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The role of soft-factors in the success of collaborative planning information systems

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1 ABSTRACT

Planning information systems (PIS) play an important role in supporting collaborative spatial planning processes especially in complex planning tasks. In such a process different actors from different organizations and different planning levels deal with ill-structured or unstructured problems. During the development and implementation of planning information systems in this type of planning processes, main emphasis is usually given to technical, administrative, and operative aspects - the so-called hard-factors. In this paper we argue that the success and failure of these systems in supporting the planning process depends to a large extent on the so-called soft-factors.

In this paper we attempt to shed some light on soft-factors and their impacts on the success and failure of planning information systems in supporting the planning process as observed during the project "Sustainable Regional Land Management - RESIM" in Stuttgart region, Germany. One of the main aims of this project was to get an overview about inner development potentials in the 179 municipalities of Stuttgart Region. This overview was considered as a foundation for preparing a strategy for land management on the regional level. To get this overview and then to keep it up-to-date, an internet-based planning information system was developed. In this project, the concept of collaborative planning implies cross-organization and cross-municipal cooperation, where few or no obligatory basis could be realized beyond the borders of organizational or jurisdictional entities. Furthermore, the existing legal framework for spatial planning does not cover these types of planning tasks. The complexity of the process emerged from three main factors: the subject is new and politically loaded; the relation between the region and the municipalities is historically burdened with some negative experiences and the number of participating actors is large. After developing the system and during the implementation phase, it was evident that beside hard-factors different soft-factors play an important role in the process. Through the identification and observing of soft-factors, it is plausible that considering of these factors can further increase the chances of successful design and implementation of PIS.

After a short introduction to the concept of planning information systems and their application in collaborative spatial planning processes, we discuss the subject of hard-factors and soft-factors in the development and implementation of PIS from the view of spatial planning. Then we discuss different groups of these factors according to their source and their impacts on the outcome of the planning process. These soft-factors could be classified mainly to the following major groups: problem-oriented (planning theoretical); System-oriented and human factors (individual and group dynamics). In the last part we introduce a framework for dealing with these factors to enhance the quality of the proposed PIS as well as the success chances of the planning process. This part covers some technical, operative and communicative measures. While most of the aspects that are discussed in this paper apply for other information systems, main emphasis here is given to ill-structured problems in cross-organizational spatial planning processes in the public domain.

2 COLLAPORATIVE PLANNING INFORMATION SYSTEMS: CONCEPT & APPLICATION

2.1 The concept of PIS

As collaborative planning information systems (PIS) are ought to support different information processes in a complex planning situation, several aspects should be considered in the development and implementation of these systems from the very beginning of the process, namely: a) characteristics of the spatial problem that should be solved; b) characteristics of the planning process that should be used; c) characteristics of the planning information generally and in the specific context of this problem and d) characteristics of the human processing of information (Elgendy 2003).

In general, complex planning situations are characterized by a high degree of interconnectivity among different levels of planning, sectors, actors, and regions. These interconnectivities are mostly not well known in advance. Subjects of these complex planning situations are not static; they change through time and during the planning process. In addition, there is a time lag between making a decision, implementation of the determined actions and realizing the outcomes of these actions. Another important characteristic of these situations implies that the side effects and the long-term impacts of these activities may extend beyond the wished outcomes and the targeted space. In many cases these outcomes are unpredictable.

This type of problems could be classified either as an unstructured problem or an ill-structured problem. This type of problems can not be approached only in the formal planning framework or using the traditional planning process and methods. The needed planning process could not be considered as a plan making process; it is a continuous process of problem solving and conflict resolution among a group of individuals and/or organizations. The knowledge and expertise needed to solve the problem are not available for one person or organization. It is usually distributed over many persons and organizations (Rittel 1982). Hence, exploring and attempting to solve a planning problem in such a context set specific pre-requirements on the organization of the planning process, in which the number of actors who may take part is large - 30 to 50 individuals and organizations (Scholl 1995). These actors have differentiated roles and they are spread across various public and private organizations. They are from a variety of disciplines and have different backgrounds. In many cases, they have different and in some cases conflicting objectives. The distributed knowledge should be shared and communicated among the concerned parties. Meanwhile, in such a process, planning information have limited accuracy, are changing, losing their precision rapidly and originated from different sources and in different types.

2.2 Main features and applications of PIS

Highly structured administrative tasks are easy targets for automation exercises, and as the processes and outputs did not fundamentally change, efficiency gains were relatively straightforward to quantify (Johnstone 2004). Hence, in developing conventional information systems major emphasis is usually given to the "hard-factors" i.e. technical factors (infra-structure, system analysis, data structure, compatibility, security, etc.), administrative (contracts, finance, control, etc.) and operative (task formulation, coordination, training, etc.). All these areas are well studied. Different tools and methods are developed to improve the performance in project management, system development and programming (Rey, 2004).

But contrary to the development approach of information systems for well-structured or semi-structured problems the needed systems for ill-structured problems can not be realized in a traditional modeling process. As at the beginning of the planning process neither a problem definition nor a solution direction is given, system requirements could not be stated comprehensively in advance as in the traditional approach. Hence, it is a vital mistake to consider the development of PIS as a sole technical task that could be conducted by information experts without pairing with the planning process. An integrated approach among planning process, problem exploration and system development could not be avoided. Table 1 covers the major difference areas between planning information systems and geographic information systems, including: nature of the system, contents of the system and functions of the system.

Aspect	PIS	GIS
Nature	Normative	Positive
Purpose	Aiming at changing space	Aiming at describing space
Information	Information that is processed or produced during a planning process (space, time, organization, etc.)	Information describing the earth, its features and peoples' activity on it.
Relation	Specific planning context, process or subject.	Related to a specific spatial context.
Orientation	Process-, problem- or subject-oriented	Space-oriented
Processes	Establishing and preserving the overview about complex planning situations Collaborative exploration of planning problems Process Support (Coordination, Communication, Documentation) Management of planning knowledge	Management of Spatial date and information Spatial analysis Visualization /Overlaying Buffering Network analysis Site selection
Development	Iterative / explorative (*The system can start by a core information and function and grow with use*)	Comprehensive (*The system should be complete to be useful*)

Table 2: A comparison between PIS &GIS

One of the major application areas of PIS in complex planning tasks is to support establishing and preserving the spatial overview on ongoing or planned spatial activities. This overview should be made available for the participating actors in the planning scene to reach a common understanding about the planning context. Common understanding does not mean that all actors must have the same viewpoint but at least they should have access to the same background. Another application area of PIS is supporting the organization of the planning process and supporting the communication process among the participating actors (Elgendy 2003). Furthermore, PIS could be implemented to manage planning knowledge that is related to a specific planning subject. In other words, PIS could be problem-orientated, process- orientated or knowledge- orientated. It could also cover a combination of two or all of these aspects.

2.3 General structure of PIS

In addition to the common components of any distributed information system i.e. hardware and networking facilities, four main components are considered the structural fundamentals of PIS i.e. planning information, functions, rules scheme and user interface.

Different types of planning information in a database or as documents of different media types.

A set of tools to facilitate information manipulation, file and media management, analysis and simulation, etc.

The rules scheme includes declaration rules and access rights.

The user interface.

These four components are further divided into sub-components. The structure of PIS in form of components and sub-components facilitates the definition of the required and optional parts regarding the circumstances of the system application. In addition, as information and communication technology is witnessing continuous innovations at a very fast rate, this structure will be developed regardless of specific techniques or programs.

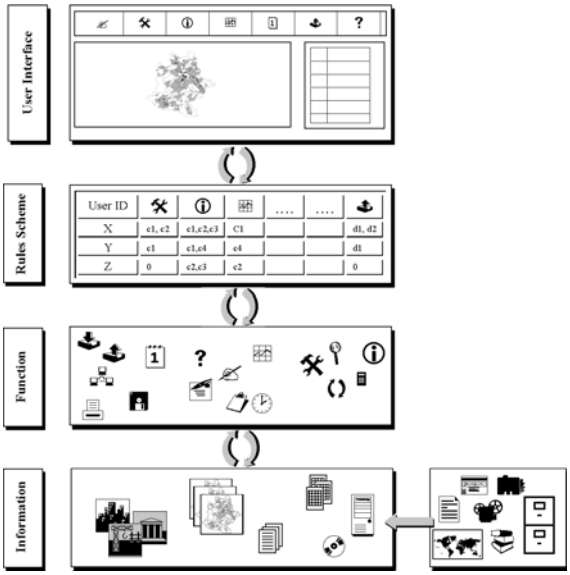


Fig. 1: Main components of a PIS

Splitting presentation, content and functions allows the autonomous development of each component and the implementation of new technologies without affecting other components. Menawhile, adopting new technologies in the back-end, the presentation and the information will not be affected. Furthermore, it facilitates presenting the same information in different ways. Updating and extending the information without affecting the presentation and the functionality.

2.4 Realization of PIS

The development process of PIS in a collaborative planning process should have an iterative manner rather than a comprehensive one to correspond to the explorative nature of the planning process. Iterative development allows starting the implementation with a core of information and functions and then extending and modifying the system according to the evolving needs. This approach allows obtaining quick results at an early stage. Meanwhile, it allows reacting to the soft-factors that usually arise during the implementation. On the contrary, a comprehensive approach or the so-called "water-fall" approach* requires a well-structured problem definition and longer time to produce results. A synthesis process for the development of PIS for a collaborative planning process would have the following main phases:

The **orientation phase** aims at defining the system requirements according to the specific circumstances of the situation.

The **planning phase** aims at preparing a general system layout according to the system requirements.

The **development phase** is organized in several cycles. In each one, a specific part of the proposed PIS is developed in a way that makes it operating independently from other parts of the system. After each development cycle, a test and consolidation cycle is organized to test the system and adapt to the feedback from the users.

The **implementation phase** starts after the first cycle of development, as the system should be operating partially. Each cycle of implementation should include an introduction or training for the target group.

From information technology viewpoint, the proposed structure could be realized using any suitable set of technologies. In the Project RESIM, the following technologies were used:

At the back-end, a database application e.g. MS Access in which information and Meta information are organized in different tables for each class of objects.

The tools and functions are server and client side scripts that are written using a standard scripting language such as JavaScript.

The rules scheme is organized as tables in the database. For class of objects the declaration rules are defined in a separate table. Users' access rights are defined also in DB table. A record for each user includes his access rights to the functions and the information.

The user interface (UI) is a standard HTML page through which each user gets access to specific functions and classes of objects according to his access rights. It also serves as a visual environment to present results of user's queries and requests.

2.5 Soft-factors in PIS

PIS - as well as any other information systems - do not exist in isolation from their context. They are applied in teams or work-groups that usually comprise members from different organizational units or even from different organizations. These systems represent more than a technical instrument for improving performance especially in ill-structured problems. They interact, influence, and are influenced by the surrounding individual, social and organizational environment. Introducing a new system is not less than initiating a change process that takes place in an organization or among different organizations. It influences different actors as individuals and as groups. Individuals or organizations have a tendency - in spatial planning as well as in other disciplines - to conduct their tasks using the means and the methods they are used to. Kirkpatrick (1985) argued that it is a basic tendency of human behavior that any belief or value that has been previously successful in meeting needs will resist change. Through the above-mentioned change processes different values, means or methods are called into question. Furthermore, existing organizational relations, communication structures and information methods are challenged.

Soft-factors could be then defined as those factors that are more qualitative in nature i.e. planning theoretical; human factors; group dynamics and psychological aspects. It is argued here that considering these factors in the development and implementation of these systems is a major success or failure factor. Different experiences and studies show that the major cause of most IT applications failures is the human, social and organizational issues rather than technical issues (Kunda & Brooks 2000). Baltzer (1991) supports this argument through the following observation *"... a university chief information officer relate the story of how members of his staff had decided to interview users of one of their administrative computer systems to determine the user satisfaction level with the system. He was amazed to find that only a very small percentage of the users surveyed expressed satisfaction; in fact, over 65 percent of them were actually dissatisfied with the system. Upon further investigation, it was discovered that none of the reasons for user dissatisfaction had anything to do with the system itself or with the technology being used. The dissatisfaction really stemmed from the lack of training and awareness-building to acquaint users with the benefits of the new system."*

The central source of soft-factors in the development and implementation of PIS in collaborative planning processes is the human component. It could be described as a three dimensional complex. The first dimension emerges from the perception of problem or the planning subject. The second dimension emerges from the perception of the needed system or the proposed system. The third dimension results from the relation among the participating actors as individuals as well as organizations. Hence in this paper we classify soft-factors into three main groups: problem-oriented, system-oriented, and human factors.

The first group of soft-factors implies the planners' view to the problem. This view is influenced by the planning culture in the organization or this of individual planners. This planning theoretical background or the planning culture influences the problem

* A waterfall methodology structures a project into distinct phases with defined deliverables from each phase. The first phase tries to capture What the system will do (its requirements), the second determines How it will be designed, in the middle is the actual programming, the fourth phase is the full system Testing, and the final phase is focused on Implementation tasks such as go-live, training, and documentation. The phases are always named something different, depending on which company is trying to differentiate its own particular flavor, but the basic idea is identical (Marks 2002)

perception, the approach how the problem should be solved and what is the suitable process to deal with the problem. These aspects are usually overlooked at the beginning of many collaborative planning processes, as it is often considered improper at the beginning of a collaborative planning process to start a discussion about the planning views of the participating actors. But ignoring these differences might cause major problems later on. Consequently, their views to the needed information system are also different, the thing that produces the system-oriented group of soft-factors. The third group, namely the human factors, is merely the result of the difference between how different actors react to the change and to the introduction of new methods. On the organization level and cross-organization levels, different unites should communicate in a new way that has not existed before. Others who have communicated earlier must change the way they communicate. These changes create uncertainties and lead often to resistance. The proposed information system is usually the target of this resistance, mostly as a reflection for the resistance against change in the current cooperation practice.

In the following chapter the application of PIS in a collaborative spatial planning process will be demonstrated through the case study of the project "Sustainable Regional Settlement Management" (RESIM). This project was conducted 2003-2005 in Stuttgart Region in Germany. After an introduction of to the application of planning information systems to explore the planning problem, the subject of soft-factors will be discussed.

3 THE CASE STUDY OF "SUSTAINABLE REGIONAL SETTLEMENT MANAGEMENT" IN STUTTGART REGION (RESIM)

In Stuttgart Region one of the key challenges for regional planning is to manage intra-regional migration and to avoid uncoordinated land use on the green fields as a result of the demand for low-priced land for settlement development on the municipal level and the inter-municipal competition on attracting inhabitants and work places. To face this challenge, the regional plan of Stuttgart Region applies quantitative management to solve this problem which includes approaches to guarantee an efficient and sustainable land use. However, the demographic trends and the resulting shrinking process, which was delayed by the economical prosperity, will start sooner or later in certain parts of the region. To meet some precautions for mitigating the negative impacts of this foreseeable perspective, the strategy of inner development combined with defining focus areas for settlement and the cooperation between the municipalities in the region can play an important role in this context. The experiences on the municipal level have shown that without a regional strategy the success of their efforts soon reaches its limits.

The decision to follow a certain strategy needs an overview on the status of the relevant area. As such an overview is often missing on the municipal level, getting the overview on the more complex regional level is even more complex. Nevertheless this regional overview is essential to compare urban growth with the inner development possibilities and to concentrate actions and investments in social and technical infrastructure where they are most efficient. Getting such an overview requires bundling many separate pieces of information from many sources, especially from the municipal planners (or the mayor in smaller municipalities).

3.1 Tasks of the project RESIM

Aiming at setting a strategy that promotes sustainable development in Stuttgart Region, the Project RESIM had the following tasks:

a. Getting an overview about inner development potentials:
   Development of an enquiry-method for the regional level.
   Enquire settlement potentials.
   Development of a web-based overview about the potentials.
b. Exploring the tools and instruments that support this strategy
   Exploration of innovative tools and instruments for implementing "inner development".
   Adaptation of these tools according to the specific requirements of Stuttgart Region.
c. Setting a strategy for Stuttgart Region
   Using the overview on inner development potentials and the available tools and instruments a strategy should be develop.
   Identification of focus areas for inner development and areas for pilot studies.

3.2 Application of PIS in RESIM: getting the overview

The backbone of this project is the overview on settlement growth potentials represents. This overview covers both "yet unrealized urban growth" as well as "inner development potentials". To establish this overview, an internet-based PIS was developed. In this system the following basic criteria were essential:

- Different overview-levels: municipality, region and public.
- Different levels of abstraction e.g. the regional overview is limited to basic-information
- Open system: to allow import and export of information with existing GIS, CAD, Office and database software
- Stand-alone system without specific programs.
- Online-input of spatial information

This PIS made the collaborative work of the many participants (179 municipalities) possible. However, for inquiring these potentials a communicative approach was adopted in the form of on-site interviews either with one municipality or with a group of neighboring municipalities. During this phase, interviews with about 80 municipal planners were conducted in several cycles. After a pilot phase (March 2004) with 4 municipalities, the second phase (April 2004) covered 20-25 municipalities. Further parts of the region were completed in a third cycle (till October 2004). During the project approximately 1000 areas with a total of 2000 hectares were identified as inner development potentials and up to 5000 hectares were identified as vacant urban growth potentials that are permitted in the current land use plans (*more information about the project's results in Elgendy, Seidemann & Wilske 2004*). This approach allowed the direct communication of the project idea to the municipal planners or mayors. Meanwhile through the direct

dialogue it was possible to name development potentials in a communicative manner. During these interviews, the system was used on portable machines (laptops) to input the information.

Organizing the process in more than one cycle and in an integrated manner with the development of the PIS has allowed the implementation of the experience and feedback that are gained during the interviews. Further, the structure of the proposed information system allowed the decentralized administration of the information. The responsibility for checking the municipal information and keeping this information up-to-date were the sole task of the municipalities. Officials of each municipality have limited access to administrate the information of their municipality.

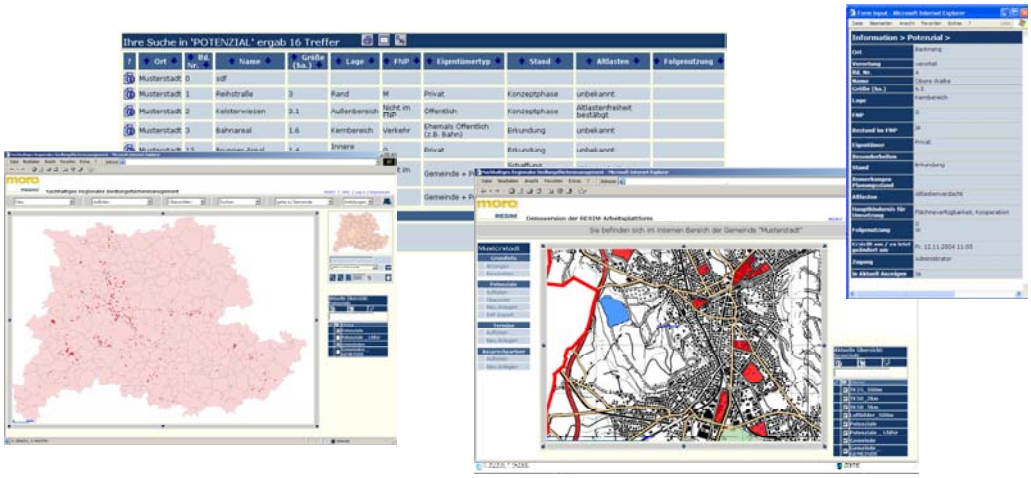


Fig. 2: Screenshots of the information platform of the project RESIM

3.3 Results of the project RESIM

a. Regional strategy: Based on the above-mentioned overview and through the assessment of the situation the main components of the regional strategy for promoting inner development in the region of Stuttgart were identified. The region should follow an active settlement land management policy and implement it in cooperative manner. Meanwhile, the regional association should differentiate among the different situations in the sub regions.

Active: this aspect implies that the regional planning association as the responsible authority for regional planning should consider inner development as a main component of the regional land management strategy. Further it implies that conflicts and problems that are connected to the implementation of this strategy should be actively clarified with the municipality.

Cooperative: The regional planning association can facilitate experience exchange among the municipalities. In addition, specific problems of inner development could only be clarified and solved in cooperation among several municipalities. These two aspects represent the cooperative dimension of this strategy. This cooperation takes place between the regional planning association and the municipalities on one hand, and among different groups of municipalities on the other hand.

Differentiated: The situation in the region is not homogeneous. Different circumstances and development perspectives govern the development in different sub-regions. Hence, the regional planning association should identify the focus tasks in each of these sub-regions to reach success in implementing the strategy.

b. Action program: The implementation of this strategy is based on an action program of three main issues:

Establishing a regional competence centre on sustainable land management as a platform for experience and knowledge exchange among the municipalities and the regional association.

A program for promoting inter-municipal cooperation in settlement management and inner development.

A funding program for inner development conception both on the municipal and inter-municipal level.

In addition to these three components the following formal instruments should be applied: land budgets; balance of land consumption during the planning processes and monitoring of the land consumption.

c. Transferable results: While the recommendations for the action program is justified for the specific situation in the sub-regions of Stuttgart, the experience in establishing a regional overview on settlement development potentials in inner parts and outskirts of cities could be implemented in other regions. The applied methodology and the process organization allow other regions to achieve such a regional overview with limited resources. Further, the tight connection between exploring the problem, establishing the PIS and producing the overview in cooperation with the municipalities on one hand and developing the strategy on the other hand represents an important experience. Regional settlement land management represents a mean to face the challenge of the increasing competence among the municipalities on limited resources in a closely networked space. Through this project it was possible to achieve, the technical, organizational and methodological requirements for emerging from municipal settlement land management to a regional settlement land management. In the following section main emphasis is given to the role and impacts of soft-factors in the project.

4 SOFT-FACTORS: TYPES AND IMPACTS

Each of the above-mentioned three groups of soft-factors - i.e. problem-orientated, system-orientated and human factors - was apparent in the project RESIM. In each of these groups several factors, which have played an important role in all dimensions of this

project, could be identified. Discussing and handling these factors played a major role in the success of such a process. Some of these factors that were observed in this process will be discussed in this section.

4.1 Problem-oriented factors

The first dimension of soft-factors implies how different actors view the subject of the project. This dimension emerges from the different planning approaches or the planning cultures of different organizations and actors. It influences perception of the problem; design of the planning process and the way how to find a solution.

In general, three types of tasks should be distinguished: Routine tasks, project tasks and focus or focal point tasks. Each of these tasks has specific features and requires specific organization of the process and responsibilities as illustrated in the following comparison. In each type of tasks, the application of information systems should be corresponding to the problem's type and to the organization of the process. Especially in focus tasks that are needed to deal with ill-structured planning spatial problems, the applied system should also support connecting the participating actors, facilitating information processing and communication according the process organization. These dimensions must be clearly discussed and clarified at the beginning and during the process to get a common consensus among the participating actors. Meanwhile the system should be flexible to adopt the developments and changes that might occur during the process. From a different point of view, this flexibility is a demonstration of openness for all participating actors.

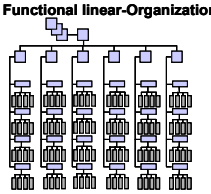
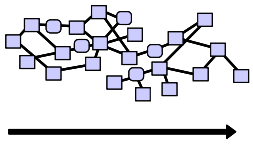
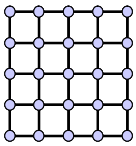
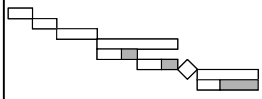
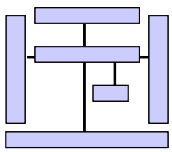
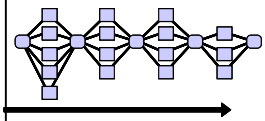
Type of Tasks	Features	Organizational structure	Process organization
Routine task i.e. issuing building permit	•The problem is known •The process is known •Results / solution are known •Continuous routines •Predefined subjects •Predefined actors	**Functional linear-Organization**  **permanent**	**Routines** 
Project Task i.e. realizing a development project	•The problem is known •The process, for the most part, is known (phases) •Target / solution are known •The process includes some routines •Subjects, for the most part, are known •Actors, for the most part, are known	**Matrix-Organization**  **Exists till a project ends**	**Phases** 
Focus tasks i.e. clarification and solving tasks related to inner development of existing settlements	•The problem is not defined •The process is undetermined •Target / solution are undefined • Few routines • Subjects, for the most part, are unknown • Many undetermined actors	**Ad-Hoc-Organization**  **Temporally limited**	**Rhythm** 

Table 3: Typology of tasks (Modified and translated after Scholl 1995)

In the Project RESIM, these different perceptions of how the planning process should be organized were evident. Two main planning approaches could be distinguished among the participating actors. The first one is the linear proceeding following the rational schema: data collection, analysis, and synthesis of solutions and development of concepts. In several situations, the presumption was expressed the project RESIM will follow this planning approach. Different actors have indicated that following this approach has only resulted in unsatisfactory results. The second approach is an iterative one that follows different cycles. Promptly at the beginning of the process an overview is established. Then based on this overview, the main issues are defined that should be the focus of the process and where the main effort should be devoted. Only then major solution directions can be developed. Consequently, in the next cycle the aim is to prove which solution is plausible. Therefore, specific information that is missing could be purposefully obtained and open questions could be explored.

In many interviews during the project, the discussions were not only limited to investigating information about inner development potentials, but they also covered these different planning approaches. It was important to make clearly and to demonstrate that the PIS is not only used for collecting information but mainly as a supporting instrument for the iterative planning process. This was clearly demonstrated for example by the openness to integrate new objects promptly when several actors showed their importance for the project. E.g. several municipalities indicated that they find it reasonable to include beside the inner development potentials also areas where major urban restructuring is needed or increasing the built up density on the building level is possible as a new category or as a new class of objects in the PIS. This new class of objects was integrated directly. Although it became aware in the further interviews that in these situations additional actions from the regional planning are not necessary in this way it was possible to respond to the different as well as to the evolving problem perceptions during the process.

4.2 System-oriented factors

The above-mentioned planning theoretical aspects, which result from cooperation among actors from different disciplines and from different administrative unites either in the same organization or among different organizations taking part in a process beyond existing organizational borders, affect how these actors observe the problem, define how the process should be organized and how a solution could be found. Furthermore, these differences influence directly the discussion about the needed system. Three points are identified in this context and discussed hereafter: goal of the system, content of the system and access rights to the information.

Goal of the system: In many cases of PIS development, although the general goal might be clear at beginning of the process., the participating actors show limited interest in an in-depth discussion of the system objectives – e.g. what the system is and what is it not - This is a usual practice under pressure of the need for quick results and the ambiguity of the problem. However, as different actors have different viewpoints to the objectives of the system, these differences might appear during the system implementation, when each actor tries to carry out his viewpoint in the form of different - some time contradicting - requirements. In the contrary, an attempt to define in details all the functions and objectives of the system is not a proper mean for this type of problems. The system development should be closely connected to the problem clarification process. Therefore, an open discussion about the general goal and main objective of the system should be conducted at the beginning of the process. These aspects should be also clarified for any new participant who joins the process in a later phase. Further, a systematic periodical discussion should also take place to check if the defined system' objectives are leading to improve the problem solving process or does the system needs additional work.

It is important to mention here that if the users' knowledge of computer and software is good, then their capability of communicating their requirements and comments better. They can also estimate the effort that is needed to realize a specific proposal or requirement. Hence it is important for the process to have participants who have both technical as well as planning experience.

Content of the system: In the classical planning approach, it is normal at the start of an information system development process to implement a comprehensive information modeling process among the participating actors to cover all information that might be needed for the problem solving. This coordination normally takes place on the executive level. Then an information expert or a company starts the development in the so called "water fall" approach. In the modern information systems development approach an early integration of the end-use is considered as a solution to avoid this situation.

A special characteristic of planning processes is the necessity of dealing with a large number of subjects simultaneously. Consequently for producing the overview many objects should be included. However, another characteristic of planning processes is that through the process it is usually found out that only a small number of these objects are significant for the problem solving. During the development process of PIS main emphasis should be given to these objects and if needed more detailed attributes. Hence, information in PIS should be organized hierarchal, so that at the beginning of the process only abstract or core information are collected and when needed more detailed information could be added for those objects that are proved to be important for clarifying the situation. By starting with a very limited effort, planners could be motivated to cooperate. A further possibility to minimize the start effort could be reached be using the same approach with the functions, by starting with a core set of essential functions. In contrast to GIS, these systems should be mainly tailored for the specific task.

In collaborative planning processes where actors from different disciplines, different planning levels and different planning cultures are participating in a process dealing with an ill-structure problem, different and imperfect information requirements represents the normal case. If the traditional approach of a comprehensive information modeling is used, the amount of information will remarkable increase and the attribute list to cover all possible requirements during the system application will be very detailed. In later phases it is usually realized that there are very limited attributes that are needed for all records (the overview) and only in few cases there will be a need for further information (focal points). Consequently a lot of information is not added or at least not actualized.

Further more, the problem understanding evolves during the problem solving process. Hence, new information objects might be needed or new attributes might be essential for existing classes of objects. This fact should be discussed and agreed upon early in the development process, so that the main concentration is given to define the core information that are expected to improve clarifying the problem or contribute to solve it. Therefore, the system should be designed in a way that allows adding new classes of objects or new attributes for existing classes without major changes in the system. Keeping the actuality of information in PIS requires a high level of responsibility consciousness and a large engagement from the participating actors. The motivation for updating the information can be promoted by facilitating some direct benefit for the own work of each actor. Hence, in the development process most of the participating actors should have the possibility to be involved in the process. The development process should not be a work for only programmers and IT experts. In addition specific areas and functions could be added in the PIS to support the specific interests of some actors beside the functions that are needed for the common main goal. In the project RESIM was the detailed level of information of the potentials not of interest for the regional level, however it was useful for the municipalities.

Access rights: In collaborative planning information systems, the problem of sharing and exchanging information usually represents an obstacle against efficient cooperation. The reason for this problem is often the lack of interest or the unwillingness, to hand over control over the information and its usage. It is evident that in many organizations that the control of information is frequently observed as a source of power. This problem is not new and is not only limited to the application of PIS - e.g. works like "The bureaucratic phenomenon." (Crozier 1964). As PIS is mainly aimed at improving the exchange and communication in complex planning situations, hence, the development and implementation of a system should include beside the technical aspects also a course of action that promote the willingness to exchange the needed information among the participating actors. The following three aspects are considered significant in this context. Firstly, the proposed PIS should concentrate on basic and core information that is needed to deal with the planning problem. Secondly, before exchanging information, there should be a possibility for discussing how information will be used an agreement about which actors are allowed to see which pieces of information.

In the case of RESIM, it was agreed among the participating actors that the regional planning association can only get access to a specific part of information about the municipal potentials. In addition, planners from the regional planning association have no

access-right to add or to edit inner development potentials of any municipality. The responsibility here is completely exclusive for the municipality. Also each municipality can define whether specific potentials should be only kept for internal use. Meanwhile it can define if other municipalities could access its specific information. In other words, each municipality can define if its potentials or specific attributes should only be kept for internal use, which gives the municipality the chance to administrate and to have full control over its information, while giving the regional planning association the possibility to get the regional overview.

In general, the following aspects should be considered in developing and implementing PIS to reduce the impacts of soft-factors:

Barriers against using the PIS should be minimized as far as possible to avoid discouraging interested actors just because of the system. On the other hand those who are not interested should not find an easy argument to refuse the cooperation.
A contact group or person should be support users who face problems or enquiries about technical or planning issues.
Training for interested users should be offered accompanying the planning and system development processes. These training possibilities could be also used for clarifying content questions as well as technical questions.

4.3 Human factors

The third group of soft-factors results from the human interaction within the process and with the system on one hand and among individuals and organization on the other hand. This group of factors can be demonstrated by the following aspects:

Resistance to change and self protection: Facing new innovations such as the introduction of new information systems many planners show skepticism even if these information systems are supposed to improve communication and exchange of information among participating actors in a planning process. Loeb (1989) argues that this is not the fear that machines will replace people that grew in the 40s and 50s in response to the introduction of mainframe computers. Nor is it the fear that we personally will have to learn something new. The fear lies much deeper: new technologies offer options to change the very nature of how we do our jobs and we don't have the slightest idea what these new ways of doing work are all about. In this case, some concerned actors may regard PIS as a way to break up conventional structures and practices to introduce new ones that aim at improving cooperation and collaborative work. It is also observed that if some actors have stipulations against the cooperation or about the sense of the planning – expressed in sentences like „It will not work anyway"; "I don't have any information!", "this will not solve the problem!" or in the case of RESIM "in our municipality, there are no potentials over 5000 sq.m!"- can lead to rejection and refusal of the proposed PIS, although they might have actually nothing to do with the system itself. In this situation, it should be examined if the refusal or the rejection is a result of shortcomings in the PIS, then these shortcomings as expressed in users' comments and suggestions should be considered. But if the refusal or the rejection is a result of the lack of interest for cooperation or exchanging of information, then counter-arguments should be discussed in the framework of the planning process. Though it is essential to avoid any weakness in the PIS that can be used as an argument for rejection, such a situation could only be handled if the development process of PIS and the planning process are paired together in a way that allows discussing such aspects in an appropriate environment.
Achieving foundations for cooperation (common language and commitment): It is evident from experiences in different planning processes that achieving a common language and confidence among the participating actors is essential. Consequently, process-components that grant occasions for building common understanding and common confidence should be integrated in planning processes, especially in planning processes that deal with complex planning situations. Such process components should be also integrated in the development process of PIS. Furthermore, a third level is important, namely those process-components that allow connecting the spatial planning process and the PIS development process should be also integrated.

In this process, conflicts among participating actors should not be ignored, the thing that may cause fear that information could be used from higher planning levels or competitors. In such a process as in RESIM, the lack of willingness to disclose and circulate information results from the lack of confidence that the regional planning authority will not use this information as an argument against municipal plans e.g. getting approval for urban growth on green fields. An important argument to explain why conflicts should be externalized during the process is that existing conflicts will arise anyway, but if they are discussed on the basis of objective information, the chance for the conflict solution is much larger. In addition, it should be clearly discussed about how to deal with sensitive information. This was the reason that in every interview during the project a contact person from the regional planning accompanied the interview team. Hence, in the project RESIM, on-site interviews were used for clarification of stipulations and critique points on one hand and on other hand discussing enhancement proposals that concern both the planning process and the development process of PIS. These interviews have represented the above mentioned third level. These interviews took place in small groups usually 4 to 5 persons - and maximum of 10-15 persons, the size that allowed an open atmosphere for discussion and free alternation among the different discussion levels. The success of this type of discussions has a basic pre-condition, namely that in these interviews specialists are participating who are capable in the development of PIS as well as in the planning process in addition to representative from the regional planning association. Further, the specific planning information was used as occasions to deal with both of basic and specific issuses, methodological and organizational as well as theoretical and practical issues.

Dealing as counterparts: Information that is collected by a central office is usually neither complete nor totally up-to-date. In spatial planning this phenomenon is more evident on higher planning levels where knowledge about local conditions is missing. In this case significant information can not be found out by the plain observation. If in spite of this fact, information is added centrally - e.g. the regional planning authority add information for all municipalities- this might force the concerned municipal planners to start searching for errors, inconsistencies or obsolete information to give evidence in advance for any conflict that might arise later. In addition, any decisions that are based on this information are put in question. To avoid this conflict, centralization of responsibilities should be avoided. Rather full responsibility over information should be given to the corresponding actors each in his spatial or functional field as described above. Herewith, the central authority has a limited control on the comprehensiveness and the actuality of the information. The intensity how often the information is actualized depends mainly on the individual actors. The probable unbalance in the information could not be avoided under these circumstances. However the above-mentioned disadvantages of a central control will influence the results negatively more than a guided decentralized responsibility. Decisions that are based on this information are considered robust as the major critique points are dismissed through decentralization. But as the participants are responsible for the content of the information system, each in his filed, a higher level of commitment among them could be reached.

Herewith, a large step is done in increasing commitment for the results of the process that are based on this information system. This self commitment gets higher importance if the process implies a high level of cooperation beyond formal and administrative responsibility fields and other informal process and instruments are used.

Another possibility to avoid this conflict is starting the dialog with the participants without performing pre-judgment from the higher planning level on municipal aspects. In the project RESIM, although an analysis of aerial photos was conducted in an early phase in the project, it was not used as a start point for the on-site interviews. Using unverified information with a high risk of error as a base for discussion might create an obstacle against cooperation. The used approach was to use plain municipal maps and in the course of the discussion to find out together where are the potentials. Instead of loosing a lot of effort in discussion about the errors in the aerial photos analysis it was made accessible for the municipal planners after the interviews to check it for consistency.

Dealing with uncertain information: In complex planning situations important information are often not available or only available as unconfirmed information such as speculations and rumors– e.g. "*when will project X that has financial problems start?", "if company Y that owns several hectares of land in city C will change its production location?"* or general statements like *"We discussed this area for a long time. We did also a development study for the area but the owner does not accept any action by the municipality", "Do you think it is a potential even if there is no realistic chance for a development now?"* or "*This area is a potential but the company is still working and any discussion about the problems they have might cause problems!"*
It is evident that stipulations are larger to input unverified or imprecise information into an information system, even if this information is significant for clarifying the planning situation. Adding such information causes unease and can only be decided upon difficultly. As there is no general rule for dealing with type of information, it should be evaluated on case-to-case basis. Even if no general rules can be defined, two measures can help in overcoming this situation:

The process for getting the overview should take the form of a dialogue. In this dialogue decisions about an individual case of uncertain information can be made. Decisions in such a case can be supported if external experts are participating in this process. (E.g. should a specific area be considered as an inner development potential? In many situations this is a case-to-case decision). This approach emphasizes that establishing the overview should consider the specific characteristics of each case.

The decision and interpretation responsibilities are exclusively reserved for those who deliver the information, e.g. each municipality has the absolute autonomy to decide which potentials and which information could be included in the system.

5 CONCLUSIONS

1. With the case study of the project RESIM we demonstrated some important soft-factors that influenced the development and implementation of PIS and how to deal with them. An essential element is the pairing between the development process of PIS and the planning process. Through such a pairing between both processes, it is possible to create diverse occasions to clarify any subject or conflict that might arise in an appropriate context. It is not possible to plan or to predict which subject or question might arise in which occasion. It also important to make pairing between both aspects on the personnel level so that a contact group or at least a contact person is always available to improve the possibility to response to any question and to promote willingness to cooperate. This can be only achieved in direct contact and dialogue. This dialogue should not only be limited to general and superficial subjects. It should also give opportunity for dealing with conflicts. Only if these conflicts are discussed on a faire basis, a proper atmosphere is reached in which a PIS could be successful. If the development process of PIS is designed as mentioned here, the system can reach further impacts beyond the primary functions to evolve into a catalyst for improving the cooperation among the participating actors.

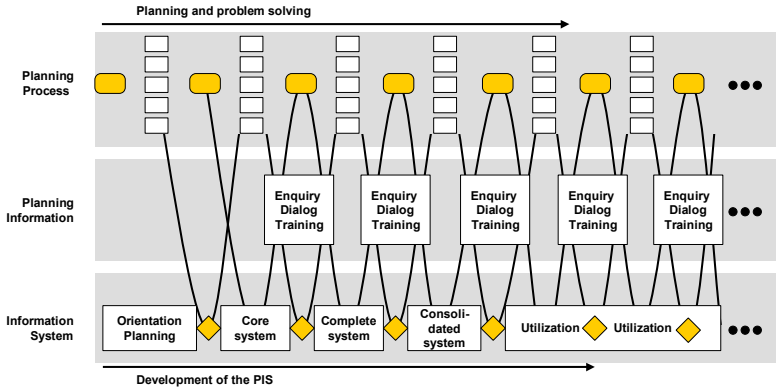


Fig. 3: Pairing between the planning process and the system development process

2. In the development process of PIS a very high level of flexibility must be considered to adapt modifications in user interface, functions, information definitions and rules scheme. Although modifications might cause methodical disadvantages (e.g. inconsistencies) it opens enormous chance for PIS implementation in a way that does not hinder the planning process but supports it not only in the primary tasks of PIS – e.g. establishing the overview, exchanging of information and supporting communication – but also regarding the development a common problem perception, confidence, commitment etc. If these criteria are considered in the development of PIS it opens large possibilities for dealing with soft factors. This does not only increase the quality of the PIS but it also enhances the chances for a successful implementation of PIS in the planning process.

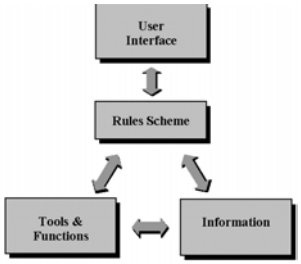


Fig. 4: General structure of a PIS

3. Different technical, operative and communicative measures can be considered in the

development process of the PIS as well as in the design of the planning process not only to minimize the negative impacts of soft-factors can be minimized but also to maximize their positive impacts. The following table concludes these measures.

Soft Factor		Planning process	Development process of PIS
Problem-oriented	Planning theoretical / planning culture	- Systematic assessment of the situation to control the goals and to find common consents about further proceeding - Opportunities for discussing the planning approach or the planning culture	- Contact group for questions about the process and the planning approach in the in the team - Openness for including further components in the process and the system.
System-oriented	Goal of the system	- Systematic assessment of the situation to control the goals and to find common consents about further proceeding	- Creating occasions for using the system so as to get feedback from most of the participating actors
	Content of the system	- Systematic assessment of the situation - Working in several levels of details to control the constancy"	- New object classes should be easily added. - Flexible definitions of the attributes to adapt to new requirements. - Integrate self interest for all actors (Win-Win)
	Access rights	- Clarification of the organizational structure - Openness to include new participants during the process:	- Flexible rules scheme for the access rights (subjects, spatial, functional)
Human factors	Resistance to change and self protection	- Open Process - External participants - Create occasions - Training	- Minimizing effort (start and maintenance) - Add comments and critique about the PIS - Transferring conflicts to the planning process if they are not resulting from the PIS - Simplicity (main functions and core information) - Customized solutions
	Achieving foundations for cooperation (common language, commitment and control)	- Open Process - Iterative proceeding - On-site contact - Differentiated roles - Discussing open questions and conflicts - Concerns of participating actors	- Combining technical and content questions in start meetings and in on-site interviews - Rules scheme for the responsibilities - Decentralize responsibilities for the information - Avoiding pre-judgment for higher planning levels - Decision autonomy is exclusive for the actor who delivers the information.
	Dealing with uncertain information	- Working in several cycles with increasing level of precession	- Unconfirmed but relevant information could be included. - Dialog with external experts - Limited number of attributes

Table 4: Conclusion of soft factors in PIS

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