The Urban Decision Room

Application and Evaluation of an Urban Management Instrument

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Abstract: The Urban Decision Room (UDR) should be placed in the tradition of urban design and planning discipline that is taught, and into which research is carried out, at the Faculty of Architecture at the Delft University of Technology. The UDR was developed at the faculty as one of the new design and planning methods with its own specific features. The UDR is specifically aimed at decision-making processes in the practice of urban planning, and particularly at complex urban area development projects.

The background to the design enables the UDR to support planning decisions that are made at urban planning element level. The participants in the interactive UDR sessions are asked to provide concrete solutions for urban planning design problems (in terms of preferences for particular functions, number of plots, etc.) and to enter them in a simulation model. A computer network is then used to calculate the common solution space of all the proposals, which is then projected onto a central screen. This outcome generally provides the basis for further discussions and negotiations, after which another round as described above can be held.

The paper first focuses on the background and the main features of the UDR system. Secondly, the decision-making issue and a description of a specific Urban Decision Room model, the UDR Heijsehaven will be explained. Thirdly the structure of, and the experiences from, the experimental sessions with the Urban Decision Room Heijsehaven are described. After that the results of the evaluation of the UDR system by participants is presented and finally the follow-up assignment for the UDR system is carried out.

1. THE URBAN DECISION ROOM SYSTEM

1.1. Background and the management point of view in the UDR system

During the past decade, parties involved with urban development projects, especially town planners, architects, urban decision makers, and investors have been faced with changes in the way building designs and urban land-use plans are made and decisions relating to them are reached. Changes which various authors in the field of the decision-making process in urban area development relate to more structural societal changes, which are connected to an increasing complexity of societal decision-making and an enlargement of the social and economic dynamics in our highly-developed society (including Van Loon, 1998; Teisman, 1998; Wigmans, 1998; De Bruijn c.s., 1999; Bekkering c.s., 2001; Rotmans, 2003). Changes, which then result in a decrease in manageability in society. Decreasing manageability which in urban area development processes has led to a change in the role and strategic conduct of the actors and parties involved. They are now more oriented towards opportunities than managing the process, and more to combinations of sub-solutions than controlling the system.

In other words the traditional, often hierarchical planning and decision-making methodology in urban developments has shifted to pluricentric decision arenas with multi-actor interaction planning, in which the mutual interdependency between the actors and the participating organisations, the uncertainty of the final outcome and ever-changing partnerships, has resulted in a change in the steering role of the government. This role used to be central in a hierarchical planning system, but is now being 'shared' with the other participating parties.

This changing planning and decision-making practice requires the incorporation of surrounding societal dynamic in the planning process; it is not only the content, but also the way decisions relating to it are reached, that from now on form a part of planning practice. This incorporation of the surrounding societal dynamic means that participants are made aware of so-called 'not content driven' aspects, such as the positions they adopt towards each other, or the way in which progress is monitored or decisions are taken. All these interactive and process-oriented aspects of the planning and decision-making process form new areas of management and organisation as described in theory and concept formation (Wigmans, 2004). Rather than being theory and concept-based, the UDR system is a methodological-technological and instrumental response to the above societal changes in urban planning practice.

1.2. An operational systems approach to managing urban decision making

The UDR system came about as a specific response to the decreasing manageability of the actual decision making in everyday practice of urban planning and design. It is a methodological response in the sense that it models, in an operational decision system, the manageability of urban decision-making practice. The objective in going for an operational systems approach is to contribute to making urban design and planning practice more manageable, especially in situations in which different actors from a number of different organisations participate in the urban decision-making process.

It can be said that such situations are of an interorganisational and interactive nature: designing, planning and decision-making are carried out in teams composed of different actors representing different organisations. The mutual dependency that goes along with this in planning and design practice requires a scientific approach aimed at cohesion and interlinking disciplines. Apart from the operational modelling part, the systems approach holds up well against these aspects, as it is a way of thinking in which cohesion in its many guises plays a key role (De Leeuw, 2002, p. 96).

The systems approach also allows reality to be seen in very many ways, described, and then modelled. Management is summarised in the systems approach as any type of controlled influence. And the term managing is not restricted to cases where control lies in the hands of certain people within an organisation. In the systems approach managing and the management process could easily be of a more distributed nature, or an implicit activity in an organisation. This is sometimes referred to as intrinsic management (De Leeuw, 2002, p. 14, 151).

This form of distributed and implicit managing is modelled in the structure of the UDR system: after all, it is based on multi-actor input in a non-hierarchical design and planning process in order to make choices about the goals to be reached. Persuading, negotiating and all kinds of fine-tuning are part of that process. This last statement brings us to a description of what the UDR system, especially in physical terms, actually is. After this, attention will be paid to the underlying system features of the UDR system.

1.3 Structure of the UDR system

The computational structure of a UDR consists of a network of a number of computers (eight in the case of UDR Heijsehaven), each connected to the others, as well as to a central computer. The digital model is on the central computer. A joint solution (digital urban plan) is built up in stages. In a UDR, simulation meetings are started by every party entering its own proposal. This is a first step in the process of finding a joint solution on how

to develop a particular area. The actors provide sub-solutions based on their own perspective to the problems relating to the plan, as well as proposals for combinations of these sub-solutions, all as part of the route towards a joint plan. A repeated series of interactive planning proposals and decisions finally makes it possible to reach a group solution. By consistently repeating these steps in sequential simulations, a structured decision-making process will be created. The UDR, then, can be regarded as an interactive planning arena as is shown in *Figure 1*.

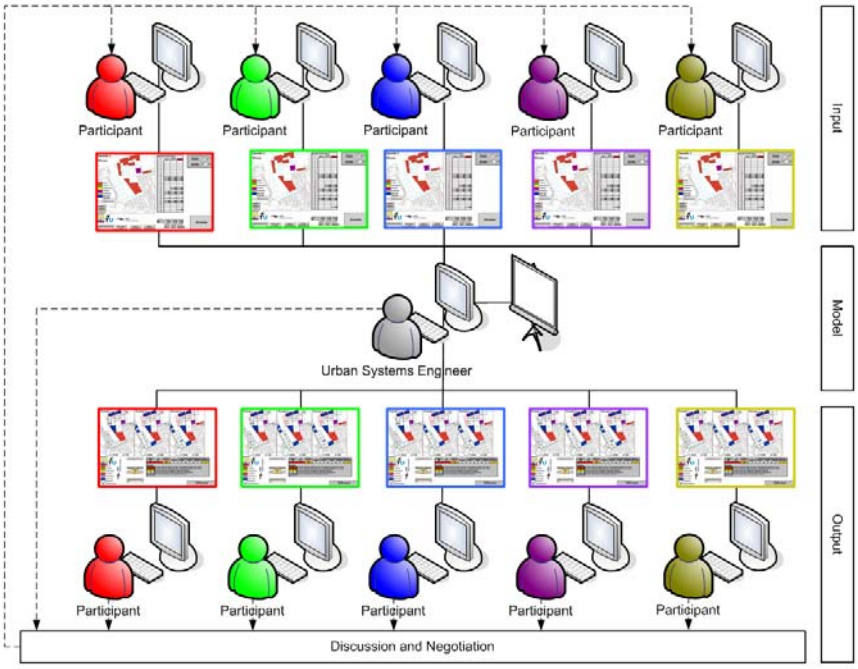

Figure 1. Diagrammatical representation of the UDR system

During the process, the intermediate stages, options, and infeasibilities are projected in a visible way (using the central computer) on to screens readable to everyone. This enables the participants to see the information that they need to enter into interactive discussions with the other parties, and to negotiate in order to come to a solution. The input of different parties from a variety of disciplines and with a variety of interests leads to optimal solutions, through an iterative working process. This makes the UDR an operational instrument for making the great diversity of ideas and interests and power relationships of the many parties involved technologically visible, in terms of the substance of the urban planning question as well as in terms of the urban decision making process.

1.4 Basic features of the Urban Decision Room System

The UDR system is based on the so-called interorganisational system concept. This concept has resulted from a multi-actor systems approach to the fields of urban design, planning and decision making (Van Loon, 1998). The concept is compatible with current urban development practice, which involves the preparations and process management being carried out by a group of organisations (both government bodies and private sector parties) specifically brought together for each project. As these organisations are not ranked in any kind of hierarchy, they have to work together on an interorganisational basis. The concept also offers the possibility of integrating the 'hard' systems approach with the 'soft' systems approach. This integration proved necessary in order to be able to model in a decision making context the many ill-structured problems that occur in urban development in practice (Van Loon, 1998).

On the basis of this concept there are several basic features used for the UDR system (see Loon, Heurkens, Bronkhorst 2008). Two of the system features are used in the Urban Decision Room Heijsehaven, and are therefore explained in more detail here.

1.4.1 System feature 1: The end-means system feature for representation of the relations in an interactive decision-making multi actor network.

Using an end-means system, a direct link is made in the UDR system between the visions and goals of the actors involved in relation to the substantial urban planning variables, the resources that are available for them, and the exchange of visions on the solution and the associated negotiation process. The latter is possible thanks to the interactive computer system, but also because of the model language used (mathematical linear optimisation) for the construction of the system. This technological system linking of content and process-related aspects is one of the most important features of the UDR system and offers the opportunity of working interactively with the substantial urban planning relationships in area development projects.

The interactive multi-actor network that has been included in the UDR system through these goal-means relationships, represents all participating actors. It is assumed that every actor will be seeking to reach his or her own goal, and that they will also be helping to arrive at joint goals. The actors are individual goal oriented and behave normatively (goal=norm). However, within this multi-actor network, the actors interact, propose individually based as well as group-based alternative sub-solutions and plans, and reach

decisions either collaboratively, or in competition with each other. As a group they are goal searching. In *Figure 2* a model of a two-actor goal-means negotiation process is shown to clarify the mentioned above.

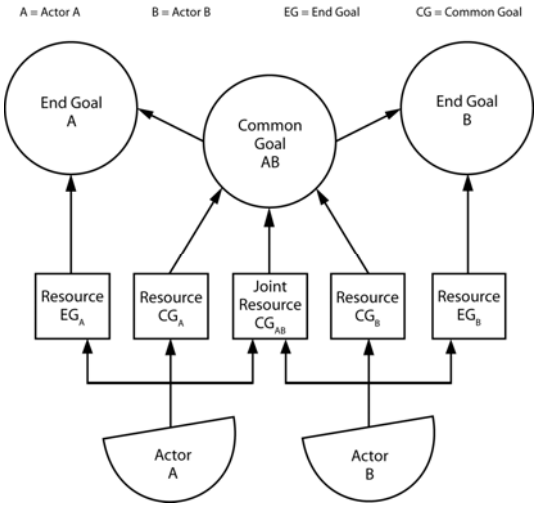

Figure 2. Model of a two-actor goal-means negotiation process

1.4.2 System feature 2: The group optimisation system feature for modelling the common dynamic solution space

Above, it is shown that the UDR system assumes a multi-actor network. Logically speaking this is a reflection of urban planning practice, as this is always the result of a group of collaborating actors (Van Loon, 1998, Teisman, 2001). To prevent actors working only towards their own individual solutions, and the subsequent bottleneck that arises when their proposals are combined, the UDR system includes the possibility of first defining and modelling a common solution space. A search can then be made for combinations of sub-solutions.

The modelling of the common solution space is intended to give the actors insight into the feasibility of their own plans, given the boundaries of this space. The plans should in any case fall within these boundaries. The actors can then, as part of the planning and negotiating process, look for the most optimal combinations of all their sub-solutions. This takes place in successive rounds of making plan proposals (interactive computer input) and 'calculating' (computer output) the most optimal combination from each round. This enables the actors to arrive jointly at a feasible group optimum that is acceptable to all the participating actors.

In this process of holding rounds, the actors have the opportunity to propose both sub-solutions and changes to the original constraints of the

common solution space, and to put forward new constraints and have them included in the (modified) common solution space. This final aspect merits attention because it creates a degree of flexibility in the negotiating positions. The group optimisation process then takes place in a common dynamic solution space *(Figure 3).*

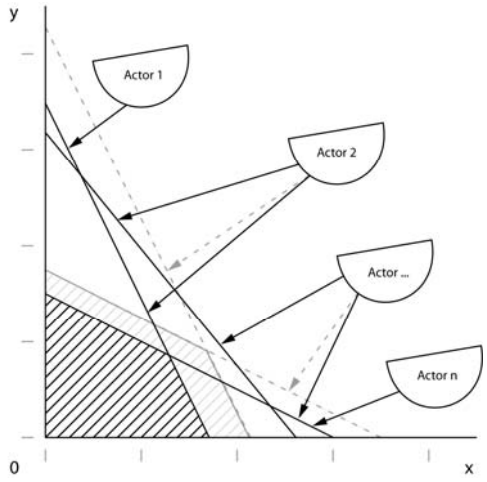

Figure 3. The dynamic solution space

2. THE URBAN DECISION ROOM HEIJSEHAVEN

2.1 Structuring the Heijsehaven urban decision-making issue

The Heijsehaven is a port area at the head of the Heijplaat, which is the southern part of the so-called City Port area of Rotterdam. A wide variety of initiatives and ideas (46 project proposals) have been developed for the Heijsehaven area by numerous private parties, as a means of transforming the Heijsehaven in the near future from an area dominated by industrial port functions to one with a mix of urban amenities. This shows that with regard to any future transformation of the Heijsehaven, various conflicting but also mutually advantageous interests and goals of the different actors will arise.

We have interpreted the above urban decision-making situation, a situation with so many different visions, interests and goals, as well as several parties each trying to attain their own objectives for the same location, as a multi-actor decision-making process issue. It can be methodically redefined as follows: which combination of which projects is feasible and optimal for the group of actors involved, and is this optimal

combination compatible with the urban planning policy of the City Port Rotterdam and the strategic land use plans of the Port Authority?

The Heijsehaven decision-making issue is represented systematically in the UDR Heijsehaven in terms of:

1. the urban planning content by means of urban planning variables (urban planning functions, area and land plot surfaces, land and building cost elements), their relationships and their possible values (minimum, maximum, index numbers, etc.) and;
2. the urban planning process by means of actors, or groups of actors, their roles, tasks, possible collaboration partnerships and relationships with the surrounding societal dynamics in urban decision-making processes.

2.2 The system features used in the UDR Heijsehaven

Two of the five system features of the UDR system have been used explicitly in the modelling of the decision-making issue of the UDR Heijsehaven, because this was appropriate in the context of the experiment, and because it is inadvisable to experiment with all five features at the same time.

2.2.1. The end-means relationships in an interactive multi-actor decision making network

According to this feature of the UDR system, each of the 46 projects can be regarded as a means to reach a goal. The project proposal of the hotel boat, for example, is a means of realising activities on the water other than the usual port activities. Goal-means relationships of this kind, between actors' project proposals, are represented in the UDR Heijsehaven in an urban land-use model that is built up of urban sites, surface areas and land costs. The goal-means relationships themselves are laid down in the relationships between the urban land-use variables of this model. The actors can use the model to indicate what project proposals (means) they wish to deploy. They can also see what project proposals every other actor put forward, and they can see what project proposals are requested by which actor and which are absolutely necessary for each actor. This overview of projects and project combinations provides the necessary information about the goals that are being aimed for, and which combinations are feasible, and which not.

The exchange of proposals and negotiations about proposals and combinations of proposals takes place using the interactive multi-actor network structure that is included in the UDR Heijsehaven instrument. It is assumed that every actor is seeking to attain an optimal realisation of their

own projects, and is willing to contribute to the attainment of common urban planning goals. The common goals of the actors involved in the UDR Heijsehaven are in fact focused on the transformation of the Heijsehaven into an area with a range of urban amenities.

2.2.2 The group optimisation within a common dynamic solution space

According to this feature of the UDR system, the group optimisation has to be performed within a dynamic, non-fixed, but explicitly defined common solution space. The boundaries of this common space are also represented in the urban land use model of the UDR Heijsehaven.

This is initially done by establishing the physical limits of the planning area. Naturally, all the projects that are ultimately realised have to fit within the physical limits of the Heijsehaven planning area.

Second, the boundaries of the common solution space become relevant in defining the investment budget for each project. Together, all these budgets make up the total investment capacity: the total amount of money available in relation to the total expected income.

Third, the urban planning vision gives a further specification of limits to the common solution space: the projects being realised must be given a place within the locations, or combinations of locations, that have been assigned a specific urban function.

Finally, there will be limits to the common solution space that result from the financial objectives of the Port Authority of Rotterdam, which will form the basis for whether it considers the cost-benefit balance is acceptable for the allocation of land.

2.3 Decisions for the modelling of the Heijsehaven urban decision-making issue

Several important modelling decisions lie at the basis of the structure of the UDR Heijsehaven. These decisions are based on and related to the urban decision-making issue for the Heijsehaven planning area, as well as to two system concepts described above of the UDR Heijsehaven. The decisions are summarised below in two separate groups:

1. Modelling decisions: about the system elements and boundaries
2. Modelling decisions: about subsystems

2.3.1 Modelling decisions: system elements and system boundaries

The first modelling decision for the construction of the UDR Heijsehaven concerns the choice of the system elements. Because the UDR Heijsehaven was due to be based on an urban land-use and land-cost model, the following elements were selected for the model: the 46 project proposals, a division of the area in plots, the water surface that could be given a specific function, the length of the quaysides, and the area has been divided up into 35 plots (*Figure 4*).

The relevant actors were then designated as system elements: the Port Authority of Rotterdam as the landowner, dS+V as the urban planning agency and all 46 parties who put forward proposals for projects. Again for practical reasons, these 46 parties were put into 6 groups, into 6 groups: housing, tourism, events, education, commerce and water-related commerce. Each function is represented by an actor who makes decisions on behalf of all parties involved with projects categorised within a specific function.

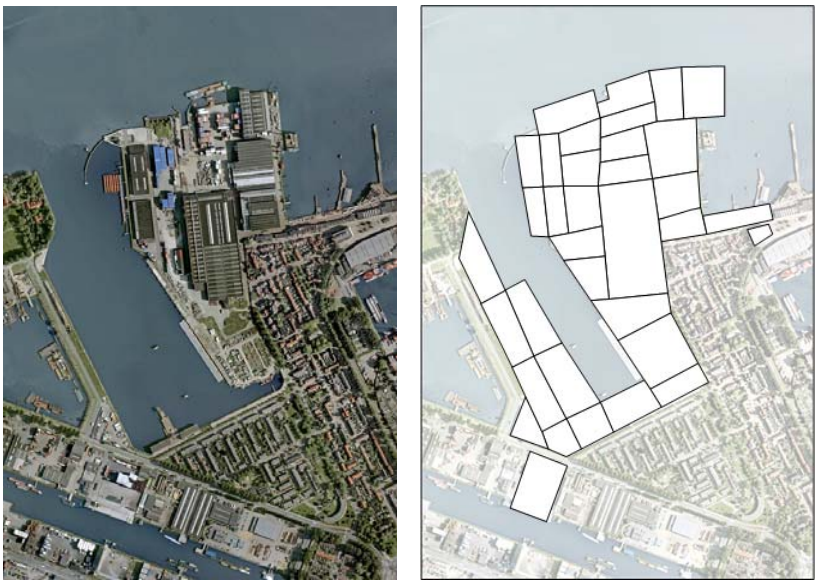

Figure 4. Airial view Heijsehaven and plot partition Heijsehaven

Secondly, the decisions concerning the system boundaries are taken. A boundary decision provides an answer to the question as to where the boundary should be drawn between the system and the environment. In other words, which objects (urban land use elements and decision-making actors) do we count as being part of the system, and which objects (also urban land use elements and decision-making actors) do we count as being part of the environment. Two kinds of boundary decisions are taken here: one regarding the physical boundaries of the area, and one regarding the boundaries (or rather the distinction) between the actors in the system and the actors outside

the system. This latter group of actors is often also designated as the actors who are in the decision environment of the first group of actors.

2.3.2 Modelling decisions: subsystems

Some other modelling decisions concerning the subsystem have been taken for UDR Heijsehaven, which are the logical consequence of the element and system boundary decisions: decisions on subsystems.

At urban planning level, two subsystems have been modelled: first, the land area and water surface sub-system which connects all project proposals and all urban planning zones, and second, the land cost and land yield sub-system that connects all the investment proposals and investment restrictions. Two sub-systems have been modelled concerning decision-making: the actor's sub-system that connects the parties of the projects, and the actor's sub-system that connects the decision-makers concerning the land-use and the financial restrictions.

2.4 Description of the Heijsehaven urban land-use model

The above modelling decisions have led to a multi-actor decision-based urban land-use model (summarised briefly below) for the Heijsehaven urban decision making issue. The description below shows which of the functions, actors and the decision variables (and their values) are included in the UDR Heijsehaven. Features and the formulated objectives for the transformation of the Heijsehaven planning area are given, for each actor (party). In other words, this is where the initial assumptions are articulated in the way they are included in the model with regard to the goals and desired functions of the actor groups.

Below an example of the Input Screen one of the actors (The Port Authority) is shown in *Figure 5*. The Port Authority (P.A.R.) owns a large proportion of the land in the area, and its most important goal is to gain an optimal return within the project. They P.A.R. also protect and represents as best as possible the interests of port-related businesses, and aims to create a successful and profitable area with as much long-term potential as possible.

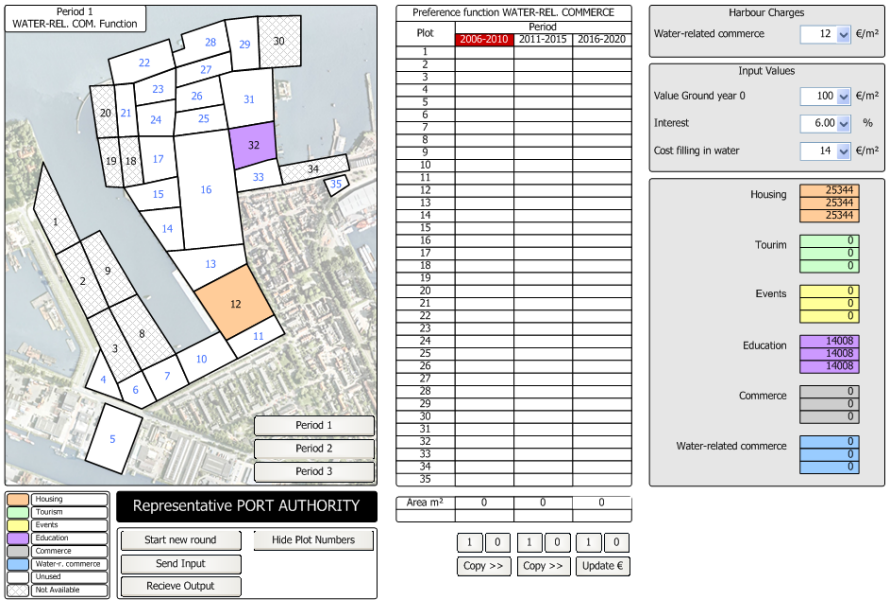

Figure 5. Input screen Landowner Port Authority

3. EXPERIMENTS WITH THE UDR HEIJSEHAVEN

This section covers the series of practical experiments with the Urban Decision Room Heijsehaven. An explanation of the structure of the experiments themselves is given followed by the experiences.

3.1 Structure of the UDR Heijsehaven experimental sessions

Six experimental sessions were held with the UDR Heijsehaven between May and October 2006. In each session, an attempt was made at working towards a solution, the so-called group optimum for the Heijsehaven decision-making issue that best suited the group as a whole for the Heijsehaven design and decision issue. At least three simulation rounds were held on each session, in the form of an interactive workshop. Some of the professionals were the actual decision-makers who were involved in the development of the Heijsehaven-project through their organisation, and some were given the role of decision-makers by the UDR leader during the sessions. It should be noted that the workshops were all held at the point in the planning process where the actors get together for the first time to investigate the realization possibilities for their own projects in relation to the

projects of the other actors. In *Figure 6* the plan of the working schedule for Housing is given, structured in various rounds.

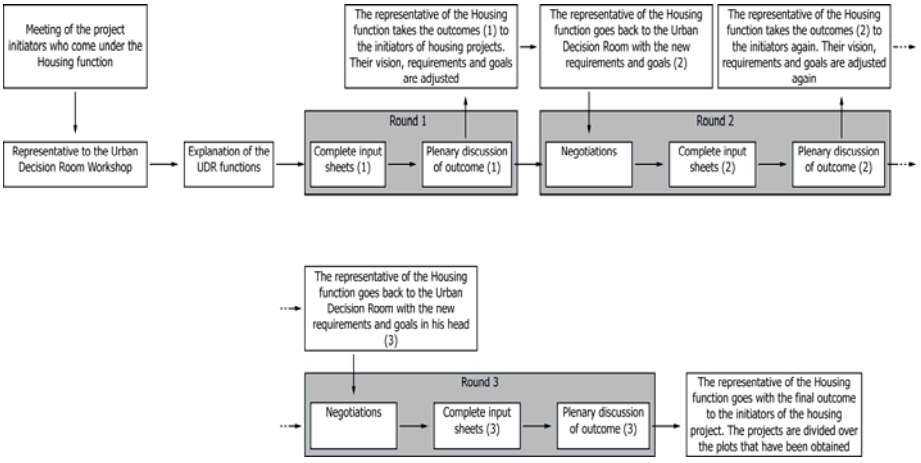

Figure 6. Plan of the working schedule of the Housing function, structured in various rounds

As is seen in the *Figure 6* above three simulation rounds are carried out. Between each simulation round time is scheduled to negotiate the group results achieved in each simulation round. Because there were six experimental sessions held with the Urban Decision Room Heijsehaven, the group results are not discussed here. More interesting are the reactions given by the participants (Chapter 4) and the experiences from these experimental sessions with the UDR Heijsehaven.

3.2 Experiences from the UDR Heijsehaven experimental sessions

The experiences on the basis of the experimental UDR sessions are:

- In terms of power relationships (as featured in the UDR), more attention should be paid to the influencing power that exists in current design practice;
- The participants would appreciate the intermediate stages during the negotiations being documented;
- The UDR leader did not appear able to act in a neutral capacity;
- The Urban Decision Room is suitable for functioning as an interactive inventory of actors' possibilities and preferences;
- The computer language of the UDR system (a combination of numerical and geometrical models) is seemingly not easy for those who are used to communicating in design language (drawings and 3D models).

Figure 7. An experimental session of the Urban Decision Room Heijsehaven

4. EVALUATION BY PARTICIPANTS

The experiences of the participants in the experiments have been evaluated by interviews in which the main evaluation themes were:

1. The objective the UDR as an interactive system for supporting the decision-making process;
2. The future potential of the UDR;
3. The usage of the UDR in a particular phase of an urban development process.

Below we list the most important areas for attention that the interviewees passed on to us, and which could form action points for further development and expansion of the UDR.

1. The structure of the UDR system as an interactive system is an interesting one and is capable of bringing future parties together, but the idea that such a system actually prompts particular decisions is, for the moment at least, taking things a bit far. Its greatest strength should be the combination of the technology of the urban engineer and the social context of decision makers. The UDR system should therefore be placed in a coordinated system of planning process, substance and communication.
2. The instrument was said to have potential, particularly in the exploratory phases of urban development. During these phases, the instrument can help speed up processes because it quickly gives an insight into where possible areas of agreement, or disagreement,

between the parties lie. In order to get the necessary support, the instrument should be continually improved, both in technological and visual and computer program terms, but also as regards the transfer of knowledge about how it works and what its purpose is.

3. The general response to this question was that the instrument in this form is best suited to an exploratory phase – at the start of a project, for gaining insight into which issues the negotiations should cover. The way various pieces of information (confidential and specific) are dealt with, both as part of the system and between the parties, is considered crucial for the role the instrument can play.

5. FOLLOW-UP ASSIGNMENTS

For the moment, the instrument is primarily suitable as a tool for preparing for and gaining insight into the possible opinions and points of view of the parties and their sub-solutions in a specific and complex urban area development project. But it can also be used to glean a view of the power relationships between the individual participating parties as well as between them as a group and the organisations operating in their 'decision-making environment'. In that sense it is a very powerful inventory of actors (with their goals, resources, possibilities, opinions) in which it is possible to put oneself in the shoes of the other parties and simulate what intentions, interests and contributions, expressed in concrete urban planning variables, could lead to a feasible solution space and the best possible combination of sub-solutions within that space.

In general, the UDR instrument is in line with the changed nature of urban planning practice, in the sense that it represents the interactive use of computers and the successive rounds of negotiations in the actual urban decision-making arenas. Nevertheless, greater focus should be placed on the connection between the technological computer system and the social context within which such a system can operate. Designers of technological systems are not always best placed to ensure that the system and the use thereof 'lands' in the arenas for which it is intended. Linking innovative technological knowledge and organisational knowledge is a precondition.

As well as the observations mentioned above with regard to the use and function of a UDR instrument and the resulting follow-up assignments, we would like to draw attention to a particular lesson that we have learnt from the experiments with the UDR system. One of the interviewees suggested placing the UDR system within, as he put it, the content ↔ process ↔ communication diagram (CPC diagram) as seen in *Figure 8*.

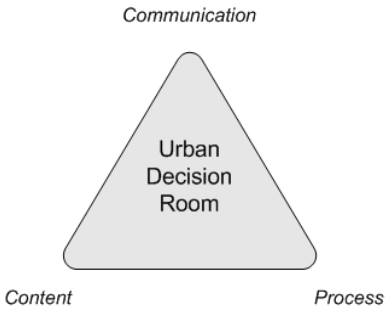

Figure 8. Thought model for Content – Process – Communication structure: CPC diagram

This suggestion ties in very closely with our idea that new instruments need to be developed for urban planners in order to support planning issues that are becoming more and more complex. New instruments which not only support content-related choices that are made (based on urban planning variables), but which at the same time are structurally similar to the process and communication technology features of the urban planning and decision-making process. In other words, in the light of the structure of relationships within the diagram, there is much that has not been researched or tested. However, the diagram can help us set up experiments with instruments for future assignments more systematically and with a wider scope, and it serves as a provisional framework for new instruments and testing procedures.

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