ARCHITECTURAL PROGRAMMING:

PROVIDING ESSENTIAL KNOWLEDGE OF PROJECT PARTICIPANTS NEEDS IN THE PRE-DESIGN PHASE

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Through the increasing complexity of construction projects, the clear postulation of the planning objectives is becoming increasingly difficult for the clients and the planners equally. However, the precise definition of planning aims and goals is of crucial meaning for a positive project outcome. The precise definition and outline of the client requirements and the needs of future users can significantly contribute to the sustainable efficiency and performance improvement. While in the Anglo-American region the method is widespread in Europe it is still unconsidered. This issue is leading to immense changing costs and has a great impact on the European economy. This paper will give an overview about the standards and procedures of the programming method. The implementation of programming will be demonstrated on a case study of the Vienna University of Technology. A performance specification was being developed for an architectural program of spatial merging of three different departments.

KEYWORDS: architectural programming, design briefing, knowledge gathering, performance specification.

INTRODUCTION

Increasing complexity is one of the main characteristics of current building tasks. The construction market is segmented into numerousness relevant disciplines. The planning process however is still separated into different specializations that are working separately. The simultaneous and interdisciplinary planning is still an exception. (Achammer, 2009) Furthermore, other facts like increasing communication, diversity of solving possibilities for one assignment or the decreasing time of the planning phase contribute all to the growing complexity. The diverging disciplines concurrently develop different languages which make the interdisciplinary exchange even more difficult. Within this changing market situation the clear definition of the client's conceptions is becoming essential.

Every building task must go through the phase of the problem statement, no matter how accurately and structured it is done. At the present, knowledge about the building task is gathered within the building process and mostly in the course of major decision-making. Programming (in UK known as brief elicitation) provides knowledge that supports such decision making processes and helps to build more efficiently, adapted and sustainable. Furthermore this method can have a great impact on intangible benefits like the organisational culture or the work ethic.

The field of programming is wide spread and an accurate elaboration demands an interdisciplinary approach. Beside the technical disciplines the scope of programming reaches into the fields of sociology, political sciences, anthropology or psychology.

This paper will present programming (design briefing elicitation) as a major methodology that is still neglected. It should demonstrate the importance of clearly defined project goals and objectives and show the significance of investment in the pre-design phase. Further on, the development of programming together with an overview of the different programming phases and its different methods will be presented. It concludes with a case study on the redevelopment process of three departments of the Technical University of Vienna in order to demonstrate the application and implementation of practice-related methods.

HISTORY AND DEVELOPMENT OF THE PROGRAMMING METHOD

Every human build physical construction is originating in problem solving of a certain obstacle though structural interventions. The definition of these problems calls for the postulation of fundamental needs and goals. For example, a Stone Age-person wants to cross a river without his belongings getting wet. The problem-definition and the instructions to somebody who is trying to solve it are as old as human civilisation. The only difference compared to the current situation, is that problem statements of the past happened unconsciously.

In the United States the first documents comparable with architectural programming occurred in the 17th century within the context of self-conscious design. The development of modern programming has its roots in the post World War II era. The profound changes that occurred in many areas of our society during and after the war called for answers to questions about how we do what we do. (Cherry, 1999) In the 1960s many of the US Scientists worked in the field of “design methodologies” especially in the field of public participation in the design process. Contemporary architectural programming as a separate discipline was primarily mentioned in 1966, by a publication of the America Institute of Architecture (AIA). About the same time, the first edition of Penas book *Problem Seeking: An Architectural Programming Premier* was published. (Kumlin 1995). Architectural programming is currently a prevalent and established part of the pre-design phase in the United States. It is incorporated into standard architectural contracts and national architectural licensing examinations. Large design firms usually have specialised staff on facility programming, in other cases programming consultants are subcontracted. (Popov 2004) In Germany and Austria the definition of the needs and problems is widely unconsidered. The German architect Gunter Henn brought the Programming Method to Europe in 1987 and adapted it to the European circumstances. (Henn 2009) In 1994 the International Organisation for Standardisation published the *ISO 9699:1994 Performance standards in building – Checklist for briefing – Contents of brief for briefing design.* This standard was converted in 1996 into the German Standard *DIN 18205 Bedarfsplanung im Bauwesen*. The mentioned standard gives a detailed checklist of what should be observed, but it gives no explanation how to achieve this information.

PROBLEM STATEMENT

According to Achammer (2009), the costs for planning betray about 1,5% of the total life cycle costs. However, this relatively small amount immensely influences the performance of the following costs, which can rise up to more than 80% of the total life cycle cost.

Figure 1 shows that the costs for changes at the project start are still minimal, and they rapidly increase with the project progress. This is why the knowledge-increasing at the earliest project phase is also a crucial economical benefit.

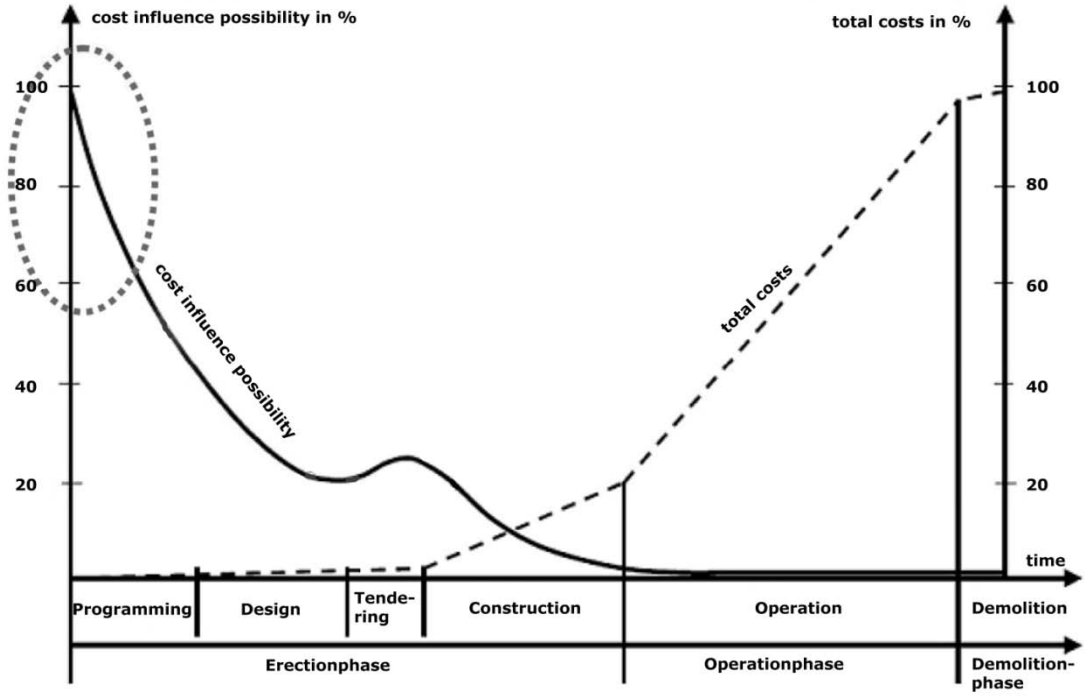

Figure 1: Cost influencing throughout life cycle adapted after Achammer (2009)

The current problem is the lacking willingness of today's clients to invest into the pre-design phase. To cause a change in such client position, the knowledge and benefits have to be communicated insistently.

INFORMATION GATHERING

The gathering of useful and important information represents the starting base of a good program. Hereby, the challenge is to separate the useful data out of the large amount of possible information. One of the main characteristics of a building is its uniqueness, therefore the information gathering methods have to be customized for each individual project. The main task of the programmer is focusing on the programming process and awareness for the relevance of the collected information. The DIN 18205 (1996) or the ISO 9699 (1994) give a detailed checklist that helps to overview the widespread field of appropriate information to be evaluated.

As shown in Figure 2, there are two different types of facts that have to be evaluated.

The first group are the hard facts or the tangible data, which can be determined through conventional data research methods like statistics. The field of these facts is wide spread and ranges from the current occupancy data to the site survey facts, if the site is known already at this early phase of the project.

The second, and maybe more important group of information are the intangible facts, which are collected through empirical social research methods. These practices include:

- qualitative techniques, like interviews or workshops;
- quantitative methods like questionnaires which can be wide spread and involve larger group of participants.

As Popov (2004) shows, qualitative methods are indispensable, as their main vantage is their openness to the different perspectives, which can provide new points of views, that could be crucial for the programmer.

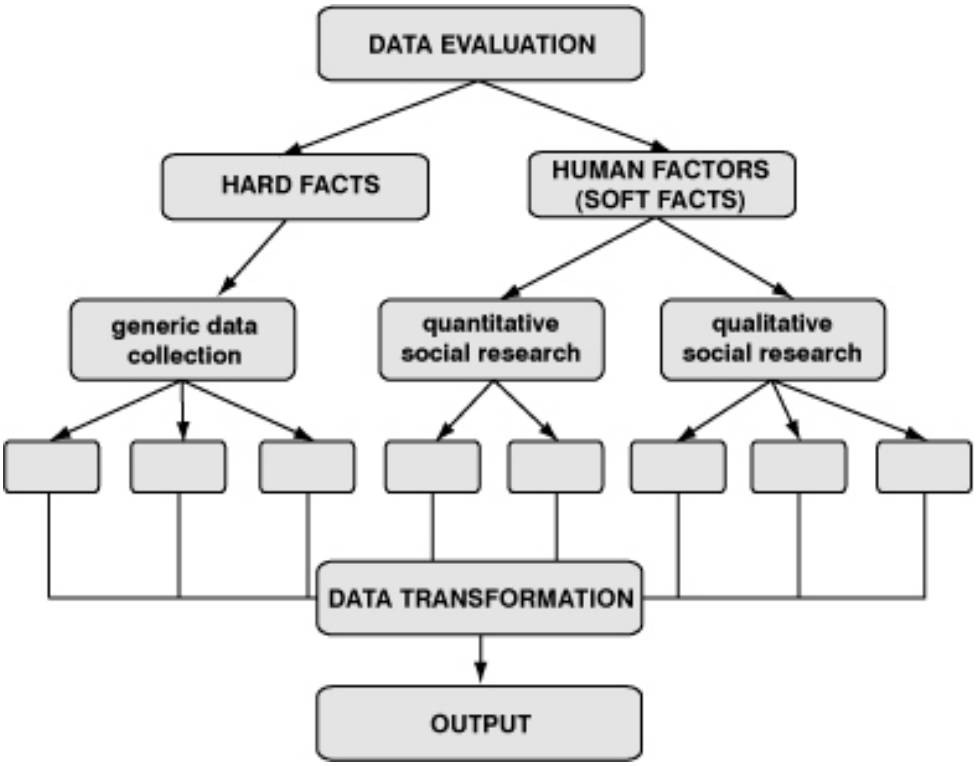

Figure 2: Information flow Structure (2009)

There is a large accumulation of different existing evaluation techniques, helping the programmer to define data that provide a maximum of relevant knowledge. Concerning this matter, the big challenge is to find methods, which maximizes the valuable data and minimizes the effort. No matter what kind of technique is used, the prearrangement must be done very accurately. The programming methods require a high level of social competence and Know-How because of the wide interdisciplinary spread of the programming team.

GOAL DEFINITION

The intention of every client is to build an excellent and unique building. However, the definition of excellence is subjective and varies within the different decision makers and the planners transforming the wishes into the build reality. *"There can´t be an excellent building without knowing what´s excellent"* The programming method makes these different pictures transparent and decreases the variety of diverse imaginations. The programming process provides the basic discussion and supports the development of clearly defined goals.

Cherry (1999) mentions, that often the client's design requirements are based on what the client wants his or her organisation to do. Therefore, she advises to establish organisational goals first, and then to transform them into facility goals and objectives. There is a wide

spread field of different goals like organisational, economical, ecological, social, design-based, or facility goals, but nevertheless the clear and specific definition of project goals is one of the key aspects of the programming method.

DATA CONVERSION AND OUTPUT

The collected amount of data should be transformed into an output paper enabling a future planner to design a building according to the imaginations of the client. Various standards and literature (Din 18205, ISO 9699, Duerk, Kumlin) give checklists and hints for structuring of the output paper. Nevertheless, the output paper should primarily focus on the clear and comprehensible preparation of the essential information.

CASE STUDY

The Technical University of Vienna is going through a grand scale redevelopment. Within this process, the three different and disconnected departments for:

- Construction Economics and Management
- Construction Process and Methods
- Industrial Building and Interdisciplinary Planning

should accrete to one “Institute for Interdisciplinary Construction Process Management”. For this combination, a programming study was made to provide transparency of work processes, structures and goals of the future institute for a prospective planner.

Data collecting

The first phase of the programming study was the evaluation of the main workflows and processes of the three departments with a specific focus on the similarities and the differences. Therefore, questionnaires for all employees where dispensed to evaluate the personal work habits. Also interviews with special selected employees of all three departments were held. At the same time, a large amount of the relevant data was collected, beside the direct contact to the employees. For example, the average utilisation of the lecture rooms integrated into the tree departments was evaluated by the means of statistic of the amount of students per time per semester. Generally, the gathered information could be divided into the following major groups:

- Existing work area (m^2) and their usage
- Employee statistics (quantity, where they work)
- Motion analyse
- Communication analyse
- Process analyse (separated in science and education)

In the second phase, interviews with all three department heads were arranged to establish the vision and the goals of the future institute. Therefore, parts of the analysis were already used to show the actual conditions.

Transforming information

After collecting of the all relevant information, the next step included the transformation of the data abundance into informative, clear structured and visualized outcomes. The main objective was always to create results, which can be understood and used also by outstanding users not involved in the process or the organisation. Figure 2 shows the main different processes representing the core businesses of all three departments. Education and science are the two major tasks combining all divisions.

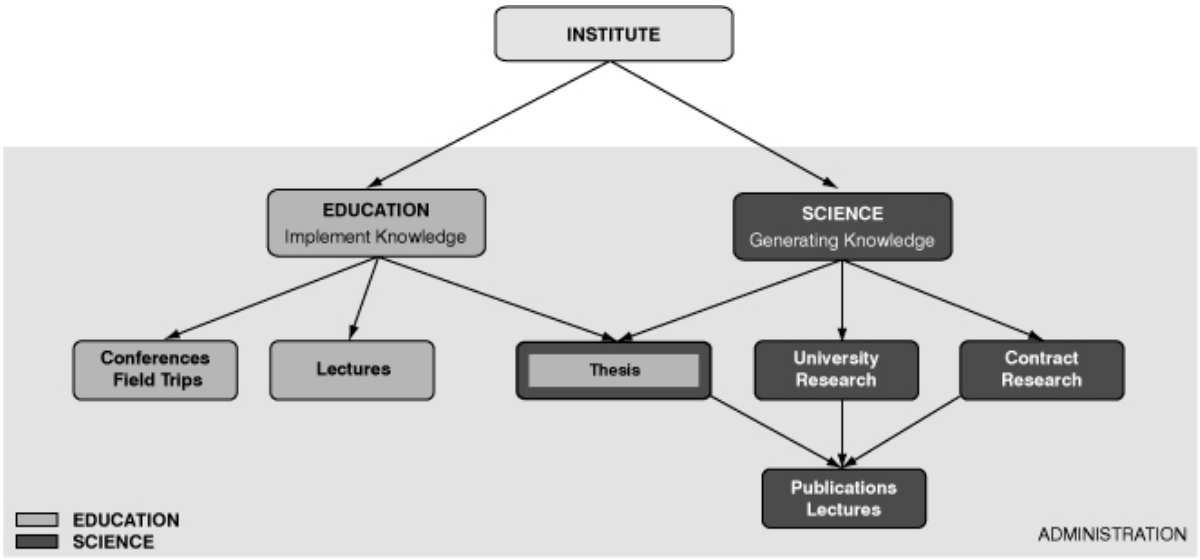

Figure 2: Institute Process Structure (2008)

The fusion of the analysis shows, that the workload could be divided in three major groups:

- about one third of the work of the staff scientists is work requiring communication
- one third of the work requires concentration and
- the last third consists of routine work.

Another key issue was the analysis of the communication structure. Every employee was asked to draw his personal communication map within the questionnaires. This method was chosen because of the fact that all of the employees are engineers, therefore familiar with the topic visualisation. These results were linked together within the communication matrix shown in Figure 3. It is obvious, that the strongest communication structures are within the departments themselves. Additionally, the communication density was evaluated within a workshop.

	Prof A	Ass A1	Ass A2	Ass A3	Prof B	Ass B1	Ass B2	Ass B3	Sekr. A/B	Prof C	Ass C1	Ass C2	Ass C3	Sekr. C	Ass D
Prof A															
Ass A1	T, P, Ko, Be		Ko, P	Ko, P	BD	Ko	Ko	Ko	BD						
Ass A2	Σ	Σ		Σ	Σ	Σ	Σ	Σ	Ko, BD, Be, T	Ko, Be	Ko, Be, T	Ko, Be	Ko, Be	Ko, Be, T	Ko, Be, T, BD
Ass A3	T	Be, T, P	Be, T, P		Be	Be, T	Be, T	Be, T	Be, T, BD						
Prof B															
Ass B1	Σ	Σ	Σ	Σ	Σ		Σ	Σ	KO, T, BD		T	T	T	Be	KO, T
Ass B2		KO	KO	KO	KO, BD, P	KO		KO	KO, BD, T		T	T	T	T	
Ass B3		KO	KO	KO	KO, Be	KO, P	KO, P		KO						
Sekr. A/B	KO, BD, T	KO, BD, T, Be	KO, BD, T, Be	KO, BD, T, Be	KO, BD, T, Be	KO, BD, T, Be	KO, BD, T, Be	KO, BD, T, Be		T	T, KO, BD	T, KO, BD	T, KO, BD	Σ	KO, BD, T, Be
Prof C															
Ass C1			KO, T	P	Be, BD				Be, T	KO, BD, Be, T		Σ	Σ	Σ	BD, T
Ass C2	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	T, KO, Be	BD, T, Be	KO, Be		KO, Be	KO, Be	T, KO, Be
Ass C3					Be					Σ	Σ	Σ		Σ	
Sekr. C	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	T, BD	KO, BD	KO, BD	KO, BD	KO, BD		Σ
AssD	E, KO	E, KO	KO, E	E, KO	KO, T, E	KO, E	KO, E	E	KO,T,E						

A, B, C -- Different Departments

KO -- direct communication
BD -- paper flow
P -- combined projects
Be -- meetings
T -- telephone
Σ -- all

frequently (daily)
continuous (weekly)
rare (monthly)
never

Figure 3: Communication Matrix (2008)

The last step of the transformation process was the development of an effective room concept. All the collected and transformed information was linked together in order to develop a most suitable facility program for the requirements of the future organisation.

Finally a workshop with all the employees and interviews with the department heads were organised, to align the outputs and results with the staff.

Lessons learned

Within the working process, the main objective was the separation of the major and relevant information from the immense available information. This was done with respect to the future work efficiency and achievement of satisfying results. Various further insights gained within the process were:

- the importance of the preparation phase of the different evaluation methods,
- an alternation of development and reflection phases,
- the clear statement of the work-session goals

which proved to be were very gainful. Within the whole process of programming more importance was given to the questions, than to the answers.

Another important aspect was the integration of the involved persons through different feedback possibilities, in order to achieve accurate outcomes and to get a widespread acceptance of the results. Another advantage of the integration was the personal engagement and the identification of the staff with the future project, which increased the acceptance of the upcoming reorganisation.

CONCLUSIONS

With the increasing demand of our society for sustainable buildings, which have to meet economical, ecological and sociological needs, the reorganisation of the planning process is becoming urgent and essential. The investment of resources in the earliest planning phase of a future building is a major step in achievement of the upcoming goals. The clients have to be made aware of their responsibility for the development of the facility program, which occurs in the course of early planning phases serving as a preset for clearly defined design aims and objectives. The whole pre-design and design period represent an interaction between analysis and synthesis. In the past, the main focus had always been on the synthesis, as the creative part. However, this approach has to be changed, due to the rising importance of the analysis, as the aim-setting phase. This focus change in the planning process towards the analysis is crucial for handling today's increasing complexity of construction projects and for the realization of successful buildings.

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