# Organizing the Information Flow within a Planning Team

Experiences, Problems and Solutions from a Practically-Oriented R&D-Project


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## Summary

Within the scope of the research project „Virtual Technology Park - Resource Saving in Construction" a new approach was developed to reduce resource consumption (materials, energy, money) over the lifetime of a building. Furthermore, flexibility in planning should increase by implementing combined organizational and technical measures to improve information flow during the planning process.

To reach this goal, appropriate tools are needed: content-related, on the organizational level, and supported by an „enabling infrastructure". The respective project results are a computational model to assess the resource consumption for a building over its lifetime, an Information Dependency Matrix to improve project manageability, and employment of a document management system to facilitate data exchange and co-ordination between project members.



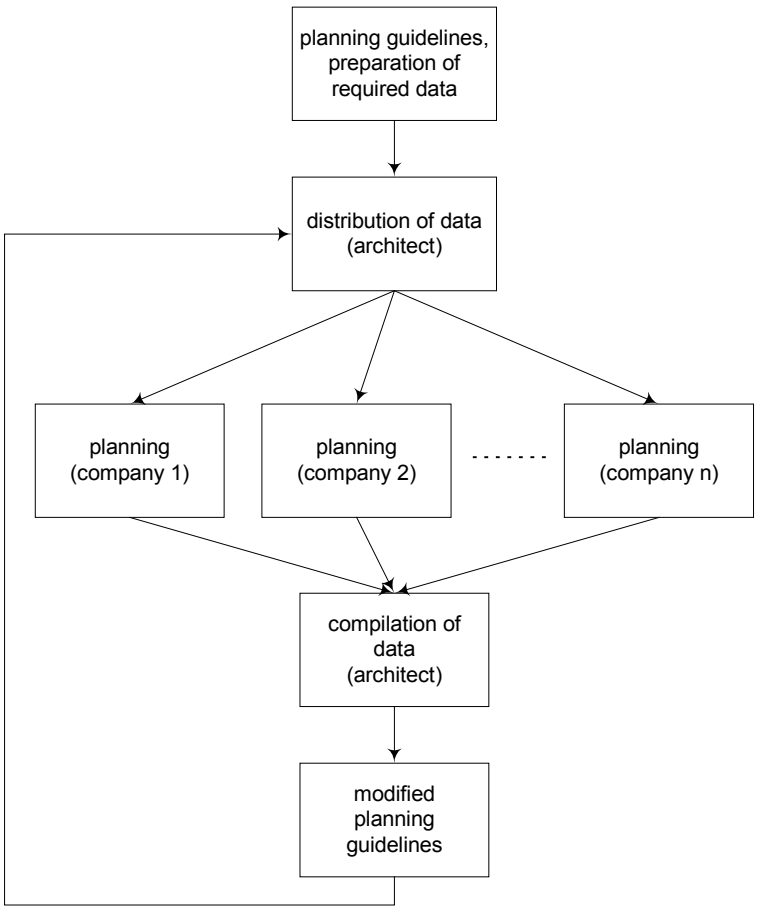
**Keywords**: Virtual Technology Park, Virtual Enterprise, information requirements, information dependency, document management, data management, resources, communication


## 1. Introduction

The research project, carried out from 1998 to 2000 in Vienna, served as reference project for the overall design and implementation of a Virtual Technology Park. The goal was not only to improve resource consumption in this one project, but to learn about technical and organizational issues relevant to support the development of innovative methods; which means that the process as well as the supporting infrastructure should be rather flexible.

In order to increase efficiency of resource consumption, one needs to have an idea how to do it, the means to actually implement the found approach, and a tool to measure the success of one's actions. Since the majority of costs and resource requirements are determined in the planning phase, the project was focused on this part of a construction project. A planning process usually needs to pass several cycles to include feedback from all team members. In the following figure (*Fig. 1*) a „planning cycle" is shown which can be optimized by data management and communication.






These cycles involve a lot of unstructured (e.g. email) as well as structured (e.g. by transferring CAD documents) communication. A specific problem for the co-operation of different, spatially separated companies' employees is the difficulty of frequent meetings and „ad hoc co-ordination“. Therefore the need for clear responsibilities and transparent information flow increases compared to intra-departmental projects.

*Fig. 1: Schematic representation of the planning process*

# 2. Project Description

## 2.1 Objectives

The project had two main goals:

- development of an organization and communication model to manage a planning team at different locations
- development of a computational model to assess the resource consumption of buildings (materials, energy, money)

### 2.1.1 Organization and communication model

The goal was to develop an organization and communication model for individual consultants at different locations to manage an innovative project and to exchange the required information in co-operation with external research institutes to rationalize and speed up planning activities using modern IT technologies. Furthermore it was necessary to identify the information requirements and to organize the information flow by employing a document management and exchange system. The planning of a building process requires a lot of communication and provides a good application scenario for the implementation of a Virtual Technology Park.

### 2.1.2 Computational model (resource consumption)

Within this computational model it is possible to quantify and thence minimize the resource consumption (materials, energy, money) both in the construction phase as well as in the utilization phase to optimize buildings in an ecological and economical way.

This development could be performed organizationally independently and will be introduced separately under the title „Ecoefficiency in Residential Building – A Prototype for Optimizing Consumption of Resources".

## 2.2 Basic Concept: The Virtual Technology Park

Technological challenges in innovative projects require the project-related co-operation of companies and research institutions; usually the members of these institutions are spatially separated and have to work together over long distances. In a competitive economic environment it is viably important to be innovative which creates the need for co-operation as well.

In a construction project, the integration of different companies in consortiums or working groups is common practice; but in the planning phase, where most of the construction and utilization's costs of a building are determined, the companies tend to work mostly on their own, making it difficult to reach an optimal result.

Planning of building projects normally only lasts for a limited period. This fact doesn't support the creation of project-independent organization structures, so they have to be created for each project over again. Besides, data exchange is difficult and intransparent without the availability of an appropriate repository which can't usually be provided by any single project member because of efforts and costs. While all members benefit from it, the provider has to bear the additional costs.

A Virtual Technology Park (see *Fig. 2*) fulfills similar tasks as its „physical" counterpart: it supports the co-operation of innovation-oriented companies, providing the organizational framework and the technical infrastructure, so that the companies can focus on their core competencies and build up flexible Virtual Enterprises (i.e. organizationally integrated teams of companies which continue to be legally separate and self-determined).

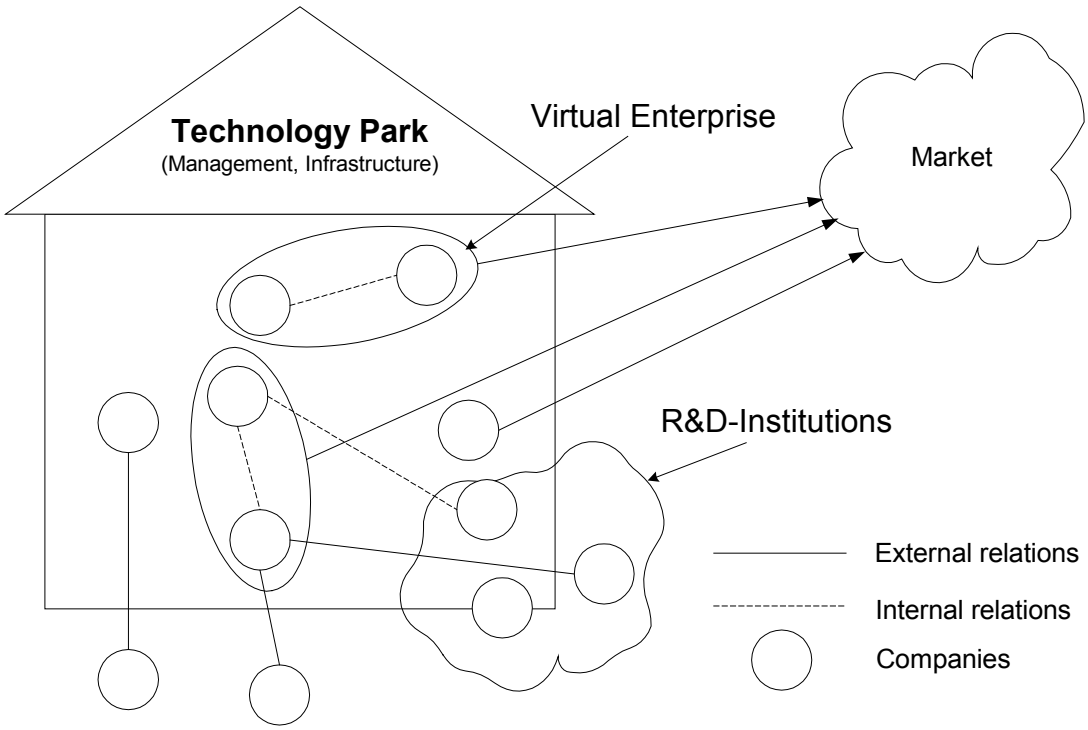



*Fig. 2: Structure of a Virtual Technology Park*

As opposed to most conventional technology parks, a Virtual Technology Park fulfills also tasks related to the project's content. It performs supporting tasks for the whole project cycle like:

- project acquisition
- serving as exchange platform for bringing together potential co-operation partners
- managing a pool of interested partners
- legal and organizational support to reach co-operation agreements
- providing the IT infrastructure for project communication and data sharing
- conflict mediation between project members
- serving as institution that can be contacted after the end of the project

These supporting tasks reduce the time and effort needed to bring together co-operation partners and get things going; flexibility also increases because of the lower time and cost for readjustments for the relations between team members.

### 2.3 Pilot Project „Resource Saving Construction"

In the Pilot Project we focused on the tasks needed for the operational phase. Resource savings were expected in three areas:

- the four **w**'s of better information (**w**hich, **w**hen, for **w**hom, from **w**hom) enable the team members to plan their resources more efficiently
- better co-ordination can lead to shorter planning times and an increase of planning quality, which reduces last minute modifications and lowers costs in the construction phase
- innovation of planning based on the results of the computational model leads to lower energy requirements and lower maintenance costs over the lifetime of a building.

## 3. Organizing a Planning Team

### 3.1 Exchange of information

The basis for every organizational improvement is the availability of the necessary information. Within the analysis of information requirements each member of the planning team had to define in advance the need of information during all phases of a project (**w**hich, **w**hen, for **w**hom, from **w**hom) to enable efficient project management. An overview of such an information flow is shown in the following Information Dependency Matrix (*Table 1*) which has to be modified in detail at the beginning of each project and its standards.

*Table 1: Information Dependency Matrix*

| Actor \ Phase | to get from | to deliver to | to get from | to deliver to | to get from | to deliver to | to get from | to deliver to |
|---|---|---|---|---|---|---|---|---|
| | Feasibility | | Pre Design | | Design | | Construction | |
| Developer | | | | | | | | |
| Project Management | | | | | | | | |
| Architect | | | | | | | | |
| Structual Engineer | | | | | | | | |
| Technical Equipment | | | | | | | | |
| ... | | | | | | | | |

CAD data takes the main part of this information flow but also calculations, text and tables as well as personnel contacts/meetings are included.

### 3.2 Data Management and Communication

During the planning process in constructions special requirements arise for communication and data exchange to support the information flow in the way described above.

Most of the electronic communication in current projects works by fax and email; CAD data are still mostly transferred by plotting them and transporting them by mail, creating the need to compare different drawings by looking at them and trying to find the differences. Nowadays files are frequently sent by email and plotted by the recipients; this doesn't lead to a solution of the named problems, however. Every project member needs to organize his data separately which increases the overall effort and doesn't guarantee data integrity – it is difficult to ensure that the planning base is always up to date.

A central question in the project was how the necessary information can be provided to all team members in a consistent way with the lowest effort. The solution was to employ a central document management system which was used to manage all kinds of project related documents, including CAD data and project communications. The system supports versioned documents and permission-based data access. The major advantages of such a system are the central availability of up to date data as well as providing an easy way to learn about the project status for persons who join the project later on (see *Fig. 3*). The information flow within the project is transparent so that the current project status is visible to all team members.

The members of the planning team don’t send CAD data directly to each other anymore but to the central server (data pool). Therefore it became necessary to develop rules for the co-operation and exchange of information. Everybody has the opportunity to get the current or previous version from the server.

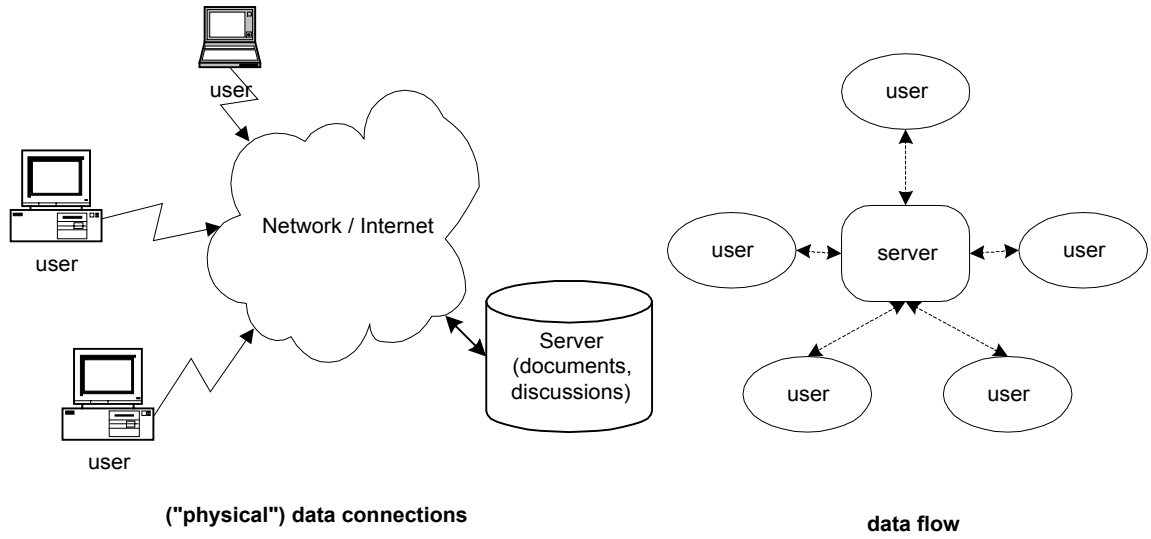



*Fig. 3: Structure and data flow in a system with discussion and document server*

During project meetings the special requirements created by our attempt to integrate the co-operation partners more closely were realized. Rules for handling the system and clear responsibilities need to be laid down.

## 4. Experiences

Several problems were encountered with this system, however. First of all it is based on Lotus Notes, requiring the installation of client software which planners had to learn to use. Secondly, following the advice of the providing company, the system was not connected to the Internet. This means that people who use email on a regular basis had to use two systems now and, as a consequence, checked for new messages less frequently. Data had to be replicated with the server. This requires high server availability and technical support which was not always sufficiently provided. Replication always took a long time and couldn't be restricted to the part of the data the user was interested in, which the system itself would have been able to do if configured correctly. This configuration work was up to the providing company and couldn't be done by the planners, however. As a result, users didn't adopt the system as much as would have been desirable.

A handy feature was the possibility to compare CAD drawings and visualize the differences, making it possible to see the changes between versions at one glance; with the additional possibility to add remarks to the drawing that are not included in the document itself (redlining). This feature never worked satisfactorily because different CAD systems produce data in formats not directly convertible into each other, leading to small deviations between the same version of the same document stored by different planning software, making the redlining tool believe that lots of changes had been made.

It turned out that no team member felt fully responsible for managing the information flow. Up to now this worked on an „ad hoc“ basis. Some members waited for information and did not actively request it, thinking that they will get the information once their results are needed. Planners occasionally didn't actually know all involved companies.

## 5. Conclusions

In order to use this new way of data management and communication in future projects it is necessary to take care of some points:

- Supporting organizational goals with an IT system must be carefully planned using the combined experiences of IT technicians and process-aware project managers.
- Users must be interested to use the system, which means that they must have an immediate

benefit of using the system. Of course one can force them to, but if quality is required, this is an inefficient approach.

- Supporting basic functions for a large number of users should impose minimal requirements on the users' know how and should only need minimal installation efforts, if any. Further functionality can then be supported by special client-side software, if necessary.
- People use different communication channels like mail, fax, email, and personal meetings. It is not desirable to add another channel; the relevant contents should rather be integrated into the same communications system (*one* email system) and/or a central repository, accessible by a web browser.
- It is difficult to amount concrete benefits to individual partners. Therefore the decision makers within the team are rather skeptical.

This new approach looks promising and will certainly be standard in the future but an effective implementation depends on the adoption of different points of view of IT experts and decision makers in the construction sector. It also can be useful to think over the traditional planning process on account of the new technical possibilities (CAD, communication technologies, etc.).

## 6. References


[1] Mertens P., Griese J., and Ehrenberg D., *Virtuelle Unternehmen und Informationsbearbeitung*, Springer Verlag, Berlin, Heidelberg, 1998, 165 pp.

[2] Rysavy E., *Leitfaden zur Gründung virtueller Technologieparks*, 96 pp., will be published 2001

[3] Teuschl J., *Virtuelle Unternehmen (VU) - ein Konzept für die Zukunft?*, Master Thesis at University of Technology Vienna, 1997, 127 pp.

[4] Wüthrich H.A., and Philipp A., „Grenzenlose Chancen durch Virtualisierung!? Was wir von virtuellen Pionierunternehmen lernen können”, *zfo*, Vol. 67, No. 4, 1998, pp. 201-206