City planning

"Dissolving" urban problems insights from an application of management cybernetics

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Abstract *Urban development in fast-growing cities is one of the huge challenges of our time, and several projects of technical cooperation are dedicated to this issue. The aim of this paper is to help project managers to enhance their capability of dealing effectively with the formidable complexities inherent in this kind of project. For this purpose, we explore the potential of Organizational Cybernetics and Social Systems Theory in a relatively new area of application. We have developed a set of conceptual tools that are helpful in coping with dynamic complexity in change and development projects. These tools have in common an inherent logic deriving to a great extent from Stafford Beer's Viable System Model and the St Gall framework for systemic management. The application of the tools is illustrated by a state-of-the-art case study from the realm of Technical Co-operation – the revision of the Urban Master Plan for the City of Addis Ababa, the capital of Ethiopia. However, the toolkit is in principle also applicable to any complex project of change or development.*

1. Introduction

Project Management is the basic approach to Technical Co-operation (TC). TC sets out to assist developing countries mainly through projects, which are jointly defined by the "donor" and the "recipient" countries [1]. Up to the 1980s, the notion of "development" emphasised the transfer of knowledge or the implementation of advanced technology. At present, however, "development" is increasingly seen as an issue of managing social and institutional change and even the objectives of these intended change processes become evermore demanding.

Instead of limiting itself to straightforward performance improvements, TC also aims at enhancing sustainability, organisational learning, equal opportunities, political participation, etc. Thus, TC projects have become much

The theoretical foundations of this paper are *Organizational Cybernetics*, especially the work of Stafford Beer (1979, 1981, 1985), *Social Systems Theory*, Luhmann (1987, 1997, 2000) in particular, and the methodological work related to modeling and simulation with *System Dynamics* (e.g. Sterman, 2000), and finally the *Management Framework* developed at the University of St Gallen, which is one of the authors' academic bases (Bleicher, 1999; Gomez and Probst, 1999; Schwaninger, 1989, 1994).

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more complex, and coping with this complexity has become the main challenge for project managers and their advisors. For project managers, increased complexity means a growing *uncertainty faced in decision-making* on the project's course of action and/or on the advice to be given to project partners and clients.

A system is "complex" to the extent that it can assume different states, or exhibit a variety of patterns of behaviour. System complexity is determined on the one hand by the variety of elements and relationships within the system and in its environment [2] and in the system-environment interrelationships, and on the other hand by the degree of uncertainty and ambiguity (with regard to technologies, objectives, etc.) that limits or expands the range of options for decision-making (Williams, 1999).

Management is the key to coping with complexity (cf. Baecker, 1997; Schwaninger, 2000). However, classical project management approaches [3] are often of little use in institutional change management. Many TC project advisors already employ elements of a systemic management approach which contravene established procedures. In fact, we observe a growing disparity between project methods as standardised and prescribed in procedures and handbooks of TC, and the reality of project implementation. This disparity in turn leads to insecurity and even confusion in the management of these projects, which will inevitably impair their performance.

In the following, we shall outline a parsimonious set of five basic and interrelated conceptual tools that capitalise on systemic principles of management. This toolkit enhances project managers' and advisor's capabilities to deal effectively with complex change and development projects. It also helps those concerned to adjust the instruments of TC to the new challenge of managing change.

We are not making a proposition invented in some academic ivory tower. First, the proposed toolkit is based on theories which have been submitted to extensive empirical tests, as corroborated in the literature we refer to. Secondly, we ourselves have applied the whole set of conceptual tools in a pilot project. This paper provides an account of this pilot project in the form of a case study.

There is no scarcity of definitions of a "project" (cf. Duncan, 1996; Wideman, 2001). For our purposes, we shall define a project as an undertaking which is in principle unique, usually to some extent innovative, and subject to a closing-date. Mostly, projects are also characterised by complex tasks and the participation of a multiplicity of actors (individuals, teams, enterprises, institutions, etc.). Also, projects are often identified by goals, start-up dates and deadlines [4].

We present each tool and then exemplify its use with the case-study, ours being a large urban project whose goal was to develop a City Development Strategy and Master Plan for Addis Ababa, ultimately leading to an advanced and foresightful Urban Management. This initiative was named the

"Master Plan Revision Project". One of the authors (MK) assisted in this project as a resident advisor to the Addis Ababa City Government, seconded by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ). The other (MS) participated in the project as an advisor on issues of systems methodology and organisational design.

2. First tool: primary processes and systems model

Occidental thinking is founded upon bipolarity. Typical examples are the notions of "cause and effect" as well as "problem and solution". These are also the root concepts on which current planning methods are usually based. With regard to concepts of causality, determinism has played a key role in the Western worldview (Luhmann, 1987; Wagner and Zipprian, 1985). Bipolar and deterministic approaches, however, often mislead us into "putting the cart before the horse" [5].

As an alternative to bipolarity, systemic thinking introduces *circularity* as a basic concept. This involves seeing projects and organisations from a viewpoint which is quite different from the traditional one. "Circularity" means that the output of a process is re-used as an input to that process (directly or indirectly) [6]. This creates a causal linkage, for which we then have two options: Either, more of one factor/variable also increases the other (for example: increased product quality increases staff self-confidence). Or, more of one factor/variable leads to a decrease in the other (for example: increased qualification of machine operators reduces accidents). Depending on the combination of these relationships in a causal network, we then obtain either self-enhancing ("reinforcing") or self-attenuating (i.e. "balancing") loops. Figure 1 shows these two different types of loops in a simplified form. Complex systems can in practice always be modelled on the basis of these two different types of loops [7].

Our central tenet is that the leaders of a change project should conceive of their project issue as a network of processes which are linked in loops. It is also especially helpful to identify a few basic processes which are central to the creation of value by the system. These basic value-creating processes are the engines/drivers of the entire system (Gomez and Probst, 1999).

Such modelling, first, emphasises the dynamic character of project work, which traditional project planning perceives as rather problematical. Second, it

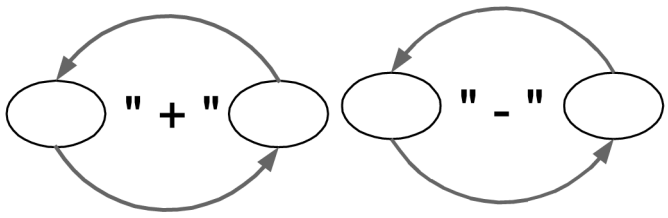

Figure 1.
Two kinds of process loops

focuses the attention of project managers on those processes which are critical for the sustained operation of the system.

The crucial tasks in developing a TC project are, then, to discover or construct – and then reinforce – circular and value-creating processes. More specifically, project managers need to:

- Discover extant circular value-creating processes which are the bases of the system's operation.
- Construct new processes whereby virtuous self-reinforcing dynamics can be created; this may take the form of transforming an open causality chain into a loop.
- Reinforce processes that embody virtuous modes of operation.
- Correct harmful processes whereby problems and conflict have become self-sustaining, by analysing and breaking up such pathological self-reinforcement [8]. Often, this is achieved by introducing a balancing loop.
- Link up processes to strengthen the overall performance of the system.

We do not conceive of the relationships between components of basic processes as deterministic. In systems thinking, causality is not rejected but seen as probabilistic in nature [9]. The emphasis is on the indeterminacy of complex systems. In practical terms, this underlines the actors' responsibility to conduct themselves responsibly. It also highlights the significance of responsiveness and flexibility, – a prerequisite to seizing opportunities.

Viewing and modelling the issues of concern in this way help project planners and managers to:

- focus their attention on the critical "drivers" of their projects,
- ensure that sustainability is already "built into" a project from the outset and in a systematic – and in a sense also systemic – manner,
- base their strategies on a view of their project which is comprehensive and which considers the importance of interfaces as well as the connectivity between the actors of the system-in-focus, and finally,
- identify points of maximum leverage for interventions into the system.

Example: Addis Ababa

Addis Ababa has long been growing in a disorganised manner. At present, the city has 3 million inhabitants, expected to reach anywhere between 6 and 9 million within the next 10-15 years. Many people fear that such unconstrained growth could make it unmanageable. How can *governance* (leadership, policy-making, urban management) be enabled to initiate and foster a more gradual and benign evolution of the capital? To answer this question, a project was launched to develop a long-term strategy and "Master Plan" for the development of the city.

In line with the propositions mentioned earlier, the project team developed a general model of urban governance (Figure 2).

The causal relationships depicted on the right-hand side of this model deal with politics, planning and finance. Urban policies influence the activities of urban actors through plans, programmes and regulation. These in turn are put into effect through the institutional set-up of the city administration. Good policies and effective implementation promote investment, which in turn enhances revenues from taxes and fees. Increased revenues, due to a bigger municipal budget, provide more options for policy-making. The left-hand side of the model is about governance and control. It shows that better policies and their efficient implementation also lead to more options for policy-making, through increased acceptance and support by the public [10].

In a highly abstract version, this model is made up of two basic loops (Figure 3).

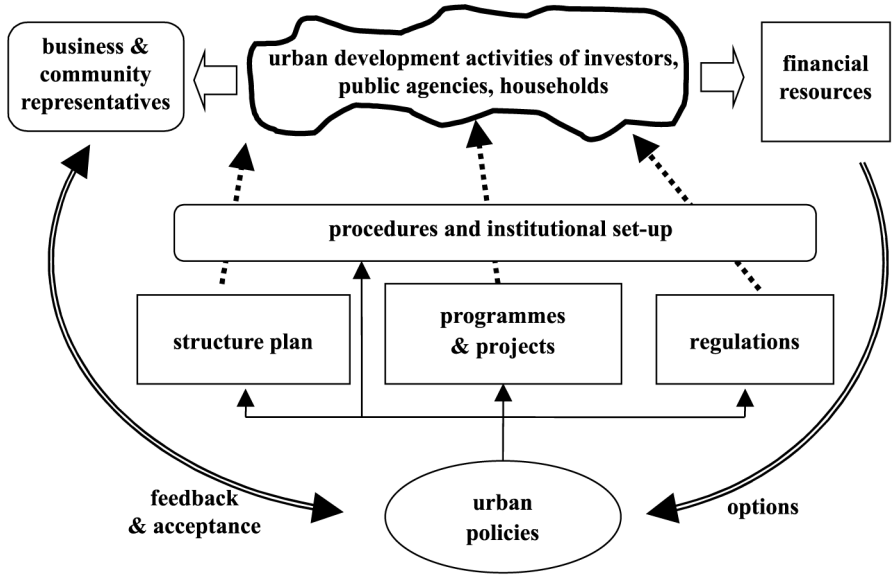

Figure 2.
Model of urban governance

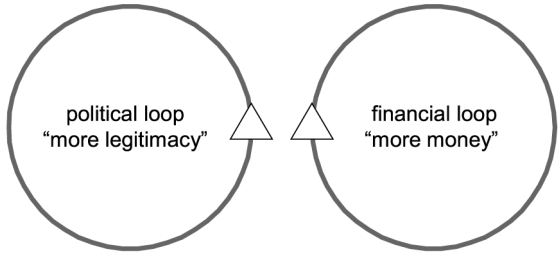

Figure 3.
Abstraction – two self-reinforcing loops

Representing the urban management of a city as a dynamic and circular system brings several important insights to the fore.

- Both of these loops depict self-reinforcing circular causalities and, hence, an inherent potential for development. These loops reveal potential win-win situations for the stakeholders involved.
- The qualitative aspect of development becomes manifest in a broader range of options (repertory of behaviours, opportunities to make impact, leeway) for stakeholders throughout the system.
- The diagram emphasizes relational aspects. The focus of optimization is on both components and their interrelationships, often with emphasis on the latter.
- The diagram shows that unidimensional measures are unlikely to have a significant impact on the performance of the system. It adverts rather to the need for balanced combinations of multidimensional measures, to which many actors can make their contributions.
- Often, political constraints block the most direct and formally "correct" path to problem-solving. The model depicts already existent, self-sustaining interrelationships. While the cause-and-effect model often leads to frustration (because "necessary and sufficient preconditions" for intended results cannot be brought about), the concept of circular processes emphasises the multiplicity of opportunities available to enhance virtuous circles. These opportunities can be taken creatively and more at one's leisure. In addition, leverage is provided through the inherent dynamics of the system.

3. Second tool: recursive structures

Typically, a project management is concerned with three organisational levels as follows.

(1) the overall organisation in which it is embedded;

(2) the project for which it bears responsibility; and

(3) its subprojects.

Traditionally, these levels are mostly conceived of as a hierarchy, where the overall organisation controls the project and the project, in turn, controls its subprojects. In large and complex projects, however, one-dimensional hierarchical relationships become increasingly inefficient. The lower level depends on decisions taken by its controlling superior level, but the latter is often challenged to provide these decisions with sufficient speed and precision. As a result, the lower level tends to wait, i.e. delay its operation. Conversely, the upper level needs more and more and ever more detailed information from the lower level to prepare and justify decisions, but the lower level is, in its turn,

hard pressed to provide this information with sufficient speed and precision. As a result, the upper level tends to delay decision-making. Traditional organisational hierarchies are more often not caught up in such a "Catch 22" situation of decisions and information requirements – a self-sustaining, harmful causal loop.

Systemic thinking offers the principle of recursion as an alternative: every primary unit (which is essentially a basic, self-sustaining and value-creating process with its own management) is considered to be a system "in its own right", while at the same time it may be conceived of as a subsystem of a larger one. Hence, we regard projects as "wholes within wholes", or systems within systems. In this way, control and organisational intelligence[11] are not concentrated at the "head" of the organisation. Rather, they are distributed throughout the primary units at all organisational levels. Each sub-unit is given an identity and the corresponding autonomy to be managed for sustainability in its own right, while at the same contributing to the sustainability of the greater whole.

Recursive relationships combine control[12] with self-organisation in a complex pattern: control from "above" is accepted, but constrained by the principle of the autonomy of the lower level. Autonomy of units at the lower level is accepted, but constrained by the principle of contribution to the "overall" needs and goals of the higher level. In complex settings, recursive structures perform better, because the above-mentioned self-created impasse of the hierarchical model is avoided (cf. Espejo *et al.*, 1996). In project management, recursive structuring leads to a more efficient use of resources and a reduced load of work and complexity on project managers.

It is therefore important for the management of recursive project structures to look at the interfaces between the different levels' "overall organisation – project – subprojects" (Figure 4). The relationship between overall organisation and project is usually set out in the formal "Terms of

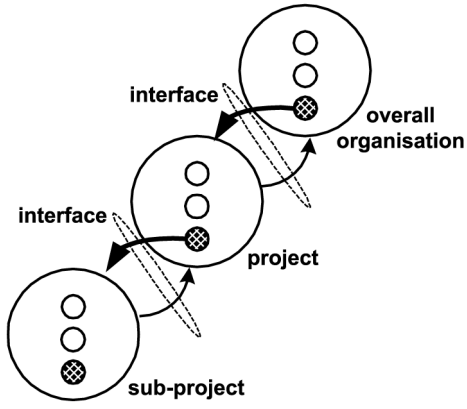

Figure 4.
Recursion model of a project organisation

Reference" of the project. These should be regarded primarily as a tool to manage this relationship, and not – as is usually the case in conventional project management – primarily as a framework for planning detailed activities of the project.

The interfaces between the project and its subprojects can best be structured according to the principle of "Management by Objectives". The leadership of subprojects should be given autonomy to manage its "own affairs", while it is held responsible for contributing to the overall needs of the project. This responsibility is formalised in "Task Assignment", which spells out the expected results and responsibilities of each subproject.

What are the consequences for project management?

(1) Ideally, units at each level should be conceived so as to:
   - have their own "identity" and structure; and
   - be able to manage, from start to finish, the processes for which they are the raison d'être ....

(2) The project management's attention should focus on the interfaces between the levels of recursion. It will neither try to interfere directly in the overall system, nor will it micro-manage the subprojects.

(3) With regard to the interface-located "upstream" project, management first acknowledges the necessity for the project to contribute to the distinctive needs and objectives of the overall system. These goals are derived from the need to maintain the overall system's primary processes intact. The management acknowledges its responsibility to structure the project as an autonomous unit within that system. These different requirements are usually not explicitly laid down in the written terms of reference attached to projects. However, interaction between the project and the representatives of its superior level of recursion is to a large extent a matter of how to balance the project's contributions vis-à-vis both the needs of the overall system and its own needs for autonomy.

(4) Looking "downstream", the project management will make use of management by objectives, leaving the internal control of the subsystems to their respective capabilities of self-organisation. However, tasks assigned to the subprojects must directly contribute to goal attainment at the level of the project as a whole.

Example: Addis Ababa (see Figure 5)

The three recursion levels in this case are as follows.

(1) *Overall system.* The City of Addis Ababa and the City Government as its decision-making body.

(2) *Project.* The Master Plan Revision Project, set up by the City Government. The MPRP project as an organisation has developed its own "corporate

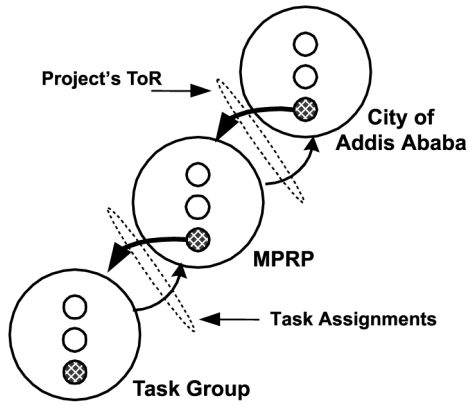

Figure 5.
Recursion model – Addis Ababa application

identity", in separate offices, with its own staff, rules, goals, and budget. It has a high degree of autonomy and can, therefore, adapt optimally to the needs of its specific target groups and partner organisations. The project leaders manage the interface between the project and the city level through continuous negotiation with the city government on the interpretation of the MPRP's "terms of reference", i.e. its goals and the degree of the project's autonomy. This leads to a dynamic alignment of goals and priorities between the two levels.

(3) *Subprojects.* The project's internal subdivision follows a "thematic" approach, disregarding sector or departmental boundaries. Rather, the project management establishes task-specific groups on a temporal basis to achieve comprehensive benefits with regard to real-life issues, as a direct output of the overall project. For example, the issue of "inner-city upgrading" is seen as just a "real-life" issue and is being handled by a group of professionals made up of planners, sociologists, architects, and economists. Since there is no internal division of labour to shield the task group from interacting with the environment and representing the whole project, each task group is confronted with the whole of the environmental complexity related to the issue it is working on. Interfaces between project and subprojects are embodied in task assignments which specify targets to be achieved. Control is essentially concerned with these targets, mostly disregarding the internal affairs of the groups (management by objectives).

4. Third tool: three-level model of management

Additional leverage to deal with complexity is obtained by applying the well-proven three level model of the St Gall Management Concept (Bleicher, 1999; Schwaninger, 1989, 1994). For a unit to achieve excellent performance, its

management must simultaneously meet criteria of success at three logical levels of management:

(1) operative management – "efficiency";

(2) strategic management – "effectiveness"; and

(3) normative management – "sustainability".

This model (Figure 6), which was originally designed for dealing with management at enterprise level, is equally valid for project management.

Operative project management is about the project's realization. It aims at excellence in execution, leading to high standards of value generated by the project "here and now", in terms of economic, social and ecological benefits, but also in terms of the productivity (cost-benefit-ratio) achieved. Therefore, the overall criterion of operative project performance is efficiency.

Strategic project management is about the orientation of the project in a larger time- and space-related horizon. Here, the focus is on building up value potentials, i.e. the prerequisites for generating value in the long run. The respective control parameters are critical success factors to be mastered (e.g. knowledge of the target groups' and partner organizations' fundamental problems) and core competencies (e.g. advisory and implementation capabilities paired with collaborative capabilities). In sum, the overall criterion of performance from the strategic perspective is effectiveness.

Normative project management is about the founding principles of the project organisation. The purpose of normative management is to ensure the viability and development of the project. The principles of normative management embody the ethos of the project and are for the most part invariant over time. The ethos, the vision, as well as structural and cultural properties characterising a project organisation, indicate how viable that project is. The systemic view implies that the viability of a project can be maintained only if it is aligned with the greater whole in which it is embedded, i.e. as long as it creates a net benefit for that greater whole. Otherwise, the identity of the project must be further developed (adjusted). In sum, the overall criterion of performance from the view of normative management is sustainability.

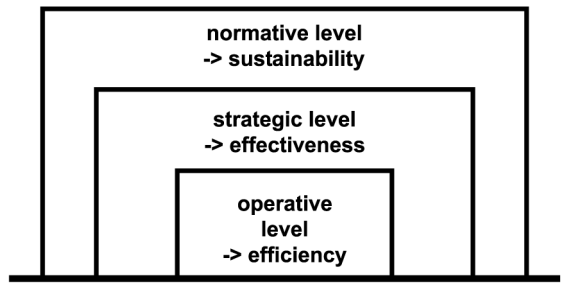

Figure 6.
Three-level model of management

Specific goals and orientators correspond to each of these logical levels. This allows for a focused management approach, but also brings to light sources of structural conflict, for example on the question as to whether resources should be allocated to short-term or medium-term goals. However, there is a logical pre-control relationship between these three levels, the superior levels creating preconditions and frameworks for the lower levels. This helps to establish priorities.

Applying the three-level-model helps the project team to:

- sort out complex issues of management, concentrating on the essential variables (mostly by applying the distinction between "operational" and "strategic" issues);
- ensure that (normative) long-term issues are identified early on and pursued consistently;
- resolve conflicts, which often arise from contradiction or competition between the different logical levels;
- attain better overall consistency in its work, by analysing issues as operational/strategic/normative and then aligning different proposals on how to address these; mostly by taking recourse to the higher levels [13].

Example: Addis Ababa

The project leaders shared experience gained from earlier cases: given the many aspects from which a project may be regarded, team discussions are often confusing, and decision-processes tend to be complicated, wearisome and time-consuming. In the end, the interests of the long-term are often sacrificed to a few short-term advantages, because these are more tangible and therefore easier to assess.

In the MPRP project (Figure 7), the managerial issues are sorted out by distinguishing and balancing all three logical levels. In this way, the goals and therewith the criteria for assessing results, as well as the necessary measures, can be conceived more comprehensively.

- *Operative level.* The project management ensures that the project continuously creates visible benefits – social, ecological and economic – for various target groups in the City of Addis Ababa. For example, the project team worked out a proposal on how to allocate scarce land for burial grounds between the different, heatedly competing religious communities. This task was initially not part of the terms of reference, but was taken on because it provided opportunity to demonstrate operational success.
- *Strategic level.* The project management invests in human resource development and strengthening relationships between stakeholder groups (for example between the public sector and the business

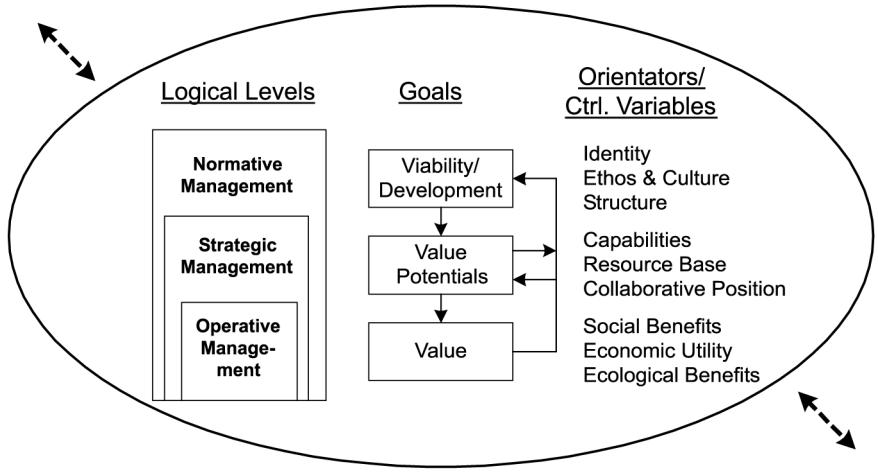

Figure 7.
Three-level model of management – MPRP project

community) by constantly developing the project's resource base as well as space for manoeuvre in the political sphere (negotiation of the project's mandate).

- *Normative level.* The project management aims at instilling a culture of result orientation, of effective decision-making and of transparency. It also cultivates an ethos of collaboration with stakeholders. At the same time, it ensures that the social values that guide the project are acceptable to the population, e.g. fairness, social responsibility for the poor, and the common good.

The *principle* of recursion and the *logical three-level model* are complementary to each other, so they can and should be combined.

Figure 8 visualises that all three logical levels of management are functions inherent in each recursive whole, – project, super-project, subproject, etc. – provided that these are to be conceived as viable units. In other words, not only an operative management for efficiency but also strategic and normative management are functions to be distributed recursively across the whole system (cf. Beer, 1979, 1981, 1985). We shall return to this aspect in Section 5.

5. Fourth tool: process control model

Traditional project planning and management approaches are static, in that they basically describe unwanted current and desired future states. However, they shed relatively little light on the processes required for the (potential) change between these states. In practice, however, projects are driven by these processes rather than by the planning documents. As a result, traditional project management is often caught up in a dilemma – either to act according

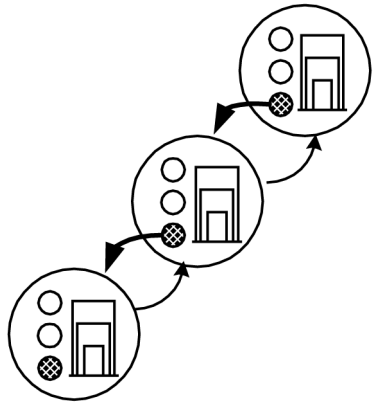

Figure 8.
Model of recursive management

to its plan, with foreseeable marginal or even negative results, or according to what is required by "the situation", even if this is contrary to its plans.

To make planning and management more flexible and adaptive, process orientation has emerged as a crucial concept. However, the concept appears to be somewhat elusive. What does process orientation mean in the context of managing complex change and development projects?

The following model of process control is based on two of the tools hitherto presented, namely, the notion of primary, value-creating processes and the logical three level model [14]. It helps to structure the complex process of project management into a straightforward but limited set of modules/activities. Figure 9 focuses on the project itself, i.e. the middle level of our recursive set "system-project - subprojects".

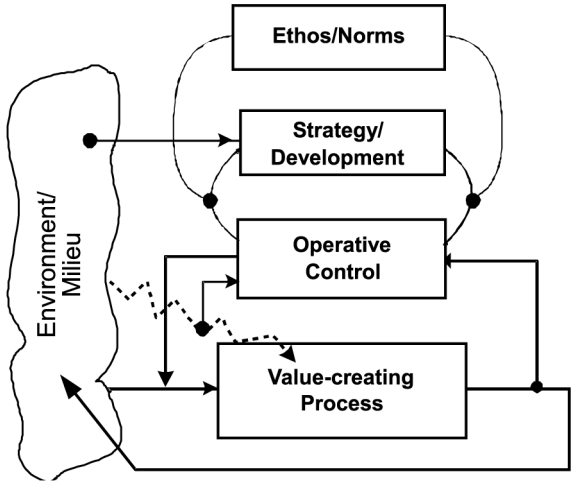

Figure 9.
Process control model based on the viable system model

To put it in a nutshell, to manage a project as a process means designing, controlling and developing (only) four components and their interrelationships (cf. Figure 9):

(1) *The primary, operative, value-generating process.* The activities which accomplish the purpose of the project (including their respective regulatory functions).

(2) *An operative control unit.* The unit which regulates (via feedback) and steers (via feedforward) the ongoing process; this unit also deals with irritations (e.g. disturbances, difficulties, hindrances, disruptions) which originate from the project's environment, and their prevention (see broken arrow) [15].

(3) *A strategy, systems design and development function.* This ensures the attainment of strategic management goals as defined above (tool 3), mainly through strategic controlling; this function also deals with the environmental changes: goals must be revised and the system design successively adapted.

(4) *A normative function.* The ethos of the project – which is normally a project of both emergence and design – manifests itself in basic norms and lived-up-to values. It is insufficient to name or "fix" these at some point, since they need incessant reflection and discourse to improve them.

Systemic process control, in contrast to traditional project management, does not require a comprehensive and detailed "operations plan". This does not imply that plans can be dispensed with. In contrast the more uncertain the process is, the more important a good plan becomes. However, planning effort is focused on the critical variables/issues and hence, reduced to a reasonable and efficient level of detail. In this sense, planning no longer means constructing rigid tracks into the future. Monitoring becomes easier and more sensible, while planning itself turns out to be a vital instrument for continual adaptation and learning [16].

Example: Addis Ababa

The management process is designed on the basis of the process control model.

(1) *Primary, value-generating process.* The causal loops of "more legitimacy" and "more money" introduced in Section 2 are the focus of project management. Whether there is "more legitimacy" for urban governance is monitored inter alia by checking local news. Whether the virtuous circle of "more money" is enhanced can be observed by gauging the City's income from taxes and fees.

(2) Operative control is basically performed through assigning tasks to subprojects and through monitoring task achievement. Indicators for

task achievement are expressed taking both "hard" and "soft" data into account.

(3) Strategy, systems design and development: the crucial instrument for these is the causal network model of city management already introduced. This model represents key elements of both project and its environment with a view to the mid to long-term. Based on this, the management team performs a periodic and "holistic" review of project status which includes its assessment in terms of goal achievement and the identification of key constraints. From this review, milestones are set, and their achievement is regularly checked.

Process control at the normative level is performed through a steadily albeit slowly flowing stream of feedback from outsiders, and through the continuous display of presence by the project leaders, and an open debate on the project with their staff and clients. This leads to a continual adjustment of the project's vision and mission as expressed by its management, the management styles displayed and the project's long-term priorities.

6. Fifth tool: relationship model

Finally, we have to address the relationship of clients and advisors. TC usually places international long-term advisors, who are provided through "projects", with senior staff of the recipient's country public offices. The advisors help the clients to do things they could not do before, or help them to improve upon what they are already doing, but "sustainable", which means that they are able to do it without their advisors, and, as everybody knows, "help" has a tendency to disempower those who receive it.

We therefore have a somehow paradoxical situation: first, to maintain the relationship in which clients are expected to do things which they cannot do (or maybe even: do not want to do). But officially, the clients are the sole beneficiaries of this relationship. Second, the advisors are expected to stay close to their clients and at the same time to keep their distance from them. In practice, it is difficult to maintain an optimal balance between remoteness and proximity between advisor and client. The optimum balance is achieved if the advisor is close enough to be able to provoke or unsettle (i.e. "irritate") the client and give him food for thought, without getting so close as to become biased or unable to criticise him (cf. Ahlemeyer and Königswieser, 1997; Sülzer and Zimmermann, 1996).

In order to disentangle these complicated relationships, we again use a systemic approach in which we conceive of the client and his institution on the one hand, and the advisor and his "project" on the other, as two distinct, autonomous systems. Both systems are complex, self-sustaining through core value-creating processes, and operationally closed (cf. Luhmann, 1987, p. 55).

The relationships can then be separated into three types of causal reference as follows.

(1) Self-reference of the partner organisation/target group ("client system").

(2) Self-reference of the project ("advisory system").

(3) Reference of the project to the partner organisation/target group.

These three types of references can be located in the relationship model (Figure 10).

The advisory system impacts on the client system through "interventions". The client system, in its operational mode of self-reference, can either "accept" or "refuse" each intervention. Therefore, it is crucial that the interventions should be individually customised and monitored, and that the advisory systems learn from such cases of "acceptance" or "refusal".

The advisory system appears "alien" to the client system. This is a constraint. But it is also an advantage in that it is often easier to suspend taboos of the client systems. Furthermore, by providing multiple perspectives on current issues of the client system, the latter's conceptual horizons are expanded, and innovation is more likely to occur [17].

The model cannot structurally dissolve the above-mentioned paradox of "help to self-help". However, illustrating it helps the actors involved to deal with the inevitable insecurity and conflict which are thereby incurred. Thus, the model makes "help to self-help" a more operational and realistic concept. The model highlights the need to respect the autonomy and self-responsibility of both parties, which is a critical building-block for collaboration in a client-advisory setting.

Example: Addis Ababa

The client in this case is the Master Plan Revision Project of the City Government, whereas the advisory role is performed by the German technical co-operation, GTZ.

Contrary to conventional practice, there is no joint plan of operation between the international project advisor and the client system. Rather, the GTZ team acts with a considerable degree of operational autonomy, which is, however, constrained by its obligation and commitment to contribute to strategic project goals which were agreed between the two governments involved. It assesses ongoing processes and tries to enhance or restrain them through various types

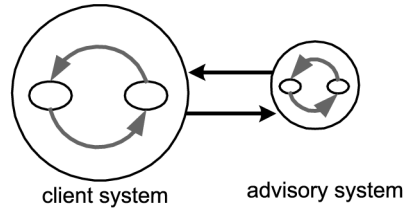

Figure 10.
Relationship model

of interventions, which may include critical questions or even "unsolicited advice". For example, if at an operational level everybody seems to agree that hawking and begging are punishable offences – an unrealistic approach and a form of denial – the external advisors may justifiably question this.

GTZ's role as an "outside advisor" has been instrumental in accessing information that – owing to a high level of mistrust within the administration – is as a rule not easily transferred between organizational units. Moreover, GTZ as an external partner can often convey bad news and criticism of high-level decisions more easily and in some cases more acceptably than a member of the client system. The relative "independence" which is granted to GTZ as an advisor also provides an option for staff of the City Government, who operate within the client system and otherwise would feel bound to adhere strictly to established standards and practice, to mobilise additional support for activities that might be considered too innovative or risky by the majority of city decision-makers [18].

Finally, GTZ is again and again confronted with a request to solve the City Government's problems, i.e. to work out and implement a proposal for participatory planning procedures. However, the definition of the relationship as shown in the relationship model helps to clarify the self-responsibility of the client [19].

7. Synopsis and outlook

The aim of this paper was to help project managers to enhance their capability for dealing effectively with complex issues, with a focus on urban planning and development.

For this purpose, we have explored the potential of Organizational Cybernetics and Social Systems Theory to support the management of complexity, from the specific perspective of project organization and leadership. To this end, we have designed a set of conceptual tools. Despite the parsimony of these tools, the fact that they are bound together by an inherent logic makes them powerful devices for dealing with the dynamic complexities confronted in change and development projects.

We have tried to outline this cogent logic along the lines of our presentation, and illustrated each tool by reverting to the manifold aspects of one single, highly complex case. The purpose of the project-in-focus is a revision of the Urban Master Plan for the City of Addis Ababa, Ethiopia. A project of that stature cannot "solve" all the problems at hand. But it can achieve a joint creation of a "vision" – a coherent scenario of a desired and viable future, and a design to bring it about. If not all the problems can be "solved", a process can be initiated, which has the potential to "dissolve" problems through the redesign of the system (Ackoff, 1999).

Given the fearsome challenge of its endeavour, this Urban Master Plan project is certainly a good case in point. The toolkit presented here deals with the invariances inherent in any complex organizational project. Therefore, it is

probably valid for a great variety of change, development or innovation projects.

The formidable complexity of the issues tackled in our pilot project makes this a good example of the new vistas for applications of Management Cybernetics and Social Systems Theory. To name just few relevant fields:

- local planning, problems of megalopolis and regional development;
- creation of viable economic and social systems;
- care of resources, ecology and sustainability;
- design for health care and education; and
- issues of conflict and peace.

These new prospects have only just started to emerge. There is plenty of work to do for Stafford Beer's disciples.

Notes

1. The following thoughts were developed in the context of a project implemented by the City Government of Addis Ababa with the support of GTZ, Deutsche Gesellschaft für Technische Zusammenarbeit. At any given time, more than 1,000 projects are being supported by GTZ, with the sponsorship of the German government.
2. When writing about the "environment" in this paper, we are referring to the specific environment here, which is relevant for a project under study.
3. See for example the Project Management Body of Knowledge (PMBoK) and the *AMA Handbook of Project Management*.
4. We differentiate the notion of "project" from that of "process" in that the latter – designating a "business process" – in business administration is usually applied to a mode of structuring routine operations. From a systemic perspective, however, project management always implies process management. We also subscribe to the "fractal" perspective, which understands a "programme" to be a project at a higher level, which is made up of a bundle of projects. Accordingly, projects can also be divided into subprojects.
5. A critique of causal models was delivered, e.g. by Musto (1987). See also Sülzer and Zimmermann (1996): 306 ff.
6. Kim (1992) and Richmond (1998).
7. To achieve stable development, a complex system must always be made up of both kinds of loops. A system with self-reinforcing loops only would necessarily move away from equilibrium uninhibitedly, and sooner or later drift into a catastrophe (Kim and Anderson, 1998; Senge, 1992).
8. See, for example, the systems archetypes proposed by Senge (1992) and Wolstenholme (2003). For applications, see Schwaninger (2003).
9. Grint (1997), Levy (1994), Stacey (1993), Sterman (2000) and Treadwell (1995).
10. This qualitative model concentrates on two self-reinforcing loops, which can drive the evolutionary process of the city. In other cases, both reinforcing and balancing cycles may be necessary for an appropriate mapping, the latter for example in relation to the reduction of pollution. It may also be indicated to elaborate more detailed models and to formalize important issues in quantitative models. In other words, the simplified qualitative model exhibited here cannot represent or simulate the dynamics of the system under study with its

often counterintuitive patterns of behaviour and unexpected side-effects. This would require a complete simulation model (Schwaninger, 1997).

11. For the concept of, "Organizational Intelligence" as used here, refer Schwaninger (2000, 2001).
12. "Control" has two components: "regulation" (based on feedback), and "steering" (based on feed forward). In the English terminology, the adjectives "controlling" and "regulatory" are often used synonymously.
13. The management based on this three-level framework can be supported effectively by dynamic simulation models, e.g. System Dynamics models (Schwaninger, 1997; Sterman, 2000), as well as evolutionary or agent-based models (Allen, 1997).
14. This model of process control is based on the viable system model (Beer, 1979, 1981, 1985).
15. A further function represented by the two punctuated arrows in Figure 9 is the provision of coordinating, self-organising and attenuating functions, as well as an auditing function. For a detailed discussion, see Beer (1979, 1981, 1985).
16. This also implies: planning serves primarily as a discourse of project members for the sake of a joint invention of a desirable future and how to bring it about, and less as an anticipation of "the"future (Ackoff, 1981; GTZ, 1997).
17. This concept revolves around what in German is termed "beraterische Distanz".
18. In early 2000, an exhibition about the Masterplan Revision Plan was held. It was visited by 50,000 inhabitants, and about 1,200 participated in hearings on city planning in Addis Ababa. Both opportunities were used, according to a broad survey among citizens, to inform themselves about their ideas and needs. By the end of 2001 over 120 workshops had been held for that purpose.
19. "Self-responsibility" refers to the autonomous handling of problems. This does not exclude recognition of the interdependencies with other units.

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