4 illustrates the transformation process. With respect to the value added chain the study predicted an increase of project economy from 2% in 2007 to 25% in 2020. This development requires a new framework of space and infrastructure, which should consider the integration of highly qualified and specialized freelancers. Many of them currently try out the flexible work environment of co-working spaces. As freelancers they have generally not been in the focus of STPs, but as a group of co-working creative people with similar demands they can be regarded as a new target group.

Summing up we identified six user groups, whose demands we wanted to assess and whose unique and joint demands had to be found out (an overview is given in table 1).

### User requirements

Workshops, questionnaires, interviews and business visits revealed not only a strong interest of our tenants to participate actively in the conception of the new building. What is more, also a broad scope of very good ideas for the new building's characteristics emerged, including infrastructure, services and ambience. We have learned a lot about the companies' criteria when deciding where to locate them. We could group the different demands into several categories (as illustrated in figure 5) and developed specific profiles for each of our defined user groups. A detailed look into all users' demands is given in table 2. STPs' tenants are demanding and ambitious companies, obviously having precise ideas about their optimal work environment. Some of their needs and requirements deserve special attention.

It became quite clear that most companies place a great demand on technical infrastructure and quality of services, but there is also a strong focus on work-life-balance, relaxation, sports facilities, informal meeting spots and a space to retreat. Concrete ideas covering this field of requirements are, for example: a common room for school children to do homework in their parents' proximity, a shower room to refresh between cycling to work and meeting with clients, a BBQ area in the garden, a table soccer in the communal kitchen, or a roof top terrace to be used for informal meetings, party or relaxation. In summary, their optimal work environment is characterized by many soft factors that make their office a nice place to work. Openness, atmosphere and good vibrations are considered to be as important as technical infrastructure.

Important too are the companies' working processes: they cover a great variety of different activities from classical paperwork over informal exchange of ideas to skyping. The companies need a work environment that supports these processes. Furthermore, priorities of these processes differ between the users depending not only on the field of business, but also on the phase of their company's life cycle.

A more basic requirement that touches many fields of demand is flexibility: flexible services, flexible rents and flexible space. The creation of this flexibility will probably be the greatest challenge when translating user demands into a concrete building.

Basing on the assessment of demands, TU Dresden's laboratory of Knowledge Architecture has assembled "demand panels" describing the different communication and interaction requirements of the very user groups. Two examples of such demand panels are shown in table 3. The next step was to combine the demand panels and identify linking points that allow for designing the space and creating a community of companies. It resulted in an extensive matrix of links between the demand panels of six user groups. A section of this matrix is shown in figure 6.

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<sup>3</sup> I am grateful to Executive Board Member of IASP Mr. Anthony Tan, Hong Kong, who suggested the term connectivity during a board meeting of IASP in Malaga in February 2013 and strongly emphasized its importance for the future development of STPs.

<sup>4</sup> Deutschland im Jahr 2020. Think Tank der Deutschen Bank Gruppe. Deutsche Bank Research 2007. [www.dbresearch.de](http://www.dbresearch.de)

## Programming

After assessment and evaluation of user needs, the Knowledge Architecture group started to translate these results into architectural language. They designed the topology of the building according to functional relations (see figure 7) respectively spatial organization (see figure 8). Finally a detailed space allocation program was developed specifying different spaces and their technical features in detail. Thus, the total programming report forms an obligatory basis of the future architect's work.

One of the most intriguing challenges is to provide spatial flexibility that supports the users' processes and demands. The building will have movable walls that can be adjusted to the companies' changing needs. Another solution is switching of functions. The building will have three different standards, ranging from "garage" to "normal" to "executive" standard. Also there will be different types of offices, such as single office, co-working spaces, and "combi offices". And finally office space and space for services (exhibition, meeting, retreat area, recreation area or meeting) will be switchable. Figure 9 illustrates the switching option schematically. We consider combining this flexibility with flexible leasing conditions with respect to duration and graduated rents.

The programming process also provides first indications, how hard infrastructure and services can be combined. Using competence centers as an example, figure 10 illustrates some of these options.

## Next steps

Phase Zero has now been completed. We have gained deep insights into the demands of future tenants, not only with respect to the construction of an ideal working place but also with respect to the creation of new services and the interdependencies between hard infrastructure and services. All tenants are highly satisfied because they were given the opportunity to actively shape the future development. They are eagerly waiting for the new building. Experts from architecture and real estate project development judge the general concept to be very promising and highly innovative.

Therefore, we had applied for co-funding from the European Funds for Regional Development and initiated a competitive bidding process for the next phases of architectural design and development. Somewhat of a surprise, at this stage the board of Wissenschaftszentrum has stopped all activities for fear of investment risk. What was on the way to become a success story, all of a sudden was regarded a risky endeavour, and put on halt. This worst-case scenario resulted in huge disappointment among the management team and the tenants. More than a year of intense work of a number of people, and more than 100,000 € for preparatory tasks were spent in vain. What went wrong? Is there anything we and other STPs can learn from the process?

Recovering from the disappointment we have analyzed the situation soberly, and are currently looking for alternatives to realize the building. To understand the decision it is necessary to look at the composition of shareholders. Wissenschaftszentrum Kiel is a public-private partnership with the City of Kiel as the major shareholder owning 51 %. The remaining 49 % are evenly distributed between the University of Kiel and a private real estate company who own the surrounding area of the Science Park. These shareholders have fundamentally different attitudes and expectations. Their practical experience about promoting knowledge- and technology-based regional and economic development is rather limited. In addition there happened other unexpected events which were independent yet parallel to our conception phase and remarkably influenced the decision process:

- The former mayor had been a strong promoter of the idea of a second building. But soon after starting the planning process he became prime Minister of the state of Schleswig-Holstein. This resulted in unexpected consequences: there was an interregnum of half a year. After that a new mayor was elected and required some time to get acquainted with her new position and then started to reorganize the administration. The transition period was accompanied by changing responsibilities. Therefore, the major shareholder was not able to follow the process of concept development. In addition, there was a strong political demand to focus on the development of another city area, which is considered to be a problem district.

- The university had applied for a subsidy program to support entrepreneurship. It's application failed in the middle of our conception period. In addition, the Faculty of Technology, which is quite active with respect to university-business-cooperation, is located quite far outside the campus area in the above mentioned problem area. The presidium of the University and the City of Kiel developed the idea to join forces and increase their activities in that district, e.g. founding a second Science Park in direct vicinity of the Faculty of Technology, but also the University of Applied Science and the Geomar Center for Ocean Research. The existing Science Park Kiel is considered to be too far away for their activities.
- The private real estate developer, whose previous success was as yet solely built on traditional concepts of development, is still focussing on office space and price instead of soft factors. Their own experience does not encompass support services beyond facility management.
- The Kiel Regional Economic Development Agency, who is marketing the space of the other Science Park buildings, is also still focussing on old-school concepts of regional development. They still have a limited understanding of structural change and act as if they are developing an ordinary commercial area instead of a community of innovative enterprises with different needs and demands.

But there have been faults and misunderstandings in the communication with the shareholders on our side as well:

- We were too enthusiastic about the concept and considered it to be self-explaining.
- We underestimated the perseverance of traditional concepts of regional and economic development in politics and administration.
- We did not see the necessity to challenge the public stakeholders and motivate them to leave their "comfort zone".

Yet, the concept of the new building offers unique selling points. If we do not succeed convincing the shareholders to take the investment risk we are to look for another private investor. We expect a long period of stability in the administration of the City of Kiel. Now we will start over again and establish a better understanding of contemporary concepts of regional economic development, the demands of knowledge based businesses, innovation strategies and participation processes. A first step has already been initiated: the board agreed to install a working group of stakeholders and the management team of Wissenschaftszentrum, to assess strategies to further promotion of the Science Park Kiel. We also offered our consultancy when developing a concept for a second Science Park. Ideally there will be strong regional alliance in the end, promoting the place's development into region of innovation through fine tuned activities in different parts of the area. We will share our knowledge, because knowledge is the only resource which grows if it is shared.

## Figures and tables



Figure 1: Stairs of ideas following the workshops

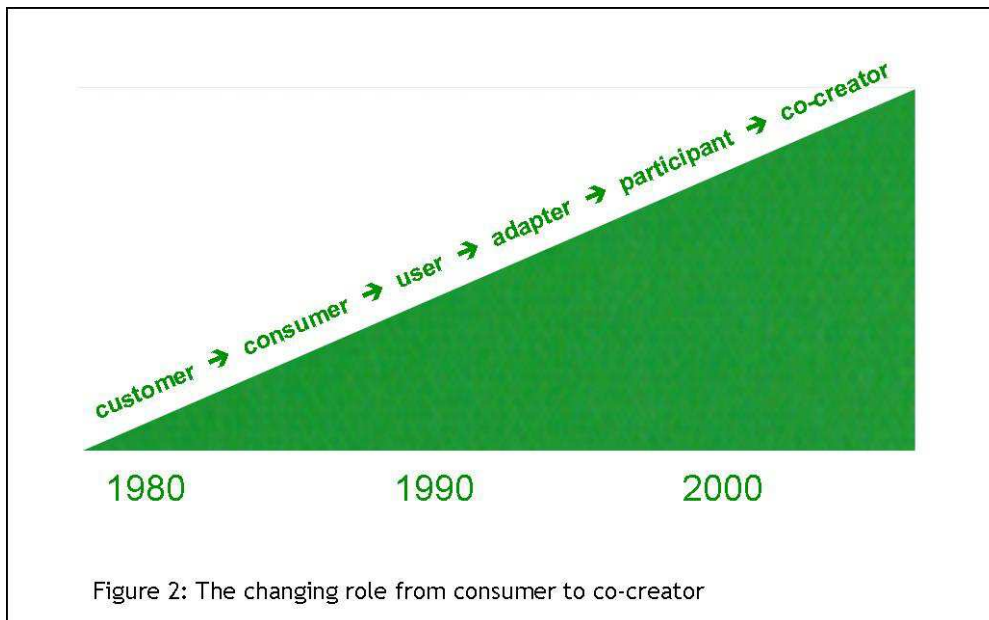


Figure 2: The changing role from consumer to co-creator

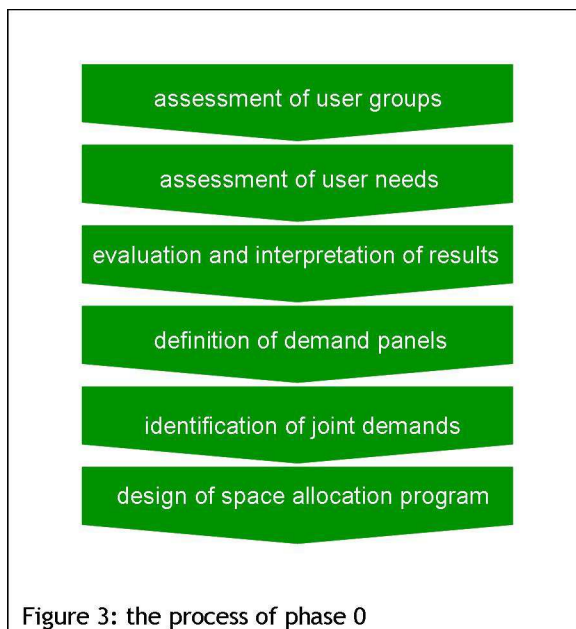


Figure 3: the process of phase 0

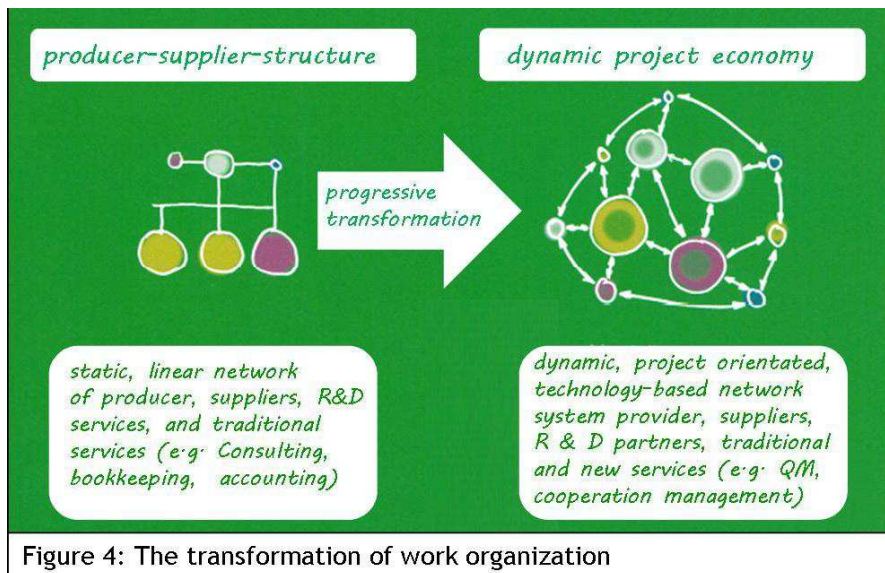


Figure 4: The transformation of work organization

Table 1: Scope of user groups of the future STP building
<ul style="list-style-type: none"> <li>• creative workers / work nomads</li> <li>• spin-offs</li> <li>• young successfully growing enterprises</li> <li>• established successfully growing enterprises</li> <li>• competence centers (R&amp;D alliances between universities and business)</li> <li>• STP management team</li> </ul>

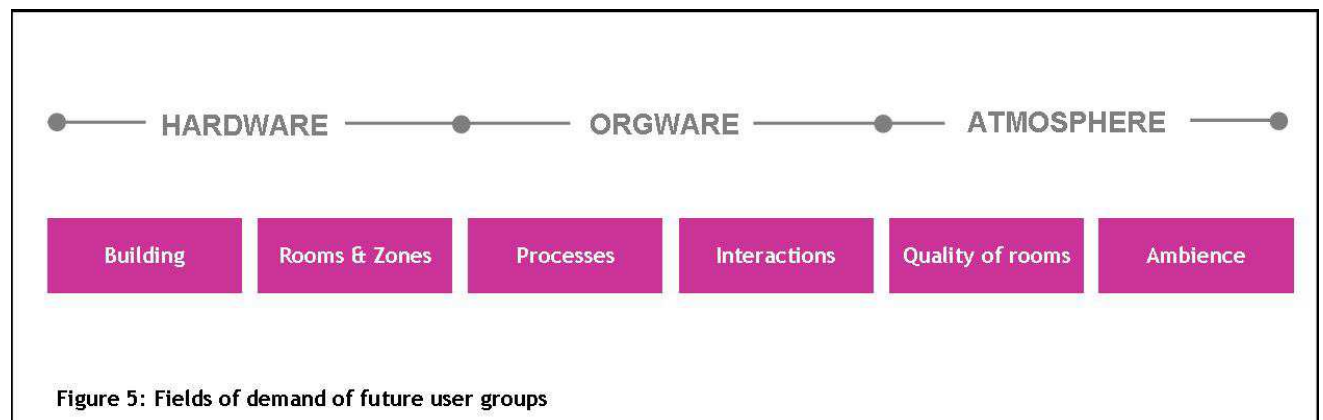


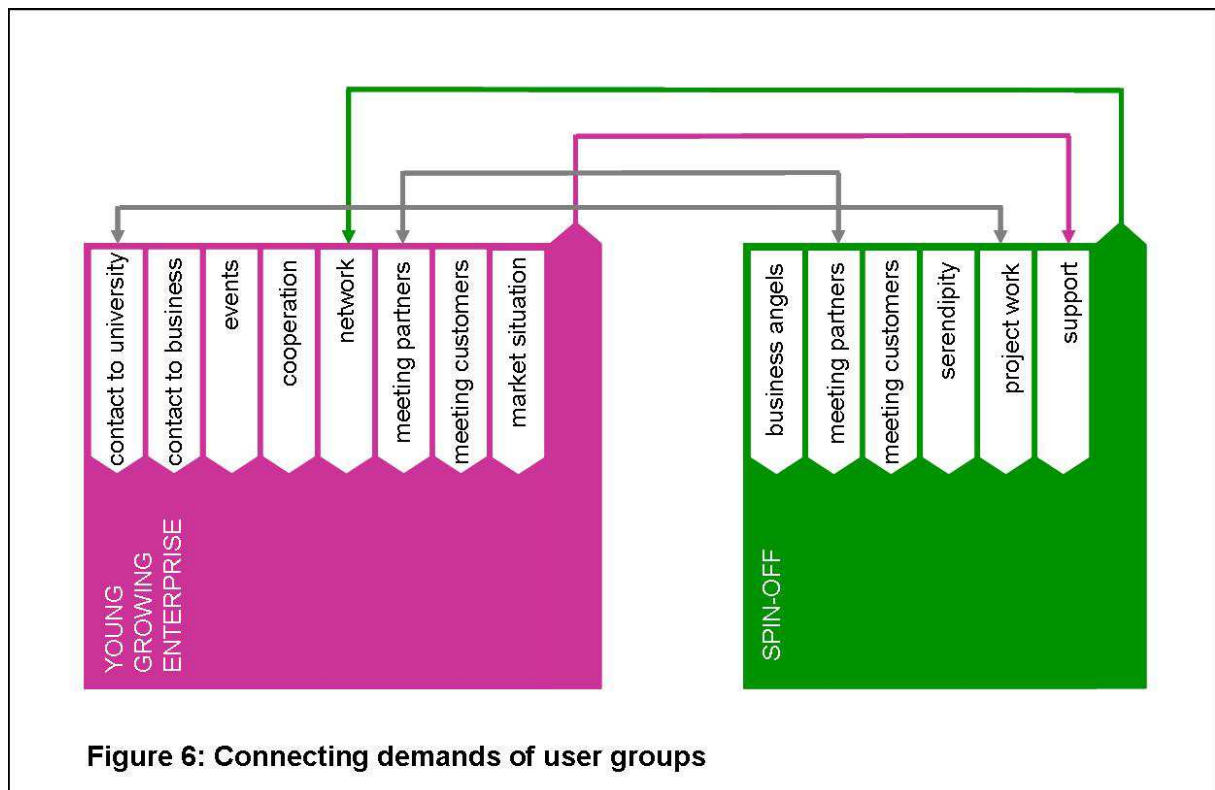
Figure 5: Fields of demand of future user groups



**Table 2: User requirements in different fields of demand**

<ul style="list-style-type: none"><li>• <b>services</b> cafeteria pin board printing service reception service consulting coaching catering mail service technical service coordination information about regional events contacting recruitment</li></ul>	<ul style="list-style-type: none"><li>• <b>technical equipment and infrastructure</b> WLAN telephone intranet conference technique storage space whiteboard security power supply server daylight sun shades / glare protection</li></ul>
<ul style="list-style-type: none"><li>• <b>working processes</b> office work project work informal meetings administration skyping consulting concentrated thinking authoring texts designing workshops research develop programming</li></ul>	<ul style="list-style-type: none"><li>• <b>interactions between users</b> networking collaboration transfer of knowledge meeting digital exchange matching information politics having a party serendipity</li></ul>
<ul style="list-style-type: none"><li>• <b>general properties of the building</b> rent location neighborhood reputation openness flexibility energy supply</li></ul>	<ul style="list-style-type: none"><li>• <b>spaces and zones</b> conference room combi office single office co-working space pantry shower lounge retreat area meeting room reception skype room espresso bar</li></ul>

**Table 3: Two examples of demand panels with respect to communication and interaction**



**Figure 6: Connecting demands of user groups**

Figure 7: Topology - functional relations

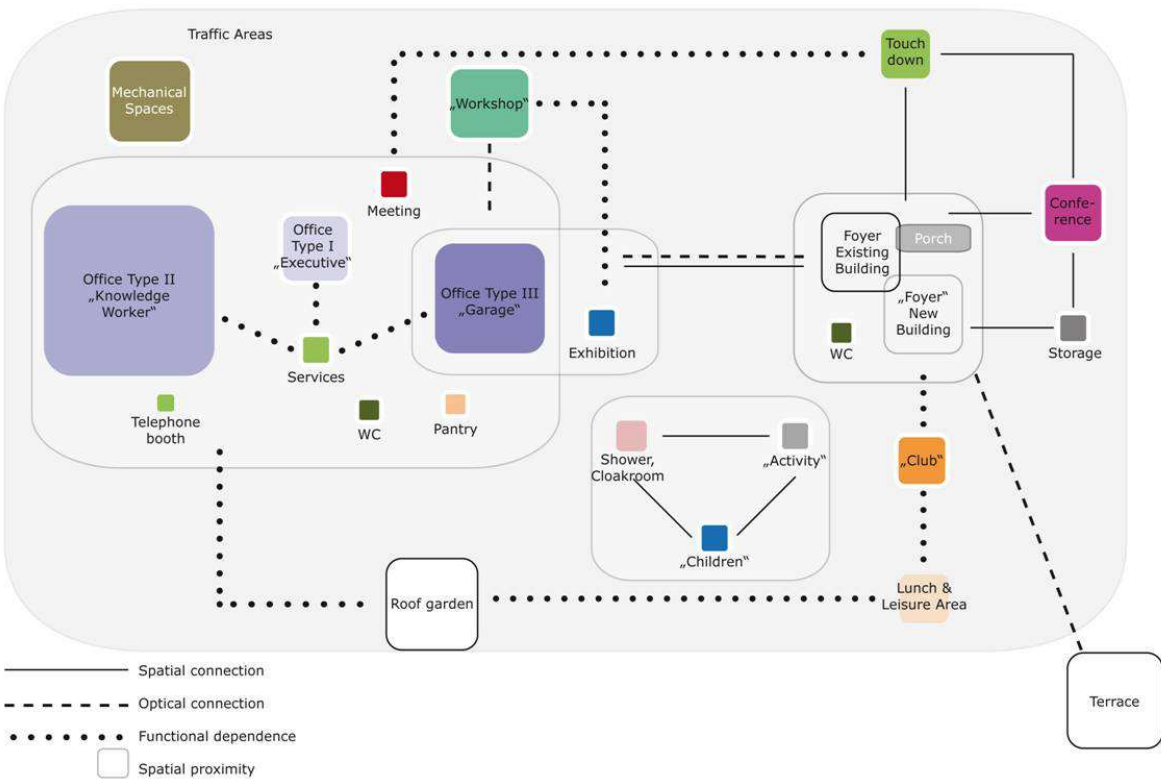
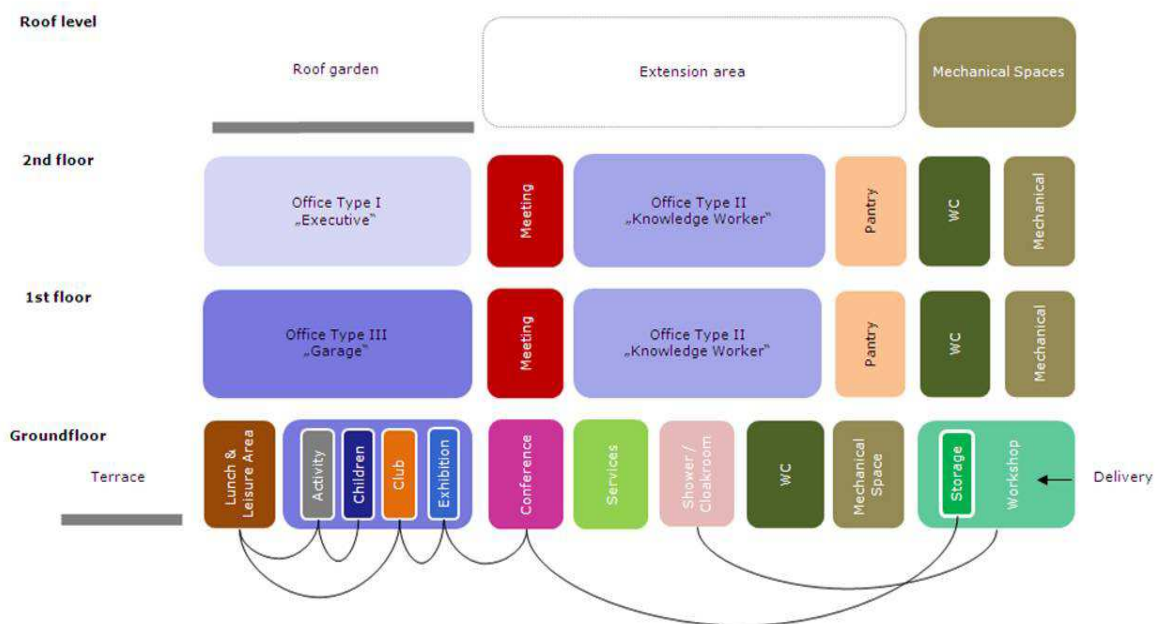


Figure 8: Topology - spatial allocation



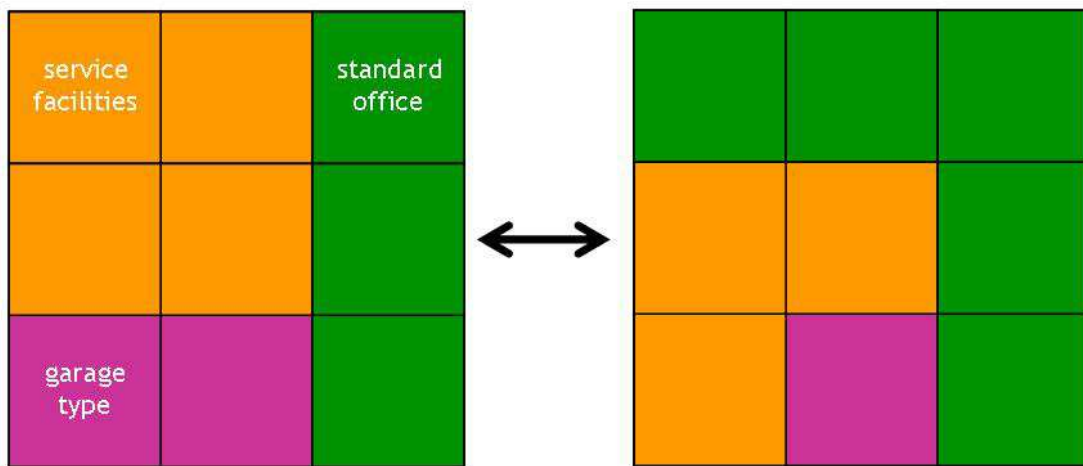


Figure 9: Switching functions to increase flexibility

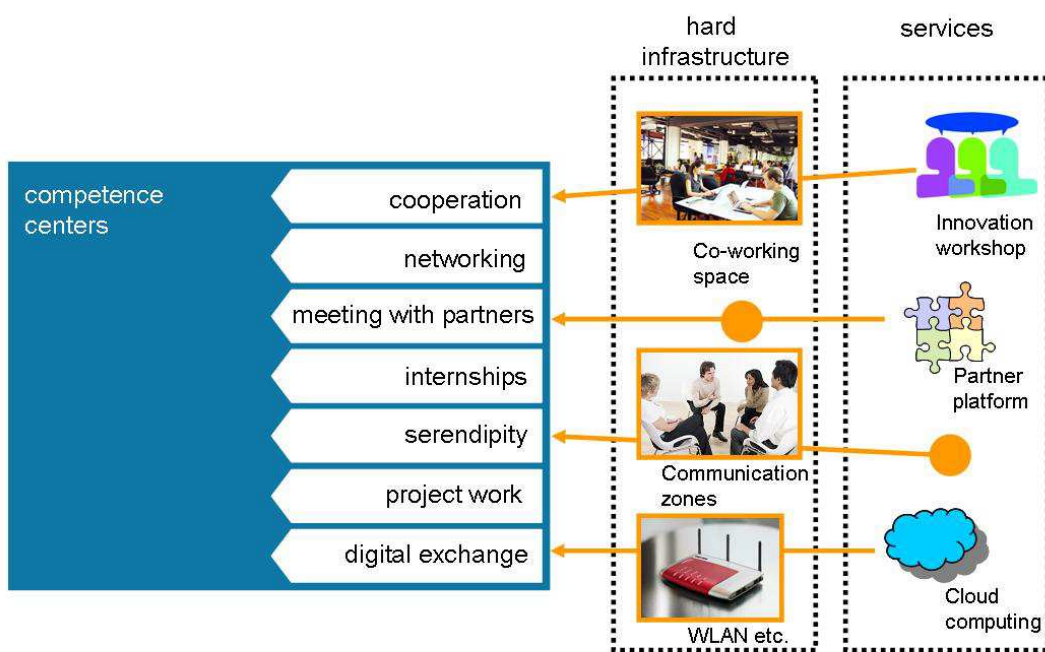


Figure 10: Combination of hard infrastructure and services