



Research Project

„Lifecycle Oriented Tendering and Procurement Procedure
of Building Constructions“

Summary - 2011

Presented by Prof. Henning Balck

IPS – Institut für Projektmethodik
und Systemdienstleistungen

Obere Neckarstraße 21
69117 Heidelberg
Tel.: 06221-5025 89-0
balck@ips-institut.de

Research partner:

Rechtsanwälte, Franke-Heiermann-Knipp
Writer of the legal contributions:
Prof. Horst Franke / M. Frhr.v.Münchhausen

DB Station & Service
WILO AG
GEZE GmbH
YIT GmbH

1 Research Scope

When this research project started (2008) lifecycle costing came more in the front within German market and political decisions. This could be seen especially in the introduction of the German Sustainable Building Certificate “DGNB” as well as the Rating System for Sustainable Building “BNB” applied for German federation constructions. Besides that, there do still exist various difficulties and barriers for applying life cycle approaches. The research project works with methods and formalities that could improve the value chain of sustainability in buildings. The focus of the research scope lies particularly on the central issues. The applied approach shows that the adjustments of the tendering and procurement procedures according to the life cycle approach and the whole reorientation of the planning as well as construction procedure cannot be separated. Furthermore it is required to extend the life cycle concept to the value steps of the previous involved industrial production and the following user process.

CENTRAL ISSUE 1:

Buildings are not just the result of an architectural and engineering design. For the resulting processes, they are mainly configurations made of constructions components that are realized by products. Consequently for sustainable buildings the choice of efficient products is important for such configurations. That includes high-tech products from nearly every sector of industry. These products determine various costs and qualities in the long term perspective. Until now researches have not considered that there need to be a distinction between products with high consequential costs and products with small consequential costs. Furthermore are missing essential, comparable product information of efficiency benefits (costs) and usage benefits (sustainable qualities).

APPROACH (1):

Through the introduction of facility management in German-speaking countries during the early 90th, for the building research appeared a new perception. The transparency of operating and managing processes increased due to more and more software applications, which enable also growing access to the long term performance of construction products regarding operation and usage. That is connected to the extension of the conservative “Triple Constraints of Projects”: costs – quality - schedule. (Picture 1-1)

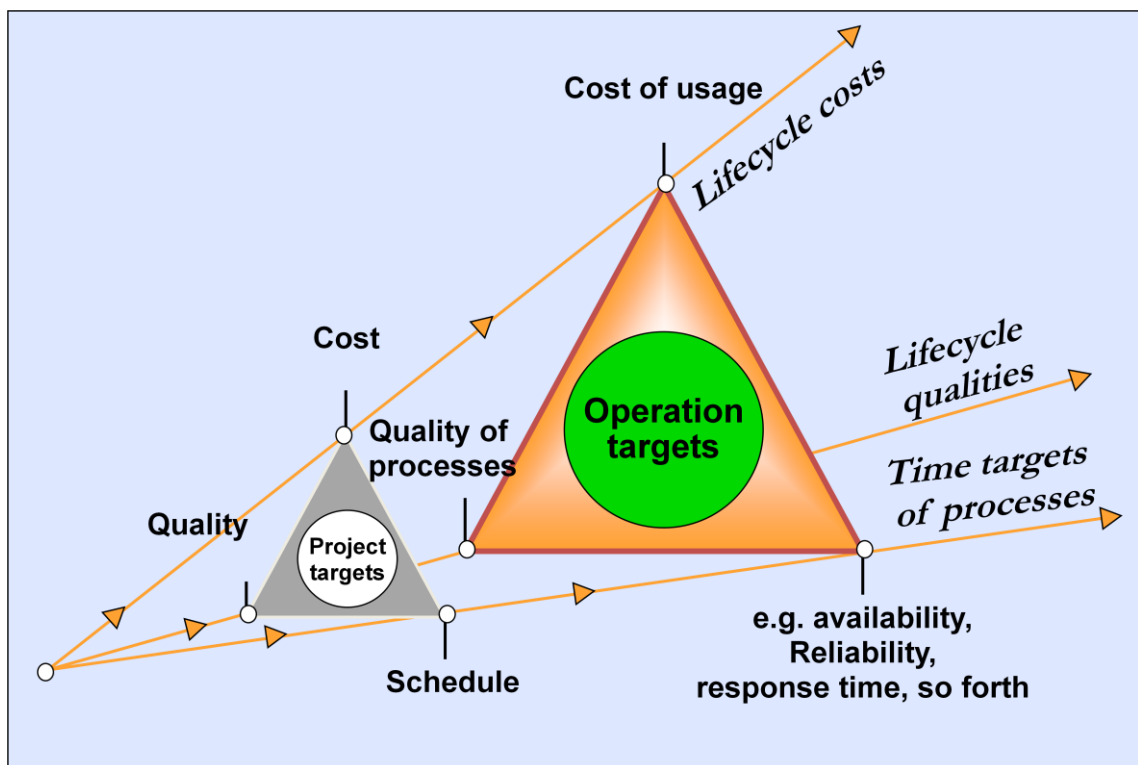


Figure 1: Extended Triple Constraint to a lifecycle oriented model [©H.Balck]

The conservative model displays just a particular point, which is time and issue-related, whereas the life cycle oriented approach includes a doubling of targets through the extension of two time horizons: the construction targets and the targets of following processes. Thus, object designations enlarging within all sections of the system hierarchy. Life cycle costs and life cycle qualities are going to be divided according to the cost sections and components of the DIN 276. Consequently are going to be also construction related time targets allocated. It results the alignment of strategic cost groups, which forms the fundamental concept for life cycle oriented processes within building constructions.

The demonstrated procedure model proves to be also compatible with the German certification system of the German Sustainable Building Certificate “DGNB” and the Rating System “BNB” from the Federal Ministry of Transport, Building and Urban Development BMVBS.¹

¹ The Federal Ministry of Transport, Building and Urban Development „BMVBS“ provides its own rating system for study purpose and private assessment: “Rating System for Sustainable Building” (BNB) – BMVBS (2010)

It also suits for their utilization, if the criteria of their evaluation procedure determines also from the beginning the target for all project phases and not just for existing design or completed buildings. In addition showed the cooperation with the product related research partner (WILO / GEZE), that the application of the certification systems BNB-/DGNB is beneficial within all stages of a building value chain and opens clear advantages in the competition to international rating systems like LEED and BREEAM.

But for realization it still requires to connecting each component and product section with the complete system “Building” through out all system-technical levels, which stand in the forefront of the present research work. This relation will be described as a challenge, which still requires adjustments in methodic foundation for the realization of the BNB-/DGNB-system.²

CENTRAL ISSUE 2:

The selection of constructions, facility concepts and building products happens within planning processes. Thereby architects and engineers give consultation to the client. But this happens nowadays still without involving the actual user and their knowledge. The selection of the building products takes place in the conventional building process without notice to the consequential costs and related qualities. Lifecycle costs and life cycle qualities are mostly unknown for designer and clients.

APPROACH (2):

Companies with a large real estate asset, which forms a key to success for their processes, have recently adjusted their organization: real estate branches and service components with operator responsibility joint to a collective responsibility. The previous separated decision processes of investment and usage are going to be connected. This organizational change ensures that user knowledge becomes designer knowledge. The Deutsche Bahn Station & Service AG, which participated in this research project, implements the described strategy. They focus especially on the realignment of technical purchase. One particular value lies in market knowledge of industrial product suppliers, which are able to demonstrate their sustainable benefit to the client. For example brought the research partner GEZE GmbH and Wilo AG this knowledge into the project. The purchase of the “user-client”³ is not only oriented to the price. Thus occurring between both sides value partner that contain sustainability as a criteria.

² The evaluation systems of the BMVBS that got developed in research projects forming the basis.– cf. Lützkendorf (2002 – 2004) – and the Rating System of the Federal Ministry BNB (2010)

³ This expression „user-client“ is used for clients that design and build regularly a real estate asset and taking after completion the user responsibility.

Comprehensive knowledge from designer and client about life cycle costs and life cycle qualities is a challenging target for the development, which demands a lot from every participant. But the path for a change contains many barriers that have to be considered. These barriers can be and have to be vanquished. A solid pathfinder is the knowledge management. It starts with the important branches and product line for sustainable products and systems. This requires an early and direct dialog between the involved parties from the investment preparation and the experts from marketing, sale, technology and product development. In other direction, where client responsibility and user responsibility meeting in large real estate assets, has to be build up a systematic knowledge about life cycle costs and life cycle qualities⁴. This also causes a movement of the historic knowledge monopoly from designer, towards a linked knowledge – by involving the supplier with their product knowledge at the beginning and user knowledge at the end of the value chain. (Figure 2 - 4).

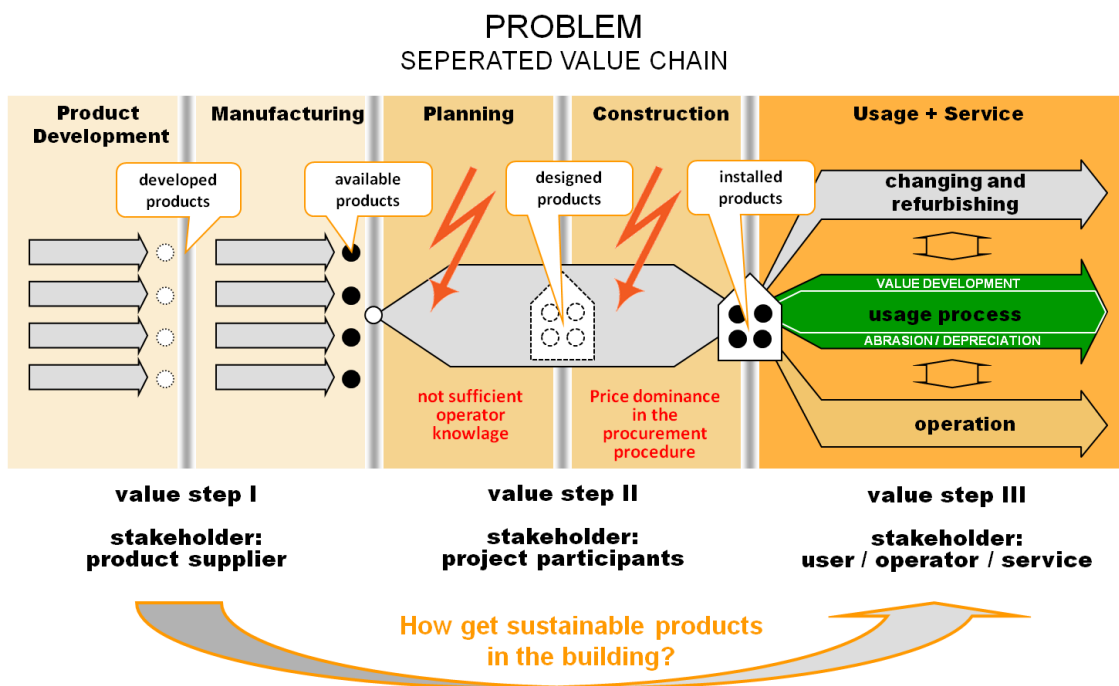


Figure 2: The problem of the separated value chain [© H. Balck]

⁴ The expression „life cycle qualities“ means in the present research sustainable qualities. They correlate with the rating system of the BNB / DGNB, but do not implement the economic qualities. Thus the diversification of life cycle costs is easier for the tendering procedure.

Solution:
collaboration between all value chains

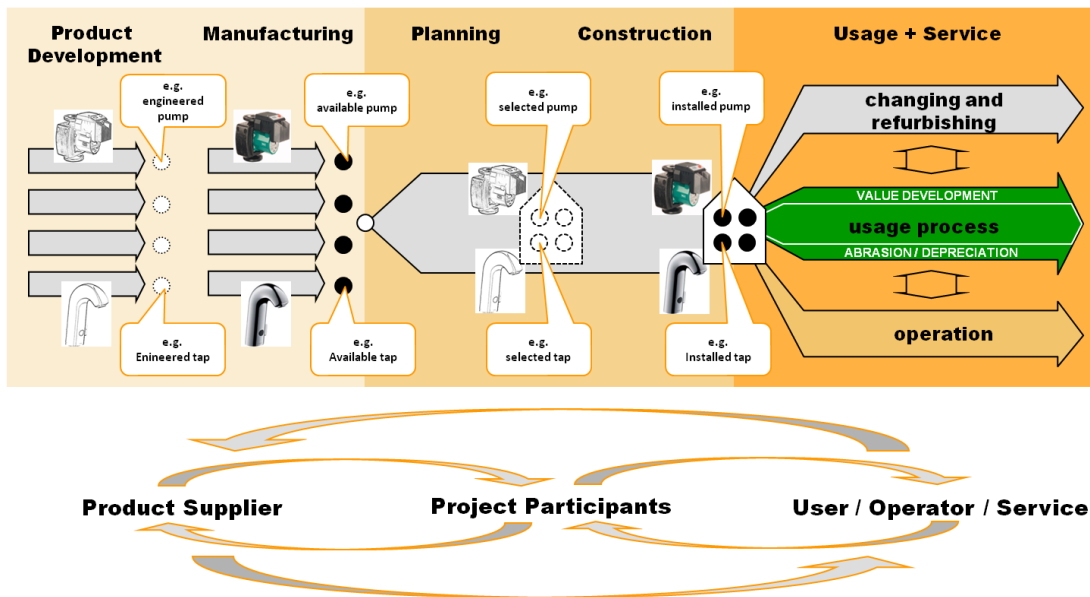


Figure 3: Process integration in the value chain of products up to their utilization [© H. Balck]

ELEMENTS OF THE RESEARCH PROJECT

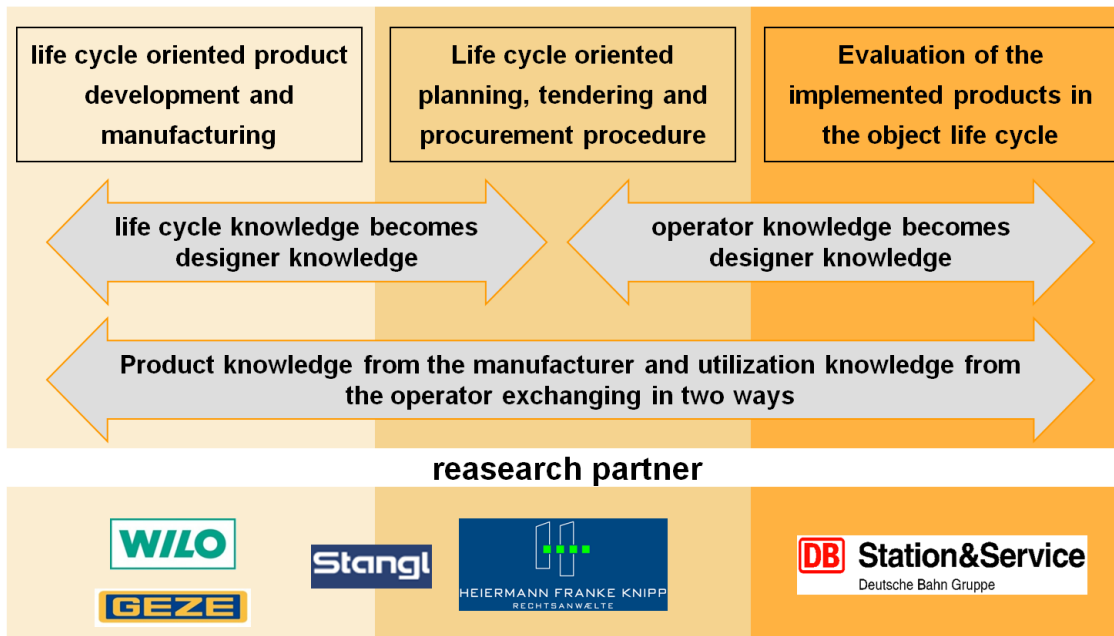


Figure 4: Integration concept according to the life cycle approach as foundation for the cooperation with the research partner [© H. Balck]

CENTRAL ISSUE 3:

Life cycle costs and corresponding quality aspects receiving not sufficient consideration within price related tendering and procurement procedures. The nowadays-usual tendering procedure has to be changed for reorganizing the whole value chain from the product development / production to the processes of the usage and the parallel running operation.

In particular have to be analyzed following aspects of the market used methods according to the requirements in life cycle approaches:

The acceptance criteria “economic efficiency”, how it is described in § 97 Abs. 5 GWB und § 25 Nr. 3 Abs. 3 S. 2 VOB/A, is not considered sufficiently in the practical operation.

It happens more and more, that judicial reinvestigations taking part in tendering and procurement procedures. The legal implementation of life cycle aspects (e.g. sustainability standards, quality aspects) requires already before the tendering procedure a precisely weighting of the rating criteria.

TECHNICAL APPROACH (3):

Standardized calculations of life cycle costs – weighted according to the most important cost segments, linked with the corresponding product groups and related methods. The foundation for this forms the DIN 276 and an assembly of standards and instructions from mechanical engineering as well as plant engineering. Especially in plant engineering existing life cycle oriented time and cost terms, which are transferable to the structural design and already implemented in the building service engineering. The development of market oriented standards in quality measurements requires innovative solutions with a constant exchange of user experience and data.

LEGAL APPROACH (3):

The abilities that the VOB offers for decision making, like sustainable, economic efficiency and quality aspects need to be used more forceful. It is required to develop life cycle oriented methods that are conforming to the VOB regulations.

Also for the functional tendering is the implementation of life cycle oriented criteria possible. The target viz. the life cycle oriented benefits have to be described already before publishing the tender documents. Problematic is that the functional tendering does not contain always the required details and transparency, which complicates the practical application and also increases risk for every participant.

Furthermore the permission of additional tender enables the vendor to place alternative solutions with life cycle oriented benefits, especially through innovative products. But this implies that the client defined previously the minimum requirements for possible additional tender. In that, the client also has to look into life cycle and sustainable ap-

proaches in a very early stage of the planning phases. But in the practical application lies a high uncertainty in the level of detail for the minimum requirements.

Eventually offers the new procedure new possibilities, where the client and vendor can come into a dialog already during the tendering and procurement procedure. That allows developing corporately solutions that are most beneficial, even according to life cycle costs. But also for the early dialog it is essential that the client works with the aspects of sustainability already in the early concept phases, because the life cycle oriented rating criteria have to be determined before publishing the tender documents. The problematic in here is that in the early phases of a project, where the demands of the client are not clear defined, it occurs as difficult to determine an exact definition and weighting of the rating criteria. Especially the required level of detail and possibility for changes from the client during the progress contain a high uncertainty.

2 Economical structure change effects procurement processes

In Germany, the federal government took in autumn 2007 a significant decision within their high-tech strategy. The responsible people for procurements established new ways for the acquisition of products and services.⁵ Life cycle costs and innovations are standing in the focus of the criteria. Approximately 12 percent of the GDP are affected. Nearly the whole economy with its products is included. Therefore this political approach will bring far-reaching aftermaths. The price competition will change fundamentally towards quality competition, because the required long-term efficiency enables the purchase of high quality products and services that have higher costs of acquisition but will amortize within a short period of time.

The new guideline of procurement is an action to support the competitiveness from German industrial branches and companies. Parallel, the purchase processes of the ministries are going to be reorganized, which will have a guiding character. It is to expect that the federal states and municipalities will act in the same way. The industry is already on a similar way and relies usually on established models from the government. That means alone for the products and services a fundamental reorganization of the value chains within the whole building industry: The chain of the building industry starts with the task and selection of the product/installation and goes to the synchronal acting user- and operating processes within the frame of technical life cycles. In the real estate sector, it starts from investment- / investor interest of the property selections and goes to the yield along life cycles.

⁵ BMVBS (2008) – Verstärkte Innovationsorientierung öffentlicher Beschaffung. Erlass B 15 – O 1082 – 000/2, Berlin 10.01.2008

Within these chains, the involved parties are engaged to define their outcome differently than in the classical contracts. It is not asked for a functioning object without “constructional defects”, the verifiable advantage is required. The energy performance is just one aspect of sustainability, what really counts is the actual performance. According to that, all steps during designing and establishing appearing into a new light. Architects and consulting engineers, which are traditionally the decision maker for the outcome, have to answer following questions within the new procurement scheme: How should constructions and technical devices look like if the evaluation criteria for implementation is not just the function, but also the user and operator process. To proof the achievement, the classical contract for service could contain besides the actual service, also the proof of energetic/ ecological efficiency plus the documentation of assured qualities.

In the extreme case, the client could order instead of a particular door, just a divined count of opening procedures in general. The proof then is the proper and efficient operation. Similar is conceivable for operational achievements like lightening, ventilation, pumps etc.

One consequence of the life cycle oriented acquisitions guidelines is the reevaluation of possible tendering procedures. That implements the procedure for functional specifications and allowance of additional tender. Additional ways of procurements are the pre-commercial procurement and the dialog with in the competition. That should all enable innovative products and services better chances within the competition. Which was, like everyone knows, just rarely the case in previous price competition. For tenderer in the high-tech branches, it is probably very alluring, but for the dominative part in the building constructions it is more than just a challenge. It is a call to leave behind old routines. Innovative solutions are the opposite of common building standards, because they contain a risk. Creative, risk-sensitive acting stands in contradiction with the well-established, negative culture of the aggressive cutthroat competition. In the sections where cutthroat competition is usual, it is missing the base of fair cooperation. But this is essential if innovative tender decisions, with a defensive risk, have to been taken within complicated planning and construction activities.

3 Long-term responsibility and system leadership

New roll of the client

The structure change benefits the life cycle approach and requires especially from the participants and persons of charge to engage in new roles and competences. Especially the ratio between client role and solution supplier (products and services) has to change fundamentally. The traditional client was the legal guardian of internal used

property and building. The internal use has decreased since the 90th significantly. Nowadays, the client who acts as an investor requires responsibility for the investment capital. Thus, the investment concern changes from the classical allocation of space and construction towards sustainable performance for real estate asset. That requires also an uncompromising adjustment of the economical outcome of the end customer. Here it is important, that the user is not just the user. Economical outcome from a property results also from the profitability and performance through tenancy or sale – so finally from the payments of tenants / vendee. This diversification is in the market self-evident – but not implemented in the building construction. It started a shifting of emphasis. The internal use orientation changed to real estate asset. That relies also on the coherence between using the building and using the technical as well as infrastructural services, which are added values for the allocated area. The consumer satisfaction with the building and provided services, constitute the outcome of a investment in two ways and in order to that also the value of the real estate.⁶

Certifications change planning and construction processes

The German Sustainable Building Council (DGNB) changed the construction business with launching a German certification system and its embedding in the international World Building Council. This is the beginning of a process of change, where real estate and building constructions processes connect. The decision making processes are revolutionizing at the certification systems from the World Green Building Council. Worldwide it comes to an adjustment of the real estate investments – from the first steps in the investment preparation up to the success control. Clients have given guidelines to the responsible parties of planning and purchasing, which complies with the rating systematic of the certification systems. At the end, the achieved efficiency and usability will be verified. Following milestones will conduct the building processes in the future:

Clients and investors give architects and involved engineers their efficiency targets, these have to be in a stage of detail, which is very unusual for the present planning practice. That requires extended achievements of the project management with knowledge about outcome factors from sustainable construction. For the decision preparation occurring life cycle oriented target systems and target specifications.

Control-milestones determine the outcome assurance, which involves also the design phases. Through the precertification, the building design gets evaluated and might support the project marketing in case of certificate. In any case it is necessary to re-

⁶ A Current study from RICS in the USA showed that LEED certified buildings have less vacancies and the rent is up to 6% higher than in not certified buildings. Eichholtz P., Kok N.: Doing well by doing good? An analysis of the financial performance of green office buildings in the USA, March 2009

ceive detailed evaluation results for further planning optimization and the collateral running quality control.

The adherence of sustainable targets, their precertification in the design phases and the following adjustment of all project phases according to the outcome control, require the reform of the project management. The traditional definition of project controlling achievements is not sufficient any more. Required is now a life cycle oriented "life cycle-project management"⁷

After completion of the construction and the existence of a certificate, the project participants see if they can present their performance or not. More important are the consequences of a certification after completion, for the following phases of optimized operation. Because in the 1. and 2. year of usage, it comes to further outcome controls, which show the actual outcome through measurable building performance. In all previous presented project shapes, the outcome definition shifts from the classical service contract with the ideal of no defects, to the certificate of predicted performances (energy consumption, service level, reliability and so forth). That has far reaching influences on the involved parties within the executive processes. Product supplier will be measured according to the performance of their products. In addition, product provider and executive companies need to extend their usual guarantee enormously in the movement towards long term responsibility. One result is also the change of product competition and construction achievements. That means for the stakeholder within the building industry to reorganize the marketing and sales practice according to performance targets and related monitoring procedures. With that changes also the definition of sales success. It is not longer just a quantitative sales accomplishment. In the focus coming now the user and operator with their satisfaction, constituted through verifiable approaches within the whole spectrum of rating criteria.

These perspectives forming difficult challenges for our economics - but also an chance to connect technical know-how with management practice. For investors and all the parties that take responsibility for real estate value, it is not just a chance in the crisis to stabilize, it is also a possibility for the times "after the crisis" to stay competitive on a higher level.

⁷ „Lifecycle project-management“ is in this research a term for an approach, which brings the life cycle approach to the clients task within all phases of the HOAI.

4 Performance of products and services

The beginning of a building project defining the targets and the related first steps which are determined by the investor or client: the selection of consultants, like architects or engineers. The second step gets prepared in the design phase and gets carried out by the tendering and procurement processes where executing companies and product supplier get selected. The tendering and procurement procedure stands in the centre of building projects and from the methodic point of view in the centre (not chronological) of all value steps. If we consider the success of market entries – decisions for design market partner and following decisions for executive market partner, it comes to the question of the outcome of all parties and their services. And now we are reaching a dilemma. Different to many industry products, where we can compare and point out successful usage or operation, there are marginal things to compare on a building and their components. But still, this question is essential for the here explained direction for purchase processes. Following we will try a approximation in the context of the technical chain:

Performance of a building – Determination within the technological value chain

The performance of a building gets measured according to the achieved criteria and at the level of satisfaction which gets documented through user / operator surveys. The criteria are coming from the certification systems like BNB/ DGNB or similar, international rating systems. The performance rating looks at the building from a comprehensive point of view. Preferred criteria of that rating system are energy efficiency, ecological qualification and contribution of service processes to enhance the user processes. Such performance ratings got carried out within the past years mainly in relation to research projects.⁸

Performance parameter: product selection according to life cycle criteria

The product selection is crucial for the performance of a building. That gets identifiable through the meaning of the first value steps. The product benefits standing especially in the innovative properties of various technologies and components for efficient and sustainable performance. If we look at these chains from the point of an existing building, we can see the building as a compellation of products, as it is divided in the DIN 276. The interconnected design and executive achievements have in the way of processes an insignificant appearance, but they forming as expenses the biggest part of the costs.

⁸ These researches showing the first time based on scientific foundation that the capacity of even high efficient technologies does not get utilized up to 15% within the first years of usage. The reasons are lacks in management. This case is known in the facility management. One consequence is the close connection of life cycle oriented design and procurement processes with the following operation process. (Prof. M.N. Fisch / S.Plessler - IGS TU Braunschweig, 2007)

Hence a building is a technical system with various previous technical chains. And to look forward, the usage and service processes, which are connected to the technical devices or product components, like maintenance, are basically follow-up processes with related consequential costs. Therefore it makes sense to include this kind of comprehensive processes (from product design to product disposal) into the aspect of life cycle costs. Parallel it is required to look at the enabled and assured qualities in the same way. In addition the ecological evaluation needs to be considered.

Operator knowledge gets designer knowledge

That means especially a consistent utilization of innovative products and solutions. But the structure problems of the well-established market complicate the integration of operator knowledge in the investment process.

Operators take barely part in the investment processes of the HOAI-phases. Even if architects and consulting engineers having this kind of exchange, often they fall into the trap of costs during the tendering and procurement procedure due to guidelines from the client: the cheapest wins. Consequential costs and quality issues will not be considered.

Tenderer of innovative products can point out their life cycle oriented benefits very rarely in the normal planning and procurement process. They fail always on the price competition.

Executive firms have rarely the opportunity to place innovative product alternatives within the price competition. The conventional product specification "...or equivalent..." is often counterproductive, because just the cheaper solution wins the competition. At the end the client, the operator and the user are defrauded of an economically better solution. Due to a lack of data and methods, until now the consequences are not known well enough for decision.

Life cycle oriented connection of construction work and service within the tendering and procurement processes

Advantages and disadvantages of products in connection with construction work and service will become in many parts standard for construction related tendering procedures. Crucial for success are life cycle oriented guidelines, which have to get developed in a network of designer and operator. Thereby it basically goes always about a dual procurement procedure strategy: Procurement procedure for construction work and procurement procedure for service, which are eventually connected through the installed components of the construction work.

This extension from the content is strictly speaking a combination of construction work specifications and service specifications. This has technical as well as judicial conse-

quences. This particular field is new for the market as well as research processes. Following cases are possible:

The specifications for construction work contain requirements for products, which derive from consequential processes like procuring of spare parts / operation processes / periodic maintenance processes. But especially the request of periodic maintenance is optional. That means it stays open, if such performances will be delivered as internal activity or not.

In addition to the acquisition of construction works, it is possible to do a tendering procedure for service achievements after completion. In this case it needs to include also the previous results of life cycle oriented tendering procedures. Also for this case stays the option, to deliver parts of the duties as internal activities.

The link of construction works and service contributions has another enlargement as consequence. That are especially service oriented properties and competences of producing companies or the related service companies.