Radboud University Nijmegen

Nijmegen School of Management

Master degree thesis in Business Administration
Specialization: Organizational Design and Development

VSM as a Tool for Organizational Change?

A Critical Examination

Author:
Frank van Caspel

Supervisor:
Dr. Dirk Vriens

2nd Reader:
Dr. Jan Achterbergh

April 2011

VSM as a Tool for Organizational Change?
a Critical Examination

Frank van Caspel

Abstract

It is an appealing idea to use the Viable System Model as a tool to guide organizational change. In doing so, however, the risk of exceeding the VSM's 'jurisdiction' is quite real. This article consists of an analytical examination of the degree to which the VSM can meaningfully contribute to organizational change. A functional definition of organizational change is introduced, in the form of the 3D-model of organizational change. It defines organizational change as consisting of three dimensions: functional, social and infrastructural. Next, the VSM is described. It is (also) a functional model, specifying five necessary and sufficient functions for organizational viability. Having acquired both a definition of organizational change and knowledge of the VSM, its suitability to contribute to change in different phases is examined. It is concluded that because the VSM is purely functional, it can only be used for diagnosis of existing or proposed organizational infrastructures. It cannot contribute to the design of concrete organizational infrastructures. This is a direct criticism of those cases in which the VSM was used during post-diagnostic change phases, some of which will be discussed. Post-diagnostic usage cannot be guided using only the VSM, but must rely on knowledge external from it. Researchers should be aware of the functional nature of the VSM, and its associated limitations. This will help to prevent the misattribution of the success or failure of change efforts to the VSM, where in fact other sources have implicitly steered the process.

Keywords: VSM, tool, organizational change, 3D-model of organizational change

INTRODUCTION

Although officially conceived as a "set of functions . . . which provide the 'necessary and sufficient conditions' for the viability of any human or social system" (Schwaninger 2006, p. 409), the Viable System Model has a particularly strong connection to management science. As such, Beer's model has sparked interest among researchers looking for models that explain or even guide organizational change[1]. Some have claimed that the VSM can support the diagnosis of an organizational problem, and even that:

> the design of a desired organization can be supported and their results substantially improved if guided by the VSM. (Schwaninger 2004, p. 414–415)

In this article I want to investigate these claims. What kind of guidance can the VSM actually provide during organizational change? Can it be used both for diagnosis of a problem and design of a solution? Beer claimed that his functional model captures the necessary and sufficient conditions for survival of an organization. It does so by specifying the required organizational functions that need to be performed. In other words: Beer describes what an organization should do in order to remain viable. Such a model obviously has potential as a diagnostic tool for organizational infrastructures. Knowing which functions should be performed in an organization, allows

[1] For discussion and examples, see e.g. Beer (1989), Espejo (1989b), Ben-Eli (1989), Espejo (1989a), Espejo, Schuhmann, Schwaninger, and Bilello (1996), Holmberg (1989) and Leonard (1989).

one to study an actual infrastructure and assess if – and to what level – it performs the required functions. Any discovered discrepancies between required and actual performance of functions, can then be marked as problematic. There seem to be no a priori concerns with this diagnostic usage of the VSM in organizational change.

However, some claim to have used the VSM to guide organizational change in *post-diagnostic* phases, e.g. in the design of actual organizational infrastructures. I believe these claims cannot be substantiated. Because the VSM is purely functional, it does not contain any specific design rules. Therefore, the VSM can only provide a problem diagnosis. No conclusions for the design, implementation and evaluation of solutions to organizational problems can be drawn from it.

This requires some explanation, in particular about the notion of a *functional model*. Such a model describes the functions that are (or need to be) performed by its subject of analysis. A functional model of a chair would, as one of its core functions, have the function 'seating humans'. How the chair goes about actually realizing this function is not covered by the functional model. Specific design rules could be given stating that the chair should be made of non-liquid materials such as wood or aluminum, or that it should be covered in soft textiles for a comfortable sitting experience, but these rules, again, have no place in a functional model which only describes what function is realized, not how it is done.

The VSM is a functional model, specifying only *what* organizations need to do[2], not *how* they should do it, i.e. the VSM contains no rules for the design of concrete organizational infrastructures. It provides no link between function and design — no link between the means (design) and the ends (function).

> As a functional model, the Viable System Model specifies behavior that is wanted in terms of desired effects. It does not specify how the infrastructure should be designed in order to realize these desired effects. It does not specify a model stating the relation between the infrastructural design and desired organizational behavior. (Achterbergh and Vriens 2010, p. 215)

From a VSM point-of-view it does not matter what an organization does or how it does it, as long as it results in the required functions being effectuated. Vice versa, any problems diagnosed by the VSM will be in terms of functions that are not performed to a satisfactory level. The analysis will not explain *why* a specific infrastructure is not producing its desired effect. Nor will it determine which other infrastructures are more suited for the job.

But simply knowing that whatever the organization is doing is not causing some desired effect, is not enough for organizational change. If one wants to design and implement a solution, a theory of how the actions of an organization effect what it achieves is needed. The VSM is not such a theory.

> *Imagine you've identified a crucial problem for your organization: sales are too low. The solution to this problem is not simply 'increase sales' ('Eureka! If sales are too low, we should simply increase them. Brilliant!'). Obviously that is what is needed, but to design a solution you have to think about* how *to increase sales. Things like 'lower prices' or 'engage in promotional activities' come to mind. By analogy, the VSM would only tell you 'sales are too low', and not 'if you lower prices, sales will go up'. Such design rules have to come from elsewhere. Obviously, a functional diagnosis is a good starting point for the design of a solution, but as soon as you involve design rules you've stepped out of the purely functional domain in which the VSM resides.*

Nonetheless, several researchers and practitioners have used the VSM for guiding their post-diagnostic change effort[3]. As I explained, I do not believe

[2] It has a further special property: it claims to hold both the *necessary and sufficient functions* organizations should perform for them to be what they are. It covers all the functions required for organizational viability, and no more than that.

[3] See for example Espejo, Schuhmann, Schwaninger, and Bilello (1996), Ben-Eli (1989), Espejo (1989a), Jackson (1989),

such guidance by the VSM is possible, on account of it being a functional model. Any guidance these researchers did receive during post-diagnostic change must have come from models or knowledge other than the VSM. The consequences of not properly recognizing the sources one uses during organizational change, and attributing to the VSM guidance which it could not have offered, is detrimental to the transparency of the process. It obscures the causes of success or failure of the process and may cause the VSM to receive praise or blame of which it is undeserving.

In this article I will set forth an analytical[4] argument to support the claim that the VSM cannot support post-diagnostic change. I will use a functional model of organizational change to substantiate my argument. This is the '3D-model of episodic organizational change' (3D-model) formulated by Achterbergh and Vriens (2008). They distilled a simple set of necessary and sufficient functions for organizational change, and divided it into three distinct dimensions, which together form the model. It has the systemic quality of looking at its subject of analysis from the viewpoint of the functions it performs and their interconnections. Because of this, it implies or prescribes no specific realizations for these functions. This grants it a certain universality, like many models from the field of Systems Theory. Using the 3D-model as a frame of reference, theories or models for change can be tested and categorized depending on the extent to which they address the necessary and sufficient functions of organizational change.

I shall subject the VSM to such a test. The 3D-model will function as a 'mold' containing the necessary and sufficient conditions for change, into which I will try to place the VSM. This tells us which dimensions of change fit in well with the VSM, and which do not. In the end, this should yield a preliminary analytical understanding of the VSM's 'jurisdiction' over organizational change. And that, in turn, can serve as a framework delineating the usefulness of the VSM as a tool for organizational change.

In order to properly display my argument, the 3D-model and the VSM have to be explained. I will do so in the next two paragraphs respectively. After that, I briefly explain the method and sources I have used for my research, followed by its results. Finally, I present my conclusions and discuss their consequences.

THE 3D-MODEL

Achterbergh and Vriens have created a simple yet powerful model which captures all of the aspects relevant for change in organizations (divided into three dimensions). The model is aimed specifically at conscious, episodic interventions into the infrastructure of organizations. Achterbergh and Vriens came to realize that several categories of problems plagued organizational change efforts. The first of these is a myriad of symptomatic problems: interventions do not have a properly demarcated start or finish but usually wither out; resources such as time and money are not allocated in sufficient quantity; interventions stagnate because of a lack of specified goals; etc..

Secondly, the academic literature on the causes of these problems is a diversified mess. Many systemic obstacles as well as interventional failures, such as lack of vision and bad communication, are heralded as the major cause for change problems. In addition to this, Achterbergh and Vriens realized that there is a very important difficulty specifically connected to changing organizational infrastructures. In a suboptimal infrastructure, people invent ways of circumventing this suboptimality. But the 'tricks' they invent only maintain and rigidify the infrastructural faults. By institutionalizing these workarounds ("well, that's simply the way things have to be done around here"), they become part of and enforce the problematic infrastructure. Escaping this vicious circle is particularly difficult, because organizing a fruitful change effort depends on the ability to properly regulate the infrastructure of the change effort – and regulating structures was the problem to begin

and even Beer (1989) himself.

[4] Analytical as opposed to synthetic.

with. If an organization lacks the ability to properly regulate their own infrastructure, how can it be expected to create a proper change infrastructure? It would appear that the only way out would be an appeal to a certain Baron Münchhausen[5]...

To cope with the aforementioned problems Achterbergh and Vriens created the 3D-model of episodic organizational change. It abstracts from the many clashes between models of change, to the underlying phenomenon which they describe. Any opposition between these models reveals a commonality, making them "contrasting forms of one and the same" (Boukema 2010, p.203). For example: two models with completely opposed perspectives about whether to involve organizational members in change-efforts, are still united in their attention for participation. Likewise, opposing models on reward structures are still the same in that they point out that reward structures should be addressed. The underlying functions, not the specific realizations praised by particular models, are what characterize change. It is this functional characterization which Achterbergh and Vriens synthesized into the 3D-model. It contains the functions that need to be performed in any conscious episodic change effort of an organizational infrastructure, and as such offers a framework to categorize the many problems that are pointed out. At the same time, it provides a functional definition of organizational change[6]. And, because it covers all aspects of organizational change, it can be used to categorize the multitude of change-models that only cover specific areas of change. Models that cover all aspects of change are rare, but one whose functional nature and wide scope allow it to accommodate the full spectrum of change models is particularly exceptional. This is the strength of the 3D-model.

The model postulates that three dimensions of

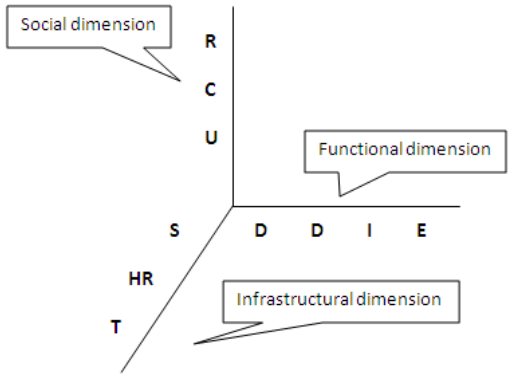

Figure 1: The 3D-model of episodic organizational change.

aspects are involved in any episodic organizational change: a functional, a social and an infrastructural dimension. The functional dimension is concerned with the actual change in the infrastructure of the organization. It is where the problem (or other reason for change) is diagnosed, and a solution is designed, implemented and evaluated. These steps form a regulative cycle (Vennix, 2004) and can be found in any change process or model, implicitly or (more often) explicitly.

"Any human system, cybernetic or not, must be operated by people who both understand it and agree with one another to operate it" (Howard 1995, p.267). This is why the model also contains a social dimension. It harbors the aspects relating to the acceptation and integration of the infrastructural change into the behavior of the organization members. This is equally necessary, since organizations "possess human and social aspects and depend for their viability on the establishment of shared understanding among their members about the goals to be pursued" (Jackson 1989, p.411). In other words, the behavior of any organization is realized by the behavior of its members. Therefore, if an organization is to change its ways, its members need to change their ways. They not only have to accept the changes, but also to integrate them in their behavior. Achterbergh and Vriens

[5]The (in)famous 18th century German baron, who – according to his own telling – once extricated himself (and the horse he was sitting on) from a swamp in which they had nearly sunk, by pulling them up by his own hair.

[6]Taking all three dimensions together will yield a complete definition of organizational change in terms of which functions need to be performed, e.g. a functional definition.

use Schein's three-stage model of the change process (unfreeze, change, refreeze) to explicate these steps.

The third and final dimension of organizational change is the infrastructural dimension. It deals with the design of the infrastructure of the intervention project, through which the functional and social goals may be attained. This means that the infrastructural dimension is itself not a goal-directed dimension, but rather it is concerned with the attainment of the goals specified in the other dimensions. It does this by specifying the types or categories of means for achieving the functional and social goals. The first of these is 'structure': any conscious change effort needs to be organized in some way (needs an 'organizational structure' or division of labor of its own). Secondly, HR-measures need to be specified which are used to stimulate or dissuade behavior, including the role (if any) of external consultants and upper management. And thirdly, technologies have to be specified for communication, research, modeling and problem solving. This simply means that some decisions have to be made about how the project is going to be communicated to its members and those around it, and in what way the problem or project is going to be tackled. Together, these three infrastructural aspects provide "the conditions under which organizational processes can be executed and regulated, so as to achieve specified goals" (Achterbergh & Vriens, p.19).

Notice that even though this dimension is concerned with the realization of the functional goals of the other dimensions, it is itself also functional: it does not prescribe any specific method for achieving goals, it only specifies the functional prerequisites for the execution of any change effort. The 3D-model as a whole does not prescribe anything in terms of methods – like many system theoretical models, it only systemically reviews its subject of analysis in terms of functions that should be fulfilled. Each of the dimensions will now be discussed in more detail.

The functional dimension

The functional dimension offers a "general 'calculus' for any intervention based on cybernetics" (Achterbergh and Vriens 2008, lecture slides) and has four subgoals: diagnosis, design, implementation and evaluation.

Diagnosis

The first functional subgoal is *diagnosing* the problem or reason for change. This diagnosis is done in terms of variables and parameters and consists of three logical steps: a problem analysis, an analysis of the causes of the problem, and the formulation of possible solutions to the problem (Achterbergh, Vriens, and Doorewaard 2009, p.21).

During the problem analysis, the relevant (problematic) diagnostic variables (DV) are specified. These can be anything from 'amount of profit' to 'percentage of female employees'. The next step is determining the range of values that are acceptable for the DV's - their desired values. After that, the actual values of the variables have to be measured. This allows one to determine the difference between the desired and actual values of the variables, which is what defines the problem.

Now that the problem has been specified, its cause has to be investigated. Step one is to determine which parameters (P) negatively influence the value of your DV's. The value of parameter 'amount of sales' could be too low, for instance. Just as with the DV's, the range of acceptable values for the parameters has to be established and compared with their actual values to distill the error-value. You then know which parameter-values are problematic and have thus analyzed the cause of the problem.

Armed with this knowledge the final step of the diagnosis can be undertaken: mapping possible solutions. Obviously, not all parameters capable of influencing your DV's are amenable to regulation. A world-wide recession can be quite detrimental to certain variables, but a solution like 'solve world-wide recession' seems overly ambitious. In other words: only parameters that fall within your regulatory perimeter should be considered for adjustment. These present possible problem solutions.

Diagnosis in a nutshell: define which variable is out of line, determine which parameters are responsible and think about which of these these parameters can be influenced. These steps are all

completely obvious and seem trivial, but explicating them will clarify your objectives for change – a proper diagnosis is of the utmost importance for the success of an intervention.

Design

Once the diagnosis has been completed, yielding knowledge of which parameter-values are problematic and fall within the scope of regulation, a selection of regulatory actions to positively influence these parameter-values can be made – *design*. This phase consists of three steps: generating 'realizations' for each of the parameters, setting up combinations of realizations and finally selecting a proper combination to execute – the design.

For each of the problematic parameters, think of ways to improve their value. For example, if parameter 'amount of sales' has a value that is too low, an ad-campaign might be in order. Create 'realizations' such as these for each of the parameters. Next, assess whether realizations for different parameters can be used to enforce each other, or whether some realizations are beneficial to multiple parameters. An ad-campaign, for example, can also be beneficial to the parameter 'corporate image'. In other words, if you have multiple problematic parameters, it may turn out that some realizations are beneficial to several of them. Some realizations could also be at odds with each other, such as 'cut back on quality control' and 'appeal to higher market segment'. Appealing to a higher market segment usually requires your products to be of excellent quality, so even though individually they can be perfectly suited for their purpose, simultaneously implementing both these realizations may not be a such good idea. In order to avoid such problems, meaningful combinations have to be created from the complete set of realizations. These combinations should consist of realizations which are not in opposition to each other, and possibly even enforce one another. The next step is assessing each combination's relative impact and efficiency. Predictions have to be made as to the degree to which the combinations can improve the various problematic parameters, and at what cost. Finally, using these assessments, identify the set of realizations that is most effective or efficient at improving the problematic parameters to their desired values. This is your design.

Implementation

The purpose of the implementation phase, is to properly implement the design. As with diagnosis, variables and parameters are used to partition and measure progress. To start with, implementation variables have to be chosen which define what a 'proper implementation' consists of. These obviously depend on the realizations included in the design. For example, if the design has 'issue ad-campaign' as one of its realizations, implementation variables such as 'quality of ad-design' and 'amount of exposure' become relevant. Again, as before, the norms and actual values for these variables have to be established. If the implementation variables are within their norms, the realizations have been properly implemented. Therefore, any difference between the actual values and the desired values of these variables, defines the 'implementation gap' – the effort that has to be undertaken during the implementation phase.

In order to close the implementation gap, *parameters* which influence the values of the implementation variables, have to be identified and controlled. For example, 'number of views' is a parameter which influences the value of the implementation variable 'amount of exposure'. Again, the norms and actual values of the parameters must be established, which will expose the error-value. This is the difference between their current value, and those values which will let them influence the implementation variables in such a way that they reach their desired values. As such, the elevation of the implementation parameters to their desired values defines the *implementation plan*. The last step in the implementation phase is to execute said plan.

Evaluation

The goal of the final phase of the functional dimension is to investigate whether the execution of the implementation plan has caused the DV's to return to their desired values. Once more, measure

the difference between the actual and norm-values of the *DV*'s and see if the situation has improved. In other words: assess if the gap between the *DV's* actual values and their desired values has been reduced. Next, investigate whether the implementation variables are within their norm-values. An understanding of the success of the intervention in terms of both the content (change in *DV*'s) and process (change in implementation variables), allows for an assessment of whether the intervention has been successful and whether the implemented design contributed to that. If both sets of variables are within norms, one can suspect that the implementation of the design had something to do with the improvement of the *DV's*. But obviously, no causal connection can be established through such a test. It could also turn out that the implementation variables are within their norms, but that the *DV's* are not. Apparently, in that case, either the design had the wrong realizations, or the chosen implementation variables are not proper indicators of the successful implementation of the design. If, in the end, the *DV's* are not within their norms, the problem persists. In that case, return to the diagnosis and repeat the process, using the knowledge that the evaluation has yielded. It might be, for instance, that different *DV's* must be chosen, or that different choices have to be made concerning realizations. Continue this cyclical process until all diagnostic variables reach their desired values, and the problem has been solved.

The social dimension

Diagnosing, designing and implementing a change in the organizational infrastructure, the functional goals of the change process, necessarily relies on changes in the behavior of the organizational members. If organizational members do not change their behavior, it is senseless to speak of any 'implementation' of realizations. Thus, the functional goals have to be *accepted* by those organizational members involved in the change, and the changes must be *integrated* in their behavior. This process can be understood "using Schein's (1987) theory. The benefit of this theory is that goals and 'psychological mechanisms' are formulated which result in a plan for realizing acceptation and integration" (Achterbergh & Vriens, p.20).

The first step of this plan is to '*unfreeze*' rigid behavioral patterns – a "motivation and readiness to change" (Schein, p.94) has to be created. For this to happen, three conditions have to be met:

Disconfirmation or lack of confirmation – people have to understand that some variable is not within its acceptable bounds.

Creation of guilt or anxiety – some form of personal commitment to the problem has to be created for someone to actually do something about it.

Provision of psychological safety – people have to feel reasonably safe from humiliation and loss of self-esteem for them to admit their previous behavior was detrimental and should be changed.

When these conditions are met, people are ready and motivated to abandon their previous routines and change their behavior.

The *change*-phase entails "helping the client to see things, judge things, feel things, and react to things differently based on a new point of view" (Schein, p.93). This new point of view can be obtained either by identifying with some role model (which could be a particular manager, a consultant, a co-worker, etc.) or by 'scanning' the environment in general and ascertaining new axioms for behavior.

Once new behavior has been accepted, anchoring it in routines is critical for it to have a lasting effect. For this reason, the *refreeze*-phase aims at "helping the client to integrate the new point of view" (Schein, p.93). Integration should take place at the personal level, where the behavior is brought into harmony with people's self-concept, and at the interpersonal level, where people in significant relationships start to share the new point of view.

Once the three subgoals of the social dimension – unfreeze, change and refreeze[7] – have been realized, acceptation and integration of the organizational change has been successful.

[7]The Lewin-Schein sequence of unfreeze-change-refreeze is specifically suited for episodic changes (the subject of the 3D-

The infrastructural dimension

The infrastructural dimension contains aspects concerned with creating an infrastructure for realizing the functional and social goals of the intervention. Three areas of concern are identified: the 'organizational structure' of the intervention, HR-measures and technology.

Organizational structure

Any intervention needs a plan specifying who will be involved (and in what role), but also how long the intervention shall take, and what its impact or scope will be. In other words: "the structure of the (temporary) organization to realize the intervention" (Achterbergh and Vriens 2008) must be decided upon. Some of the more common frameworks for change have been listed and characterized by Van Amelsvoort (1998). Those who seem specifically suited for episodic change include the expert-approach and the collective approach. The first of these focuses on heavy external influence from an expert who changes the organizational infrastructure 'from the outside'. In situations where little internal expertise is present, or where internal interests have created a stalemate, such an approach can be appropriate. The collective approach, on the other hand, is a very participative structure, in which large groups of organizational members work together to reach consensus on the required infrastructural changes. Although this approach avoids most of the disadvantages of the expert approach (low levels of acceptation, and usually a narrow focus), it has its own problems: reaching consensus may take a very long time, and the nature of the method places restrictions on the maximum size of organizations in which it can be realistically executed.

These approaches seem well-defined, and may very well suit an episodic change. However, in all actual change processes, the social and functional goals must dictate the way in which the change infrastructure is set up. No one single predefined framework may be suited for the job. The 3D-model, being functional, does not prescribe a specific structure, but merely states that choosing a structure is a required function of an organizational change process.

HR-measures

Several HR-measures have to be aligned with the functional and social goals of the intervention. First of all, the reward-system has to be adjusted to stimulate change. There are many different options for doing this. One could offer extrinsic rewards such as money, which can either be offered up front in the hopes of stimulating the new behavior (Wruck 2000) or afterwards when the change has been successfully implemented (Ledford and Heneman 2000). Intrinsic rewards may also play a major role, and this has to be considered. Also, the type of leadership required for an intervention has to be assessed. Again: there are many options. Choices have to be made between providing a charismatic leader who actively 'guides the troops' (Conger 2000), or one who takes a more supportive role and lets the intervention 'play out' (Bennis 2000). Lastly, decisions have to be made about the role (if any) of an external consultant. Will he take the role of 'expert' and focus on content, functionality and creating a conceptual framework in which to proceed? Or would a 'facilitator-type' (supporting people in drawing their own conclusions) be more fitting to the intervention? Obviously, any intermediate version of consulting could also be considered.

Technology

The last category consists of the technologies used for communicating, researching, problem solving and modeling during the intervention. Neither the

model), whereas in continuous change, "a different mindset is necessary" (Weick and Quinn 1999, p. 379). Marshak (1993), for instance, believes that where change is already happening continuously, 'freeze-change-unfreeze' would be more appropriate. Still, the sequence in which the social subgoals appear in the 3D-model is not necessarily rigid. The linking of these goals to the functional subgoals can be done in multiple ways, thereby accommodating different views on the acceptation and integration of change.

organizational structure of the intervention nor the HR-measures prescribe any specific way of going about realizing these aspects, and since they are a necessary component of any change effort a separate category is justified. Any kind of intervention-technique and way of thinking about intervention can be given a place in this category. In fact: the 3D-model itself is a way of modeling an intervention.

It is important to note that all of the aspects of the infrastructural dimension are subject to change during an intervention. As the functional and social subgoals develop, it is quite possible that the infrastructural elements need to be re-established for the intervention to remain on course.

The essence of the 3D-model has now been explained. Before we go on to the VSM however, a short recap is in order. In the introduction, I claimed that the VSM cannot be used during post-diagnostic phases of organizational change, due to its functional nature. How can a model that only tells us which functions should be effectuated, help design a solution to an organizational problem? Designing a solution involves acting on theories of how certain actions or infrastructures influence the effectuation of a function, and such information is not available from just the VSM. To prove my claim, I set out to carefully answer this question: *to what extent can the VSM be used as a tool for organizational change?*

In order to answer this question, two important concepts needed to be established:

1. Organizational change.
2. The VSM.

Then, given an understanding of both organizational change and the VSM, step three can be taken:

3. Investigate to what extent the VSM can function as a tool to support organizational change.

At this point step one has been taken. The 3D-model provides us with a functional definition of organizational change. This gives us a baseline against which to test the VSM for its suitability to support change. Moreover, because the 3D-model is a functional model, investigating the usefulness of the VSM as a tool during change can be very direct. If one wants to know whether something can be used as a tool, knowledge of the function the tool should perform is essential. The 3D-model provides a functional definition of organizational change, which defines the exact function a tool for organizational change should perform. This is why the 3D-model offers a perfect frame of reference to test models (e.g. the VSM) for their suitability to act as a tool for organizational change. Before this can be done, however, step two needs to be taken: understand what the VSM is. This is the subject of the following section.

THE VSM

The *Viable System Model* has been created as a model for "the structure of any viable system" (Beer 1979, p.114), where viability is defined as "being able to maintain a separate existence" (Beer 1979, p.113). The 'structure' of the system is specified in terms of functions that are performed. Furthermore, Beer claims that his model contains both the *necessary and sufficient* (Beer 1979, passim) functions for viability. For an organization, this means that if it properly performs all of the functions of the VSM, it should be able to maintain a separate existence.

Beer has identified five functions (or systems) that, together with their interrelations, make up the VSM. He starts by making a logical division between types of functions: operational functions (one through three) which are concerned with the realization of current organizational goals, and metasystemic functions (three through five) for adapting these operational goals. Together they describe an entity that is able to realize and adapt its goals – to survive. I will describe the functions in more detail momentarily, but first, a very important cybernetic principle has to be introduced: complexity.

Each of the functions is designed to deal with and absorb complexity stemming from operational and environmental variability. Complexity is measured as the *variety* a system can display, or "the num-

ber of distinguishable systemic states" (Beer 1984, p.10). Ashby's Law states that "only variety can destroy variety" (Ashby 1957, p.207), thus the variety of regulatory actions (or systemic states) must at least match the variety of incoming disturbances. If it does not, there are disturbances to which the organization cannot react. So, in order to 'destroy' (deal with) the environmental variety, internal variety must be amplified to match it. Alternatively, measures to attenuate incoming variety could also be taken. In conjunction, these attenuating and amplifying measures try to accomplish a balance between disturbances and regulatory actions. A system is stable if it can react to all disturbances it may encounter. So, if an organization is to cope with the vast number of possible states of its operation and environment, it should create ways of attenuating incoming variety and amplifying its own variety.

The VSM's core principle is complexity attenuation and amplification between the functions, and between the functions and the environment. All of the interactions between the functions are constructed with this principle in mind. However, the most important attenuating element of the VSM is that it is a *recursive* model. Each primary function of a viable system is in turn itself a complete viable system, containing each of the five functions. Such a system should be able to absorb all complexity stemming from its environment and internal operations – and as such be 'variety neutral'. A system on a higher level of recursion, containing this system as one of its primary functions, will therefore not be burdened with this 'lower level' complexity. The only complexity with which systems two through five of this higher-level system will have to deal is the complexity stemming from the interrelations between the different primary functions (systems) contained within its system one. In other words: only variety that is metasystemic to system one needs to be 'destroyed' by the other (metasystemic) systems. This is an extremely powerful mechanism for complexity attenuation, and an essential characteristic of the VSM.

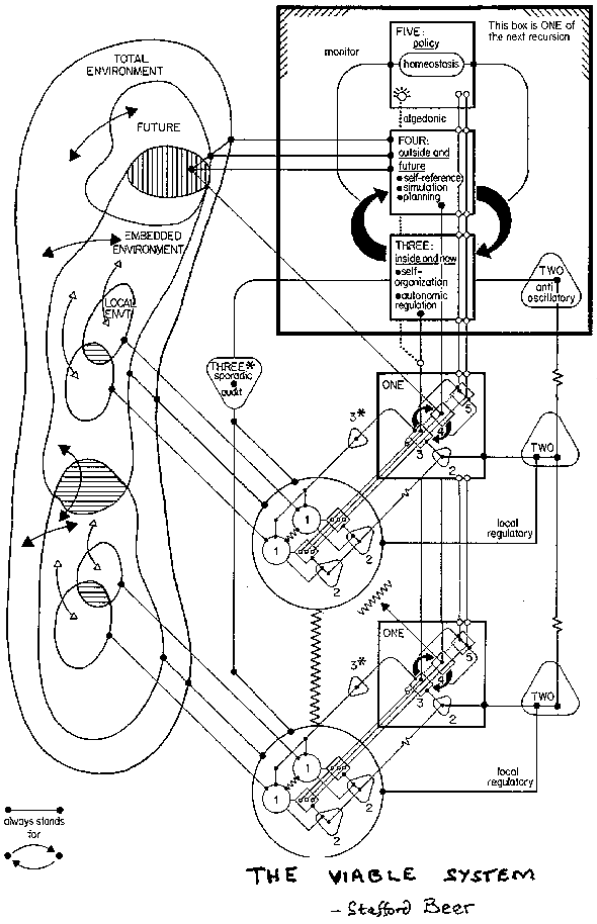

Figure 2: An impression of the Viable System Model including interrelations between the functions. (Beer 1985, p.136).

Function One: Primary Activities

Function one is defined as the collection of primary activities (each of whom are, by themselves, also viable systems) of a system in focus. They are the transformation processes by which the organization or system defines itself. For a bakery, 'baking and selling bread' would certainly be among them. Similarly, a bank would have 'manage bank-accounts' and a library 'providing books' as one of their core activities. These activities "realize the identity of the vi-

able system" (Achterbergh and Vriens 2002, p.227). It is important to realize that all activities which directly concern a primary transformation are included into function one. In the library, for example, the buying of new books, keeping track of loans, passing out information about books, etc., are all part of system one.

If a system containing multiple primary activities is to remain viable, "it is necessary to forge the *manifold* of primary activities that have their own autonomy into the larger synergetic and cohesive *whole* of the organization" (Achterbergh and Vriens 2010, p.197). It is here that functions two through five step in.

Function Two: Coordination

Since each of the primary functions is a viable system in itself, no external regulation is needed as far as their internal operation is concerned. However, in a company with multiple primary activities, interdependencies between the functions may arise. These need to be controlled, in order to prevent dangerous oscillations – this is function two. Actually, "System Two has the highly specific function of damping oscillations, and nothing else. In fact, then, System Two is a **service** to System One." (Beer 1979, p.177)

What this means is, that function two should only concern itself with creating *constraints* for the various primary activities if these relate to their interdependencies, and should otherwise not attempt to control any internal mechanisms of the primary activities. As an example, imagine that the library also opens an in-house book store. It would then get a second primary activity: the selling of books. But now some interdependencies between these functions arise: they share the same building, the same staff and are likely sharing financial resources. In order to coordinate the allocation of these shared resources a second function is required, which is logically distinct from the primary activities themselves.

Function Three: Control

In order to ensure that the primary activities continue to contribute to the identity and well-being of the organization as a whole, something more than coordination is required. Their individual *goals* need to be monitored and controlled if needed. For example, imagine the library's in-house bookstore decides to start selling pornographic material to boost sales. As the library is a place for all ages, this obviously is not compatible with the organization as a whole. But from a book store perspective it may seem like a great business opportunity! One can see that the various primary activities need not only to be coordinated so as not to clash in terms of resource usage, but also to be monitored when it comes to their goals in order to make sure that the organization as a whole retains a certain unity. This is the task of system three, which is typified "by the synoptic systemic viewpoint from which it surveys the total activity of the operational elements of the enterprise"' (Beer 1979, p.202).

System three can either directly set and control goals for the primary activities or indirectly, using the coordination function which influences the constraints that are placed on the various primary activities. Information needed for system three to gauge whether or not system one is performing within the set boundaries can also come either directly from system one, or through the coordination function (system two).

Function Four: Intelligence

Whereas function three is concerned with the 'inside and now', function four is about the 'outside and then'. In order to survive, an organization needs to do more than properly execute what it already does. Attention has to be paid to the environment, so that organizational goals can be adapted to suit any changes that may occur. This is the function that initiates change in the organization – ensuring adaptation to its environment. It "produces knowledge about developments in the environment of the organization" (Achterbergh and Vriens 2002, p.228), which it then translates into suggestions for change in the goals of system one. These suggestions are presented to system three and tested for compatibility with current goals and operational restraints. If compatible they can then be marked as viable options for change.

Function Five: Policy

However, function one through four still leave residual complexity. To 'close the system' a final function is needed, one that controls the balance between systems three and four. If, in an organization, too much emphasis is placed on 'doing what we do best' (system three), a conservatism which can threaten the viability of the organization can take hold of the system. If, on the other hand, too much emphasis is placed on finding new opportunities and setting new goals (system four), an overly innovative environment can arise in which there is no chance of actually capitalizing on the systems' capabilities. Some kind of balance has to be struck, which is something that can neither be done by system three or four themselves, but requires a logically distinct function. This is the policy function, which "links intelligence to control and ensures that the organization (re)defines its identity in a way that fits developments in its environment as well as its own potentials" (Achterbergh and Vriens 2002, p.228).

It is important to note that, in order to comply to the complexity principles discussed earlier, system five should not expect to be fully aware of what goes on in systems three and four. They should be able to deal with their own complexity, and not transfer it 'upwards' to system five. The only thing that system five must regulate is the balance between the functions. As such, system five does not need a thorough understanding of both innovative plans or their effect on primary activities, but merely "a general insight in the organization's primary activity and its environment" (Achterbergh and Vriens 2010, p.203).

In a nutshell, then, the VSM's image of an organization consists of primary transformations occurring in system one, whose interdependencies are being coordinated by system two. System three sets and controls a coherent set of goals for the various primary activities in system one, and system four connects the system with its environment. System five, finally, keeps the balance between rampant innovation and stale conservatism. These logically distinct functions are, according to Beer, both necessary and sufficient for the system's survival.

Inter-functional relations

Beer not only introduces these five functions, but also extensively discusses their interconnections (communication and command lines). Figure 2 on page 10 provides an impression. These interconnections are important in the context of this paper, as they can provide some substance to the guiding influence of the VSM during diagnosis and design in organizational change.

Achterbergh and Vriens (2010, p. 205–215) provide a concise overview of these relations:

1. Direct commands and reports, and resource bargaining between control and the primary activities

This first relation follows directly from Function Three's *raison d'être*: ensuring that the primary activities continue to contribute to the identity and well-being of the organization as a whole. In order to do that, "the identity and mission of the organization as a whole should be translated into goals for the primary activities and the performance of the primary activities should be controlled" (Achterbergh and Vriens 2010, p. 206). Through setting goals for the primary functions and by monitoring their actions through regular, aggregated and standardized reports, control can ensure cohesion. If a deviation between the goals and actions of a primary function is detected, control can intervene by issuing direct commands. However, such commands should only be given if they relate to the cohesion *between* primary functions. No direct commands relating to the internal operation of the primary functions should be issued, as that would mean that control is absorbing complexity from system one; which should rightfully be dealt with solely by system one.

2. Audits of the management of the primary activities

To avoid the risk that the aggregate, standardized reports produced by System One misrepresent its

situation to System Three, this second relation between these two functions is needed. These audits bypass the management of the primary activities, and as such allow for "relatively detailed scrutiny of and communication about their actual operations and performance" (Achterbergh and Vriens 2010, p. 206). Audits should be carried out at irregular intervals, so as to avoid standardization and its associated risks. If organizational members know when an audit will take place, they could be tempted to temporarily change their behavior to be more in line with what they believe the auditors want to see. This will taint the outcome of the audit and should be prevented. If carried out well, these audits help control to maintain detailed knowledge of what actually goes on in the primary activities, thus avoiding the risk of estranging itself from the 'shop floor' (Achterbergh and Vriens 2010, p. 206).

3. Controlling the coordination function

The coordination function handles interdependencies between the primary functions. In order to do that, it needs axioms with which to assess the relative importance of requests for resources from the primary activities. These are provided by control. The goals set by control for the primary functions act as parameters which coordination uses for its operation. Also, control should set performance guidelines for coordination, restricting the amount of resources spent on coordination itself, or specifying an upper limit for losses connected with coordination problems (Achterbergh and Vriens 2010, p. 207). As with the setting of goals for the primary activities, the controlling of the coordination function should take place at regular intervals, and with a low level of detail.

4. Coordinating interdependencies between primary activities

The fourth relation is between Function Two, coordination, and Function One, the primary activities. In order to properly align interdependencies in system one, the coordination function should have continuous and detailed communication with the primary activities. Thus alleviating the complexity with which control is faced when it assesses the performance of the primary activities. This makes coordination as much a service to System One, as it is to System Three.

5. Generating finalized proposals for innovation

Functions Three and Four have to communicate continuously and in great detail about the realizability of plans for adaptation produced by intelligence. System Four cannot finalize these plans without consulting with control, as operational constraints need to be taken into account to prevent unrealistic changes. Together, control and intelligence produce finalized proposals for innovation which take into account changes in the environment, as well as the current state of the organization. These proposals can then be presented to Function Five (see relation 7).

6. Facilitating communication between control and intelligence

Communication between intelligence and control should be balanced (to prevent either conservatism or innovatism, see page 12), highly interconnected (in order to absorb the ensuing complexity of their debate), and allow for ample complexity (if it is to appreciate the intricacy of planning the future of an organization). If these conditions are met, the variability stemming from the debate between systems three and four can be quenched.

Obviously, neither intelligence nor control can be made to ensure that these conditions are met. The condition of balance, in particular, has to be controlled by a logically distinct function. Therefore, it is Function Five, policy, that should perform this task. If it properly facilitates the debate, it can "reap its benefits, the finalized plans for adaptation" (Achterbergh and Vriens 2010, p. 211).

Facilitating communication between intelligence and control should be a low variety activity. Policy should focus merely on the conditions ensuring a proper debate, not delve into the complicate matters comprising it. This is to prevent that complexity

Relation	**Related functions**	**Periodicity**	**Detail**	**Standardization**	**Focus on**
1. Direct commands and reports and resource bargaining between control and the primary activities	Control (F3) – Primary Activities (F1)	Regular intervals	Low	High	Management by exception of synergy of primary activities
2. Audits of the primary activities	Control (F3) – Primary Activities (F1)	Irregular intervals	High	–	Cross-checking the activities and reports of the management of the primary operations
3. Controlling the coordination function	Control (F3) – Coordination (F2)	Regular intervals	Low	–	Contribution to overall synergy by coordination
4. Coordinating interdependencies between primary activities	Coordination (F2) – Primary activities (F1)	Continuous	High	Low	Supporting interaction between primary activities
5. Generating finalized proposals for innovation	Intelligence (F4) – Control (F3)	Continuous	High	Low	Balancing and integrating proposals for innovation and potentials for change into plans shaping the organization's future
6. Facilitate communication between intelligence and control	Policy (F5) – Intelligence (F4) and Control (F3)	Continuous	Low	Low	Balancing, interconnecting, and amplifying intelligence and control
7. Consolidating proposals for innovation	Policy (F5) – Intelligence (F4) and Control (F3)	Irregular intervals	Low	Low	(Re)defining the organization's identity and strategy

Table 1: Interconnections between functions of the VSM, adapted from Achterbergh and Vriens (2010, p. 208 & 212)

which should be dealt with by intelligence and control 'leaks upwards' to policy.

7. Consolidating plans for innovation

The final relation is between function five, and functions three and four. Its existence is a direct consequence of function five's task of giving 'closure' to the discussion between intelligence and control. Using its general understanding of the organization and its environment, policy evaluates the finalized plans for innovation and decides upon a course of action. As such, policy oversees the adaptation and realization of the organization's identity. The decisions have to be communicated to both system three and four, hence this relation.

Policy should be well aware that its decisions are based on input that is highly aggregated. And rightfully so! Policy is not equipped to deal with the complexity of producing these plans, as control and intelligence are. Rather, policy should focus on facilitating the debate between control and intelligence so that the finalized plans on which it bases its decisions are the product of a debate that meets the conditions specified earlier.

Clearly, consolidating plans for innovation is not something that happens on a frequent basis. This relation is one of low variety and of low frequency. In fact, "communication should focus on essentials and only take place if considered opportune by intelligence and control. A highly interconnected intelligence and control function should do the real work" (Achterbergh and Vriens 2010, p. 209). Emphasis is placed, again, on the notion that policy should not get involved in producing the plans, but merely focuses on consolidating them.

Together, relations one through seven form the 'nervous system' of a viable enterprise. Table 1 on page 14 provides a summary. The first four relations are between functions realizing an organization's goals, the last three between those adapting them.

The major outlines of the VSM have now been addressed[8]. We have seen how the model describes the necessary and sufficient conditions for the viability of a system: by specifying the functions that need to be performed, as well as the required interconnections between them. In the next paragraph, I shall provide a brief recap of the article so far, and describe the methodology I used for the combination of the two models that were introduced. Before I get to that, one last line of communication – the importance of which is stressed by Beer – has to be introduced: the *algedonic mechanism*. Beer describes the risk of a 'lethal calm' overtaking a system. If all goes well, the policy function should have very little to do. If such a situation persists for a long time, chances are that the system 'falls asleep' and becomes insusceptible to new problems that are arising. To prevent this, Beer believes that a possibility should be created for the transmission of crucial problems straight to system five. "At that level, action may then be taken to deal with the problem" (Achterbergh and Vriens 2010, p. 213). This 'pain stimulus' should provide system five with the information it would otherwise be lacking, and prevent fatal lethargy. The addition of this final mechanism concludes Beer's list of required relations between the functions of a viable system.

METHODOLOGY

Now that the 3D-model and VSM have been introduced, the actual investigation of the usefulness of the VSM as a tool for organizational change can begin. In this paragraph I will describe the methodology I used.

But first: time for a recap. The main point of the article is that the VSM, on account of it being functional, cannot be used during post-diagnostic phases in organizational change. In order to substantiate this claim, an analytical investigation relating organizational change and the VSM is undertaken. Two preliminary questions needed to be answered before such an investigation could get started: (1) 'what is organizational change?' and (2) 'what is the VSM?'.

[8]For a much more detailed exposition, see (Beer 1979).

(1) The 3D-model provided an answer to the first question, by providing a functional definition of organizational change. Recall that the 3D-model consists of three dimensions, each of which contains several aspects. Together they form a functional model of organizational change – they describe what has to be *done* in order to achieve change in an organizational infrastructure.

The first dimension is the functional dimension, containing aspects concerning the actual change in the organizational infrastructure. These formed a regulative cycle: diagnosis of the problem, design of a solution, implementation of that solution and, finally, evaluation of the solution and implementation. In order to clearly identify the problem and its causes, variables and parameters are identified which explicate the relevant issues.

The social dimension specified the functions required for acceptation and integration of this structural change, by the members of the organization. In order to achieve acceptation and integration three conditions have to be met: unfreeze, change and refreeze. During the unfreeze-phase members of the organization learn that there is a problem, and that they are involved with it somehow. Also, their psychological safety is ensured, so that they feel free to admit their contribution to the problem. During 'change' new behavior is learned, either from a role-model or by scanning the environment. Lastly, during 'refreeze', the new behavior is fixed into personal and interpersonal relations and routines, thus ensuring a lasting effect.

The final, infrastructural, dimension deals with the realization of the functional and social goals. It specifies types of means to realize them, requiring questions such as 'who will be involved?', 'how will we use HRM-measures' and 'how will we communicate the goals?' to be addressed.

Together, the three dimensions specify the functions that are necessary and sufficient for organizational change. If all of these functions are performed to a satisfactory degree, organizational change will happen. It is what organizational change consists of.

(2) Next, the VSM was discussed. Just like the 3D-model, it is a functional model. It describes the necessary and sufficient conditions for a system to survive in terms of the functions (and their interconnections) that need to be performed. Both models focus on the *structure* of organizations. The VSM describes structure in terms of functions, and the 3D-model describes the conditions under which change in an organizational infrastructure is possible. So we have two functional models aimed at the organizational structure - one that sets viability constraints and one that defines change.

Now, the question is: how can the first be used during the application of the second? In order to answer this I will attempt to project the VSM onto the 3D-model. In other words: I shall try to place insights from the VSM on the different axes of the 3D-model to see what aspects of organizational change can be guided – and to what extent – by the VSM.

A more specific way of looking at it, is to see the VSM as a 'technology' which can potentially be used during organizational change. This is because, from a 3D-model point of view, the VSM is a kind of technology. It is an instrument for structuring the change-effort which can provide insights into the infrastructure and viability of the organization. It is a specific realization of the technology-function on the infrastructural dimension. Remember that one of the functions from the 3D-model, related to creating the conditions in which change projects could be executed, was the choice of technologies for communication, research, modeling, etc. The VSM is actually a choice of modeling and research technology. My combination-effort can therefore be more specifically described as follows: I insert the VSM into the 3D-model on the infrastructural axis under 'technology' (see figure 3 on page 17). Then I assess how this influences the other infrastructural categories as well as both the functional and social dimensions. For every dimension and aspect, I will assess whether the use of the VSM as a technology has consequences. This will clarify what the VSM can and cannot contribute to an episodic organizational change.

To achieve this I will sequentially discuss each of the dimensions and categories of the 3D-model and determine the VSM's relevance for every one of them.

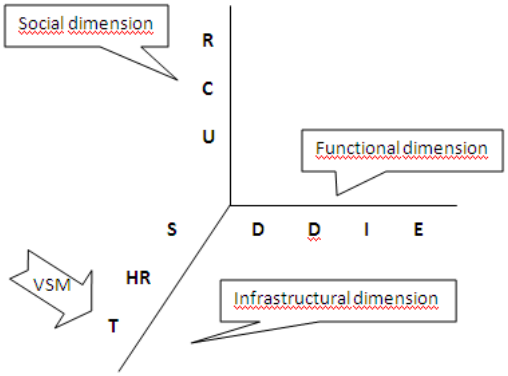

Figure 3: VSM as a technology on the 3D-model

My findings will be based primarily on Beer's own work (as it is, he has some authority when it comes to the VSM), but other – more recent – work will also be involved. However, when it comes to conceptual combination of the models, I will not stray far from Beer and his original, analytical, version of the VSM. *That* is the model which I want to test for its usability in change efforts. Any additions by other authors may inadvertently imply specific design requirements (as opposed to functional requirements), that could taint the outcome of the investigation.

THE VSM vs. THE 3D-MODEL

Now for the actual examination of the VSM's suitability to guide organizational change, using the 3D-model as a testing ground. My method has been described above, which I shall execute using the framework of a question. For every function that is part of organizational change, as specified by the 3D-model, I shall ask: *to what extent can the VSM contribute to its realization*? For example: the social dimension starts with 'unfreeze' (see page 7). Several conditions have to be met in order for organizational members to be 'unfrozen'. So I will ask: to what extent can the VSM be used to create the conditions under which 'unfreezing' can take place? I will look for an answer in Beer's writings as well as in case descriptions from researchers who have used the VSM during organizational change. Every aspect on each of the dimensions of the 3D-model will be discussed in similar fashion. This means that, in the end, the VSM's full potential to contribute to change in organizational infrastructures will have been examined.

The functional dimension and the VSM

The functional dimension focuses on the actual change in the infrastructure of the organization. As we know by now, a regulative cycle of diagnosis, design, implementation and evaluation is used to describe the different functions that have to be realized for the structural change to be realized.

Diagnosis

As I've already pointed out in the introduction, there seems to be an obvious opportunity for the VSM to be of service during this phase. As Beer puts it: "the approach to a fresh enterprise is essentially diagnostic" (Beer 1979, p. 447). The VSM provides a functional definition of an organizational structure, containing necessary and sufficient conditions for its survival. If we want to diagnose an infrastructure, those conditions provide helpful guidelines against which to test it. The diagnosis consists of three parts (see page 5): problem analysis, an analysis of the causes of the problem and the formulation of possible solutions to the problem. To what extent can the VSM be used during each of these?

Problem analysis

We need to take a step back for a moment, and realize the conditions of the scenario that has been created. The idea is that we want to effect an episodic, conscious change of an organizational infrastructure (its division of labor, HRM-policies, and technologies). The 3D-model specifies what has to be done in order to realize that. The functional axis of the model, which is where we are now, concerns itself with the actual change in the infrastructure. Now, the first step is a diagnosis of the 'problem' (or rather: of the subject of the intervention) which begins with a problem analysis. The goal of this analysis is to

identify and measure the variables that accurately describe the relevant aspects of the subject of intervention, in this case an organizational infrastructure[9].

"And it is at this point that the model [VSM] becomes useful as a diagnostic tool" (Beer 1979, p. 225). It defines the functions that need to be performed by an organization. Functions that are both necessary and sufficient for survival. This means that if we check to what degree these functions are being performed, we get an excellent overview of the status of the infrastructure in all relevant aspects. Taking this into account, the diagnostic variables for the organizational infrastructure take the following form:

> The degree to which function x is performed.

Any one of Beer's five functions can be substituted for x: primary activities, coordination, control, intelligence or policy. This is not the whole story, however. A variable such as that cannot possibly be measured directly. What is needed is further operationalization of the variables. They need to be 'split up' if you will. We need to ask: what does it mean for a function to be performed? What does that performance consist of? Answers to those questions will provide the more concrete variables whose values together constitute the value of the 'higher level' variable.

The VSM can, to a large extent, directly guide this process of operationalization. In fact, the relations between the functions (see page 12) make up a large part of what it means for the functions to be executed. The policy function, for example, consists, for a large part, in 'consolidating proposals for innovation' (relation 7 in table 1 on page 14). So actually, by describing the required relations between the functions, Beer starts off the process of operationalizing the functions into more concrete variables that can be measured.

However, the relations between the functions do not form an exhaustive list of what it means for the functions to be performed. Other, 'function-internal' aspects need also be represented. These can be extracted from Beer's extensive discussion of what the different functions entail. As an example one can look at Espejo (1989b), who, in his 1978 diagnosis of a small British company, used 'variables' such as "How apt is the organization in reflecting and deciding about its policy", "How likely is it that people in the organization will discover imaginative answers to cope with environmental threats and opportunities?" and "How likely is it that management will keep the organizational activities under control?". All of these questions directly relate to one of Beer's functions.

Note that the actual organization one is trying to change should not play a role in the operationalization of the variables. This is because a dangerous identification could arise of functions with specific persons or departments. For example, if a variable from the operationalization of the coordination function is 'Mr. Jones from scheduling should contact Mrs. Bagel from maintenance every time a new production batch is started' then something goes awry. This is *not* a functional variable (from the perspective of the organization), although it might reflect what is currently (part of) the execution of a function in a specific organization. Departments, employees, and divisions of labor can change, and although that has no effect on the functional requirements for viability, it completely renders operationalizations such as this example obsolete. So variables such as those should never feature as diagnostic variable, which guides and sets goals for an intervention. This phase is still purely about the functional requirements for organizations in general. Nothing in the VSM points at specific tasks for either mr. Jones, or Mrs. Bagel.

The next step in the problem analysis is to decide upon a norm for each of the variables. What range of values is acceptable for a given variable? Beer tells us what the *raison d'être* of each of the five functions is. The norm for each variable is the minimum level of performance, at which the function can be said to fulfill this reason for being. "The concern of the management cybernetician ... is to see whether the regulatory roles of the metasystem as defined are being discharged or not" (Beer 1979, p. 370). Clearly, functions are not either 'on' or 'off', but pinpointing the minimum level required

[9]There is a second option, which I will discuss at the end of this subparagraph.

is merely a practical problem. The VSM offers a set of functions and tells us what the effect of their execution should be. During an actual diagnosis, the researcher should ask: is this effect actuated? The answer should boil down to 'yes' – that is the norm.

After the diagnostic variables and their norms have been established, the next step in the problem analysis is measuring their actual values in the organizational infrastructure we're trying to diagnose. This is the final step of the problem analysis, in which discrepancies between norms and actual values of the diagnostic variables become apparent, i.e. the problem. Only now do we really involve ourselves with the actual organization. It is very important that, as a first step, the organization at hand is 'mapped' onto the VSM. The functions, which most likely are not neatly divided between actual departments, have to be identified. Or rather: the departments and people performing the functions have to be identified. Failing to do so leads to a risk of mis-diagnosis. For example, if one blindly identifies Function Two with, say, the P&O-department, and some of the coordination functions are actually performed outside that department (which is highly likely), then any value you measure for the diagnostic variables relating to coordination will be off. Considerably. Therefore:

> The mapping of actual organizations on to the VSM is a matter both of cybernetic technique and of profound knowledge about the particular organization under study. (Beer 1989, p. 338)

What is also very important, is that the mapping is done at the right level of recursion. Remember that the VSM is a recursive model, wherein each of the primary functions is a complete viable system in itself. And any viable system can be a System One for a higher level of recursion. So, for this mapping, the system in focus has to be determined. "The focus of our recursions is wherever our interest lies" (Beer 1979, p. 311). So we must ask: which system are we changing? Is it the entire organization? Or one of its primary functions? This obviously greatly effects the focus of the mapping. Also, during the diagnosis, the researcher must be acutely aware of the level of recursion on which the intervention focuses. If, at some point, data are considered that relate to either a lower or a higher level of recursion, then he or she should take a step back and assess whether or not the intervention is focusing on the right level. Beer provides an exemplary diagram of the idea of recursion in a company (Beer 1979, p. 315), and states that "in actual analyses of of actual institutions, such a diagram has often proven helpful" (Beer 1979, p. 313).

The mapping tells us who does what in terms of the VSM, which allows the diagnostic variables to be measured accurately. Now, we are able to assess to what level the functions are performed, i.e. to assign values to our diagnostic variables. Any variables that fall outside of their norm-values are then identified as problematic. Remember: it is not that they *indicate* the problem, they *are* the problem. The variables we used are the functions required for viability. Any function that is executed poorly is a problem.

It is at this point that the second option, mentioned at the beginning of this subparagraph (see page 18) comes to the fore. The entire method described until now used the VSM to directly supply the diagnostic variables. This approach forces the diagnosis to have a rather wide scope. One takes the VSM's viability conditions and starts diagnosing an organization without any specific focus. This can be fine, if one wants to do a general diagnosis, but usually, in practice, a researcher is presented with a specific organizational problem. In that case, it seems a bit awkward to ignore that problem (apart from using it to pinpoint the level of recursion at which to operate) and start a general diagnosis. Rather, the second option would be to directly use the problem as the diagnostic variable. For example: if the problem is a high level of absence, the diagnostic variable would be 'degree of absence', for which a norm and its actual value would have to be established. The variables supplied by the VSM (its functions and their operationalizations), would then act as possible causes (parameters) for this problem. Not as DV's. This way, the intervention is focused more on solving a specific problem, looking at how the values of the function-variables supplied by the VSM influence the

problematic parameter. Even in this case, however, the VSM's functions would have to be operationalized as described in this paragraph. And also: they would still require to have the causes of their values explained. Say, for example, that function two is found to perform below its norm, i.e. coordination is not functioning properly. Given the existence of certain coordination problems, this 'value' has been established. Unfortunately, this still provides no clue as to why these problems occur. The need to look for concrete (sub)parameters which influence the value of the VSM's parameters therefore remains.

From a 3D-model point of view, either option is fine. Depending on the situation one could choose for a general diagnosis, or work from a specific problem. In the remainder of this article, I will continue as if the VSM's functions function as the DV's.

In conclusion: during the problem analysis *the VSM can play a significant role*. It can supply the diagnostic variables (or higher-level parameters) and guide their operationalization (partially through the specified inter-functional relations). It can also supply the theoretical norms for the diagnostic variables (or higher-level parameters), and is used as a precursor during the measuring of their actual values. For that, the VSM is used as a 'blueprint' onto which the organization is inserted in order to be understood and in order for the DV's to become measurable.

Analysis of causes

Now that the problem has been identified, the next step of the diagnosis is to find its cause. The researcher must identify the parameters which influence the values of the problematic DV's. But while the VSM offers a guideline for the identification of the DV's, it cannot help in establishing these parameters. They will have to be identified by the researcher using his understanding of the organization or using input from other models. This follows necessarily from the functional nature of the VSM. It does not cover the relation between concrete realizations on the one hand, and the functions on the other hand. And exactly because such a link is not provided, the VSM cannot contribute to an analysis of the causes of problems, which is specifically concerned with this link.

For example, suppose a problem has been found in the execution of Function Three: the primary functions have lost their cohesion and are no longer contributing to the organization as a whole. The reason why this is so has to be discovered by the researcher, e.g. the in-house bookstore at the library starts selling pornographic material. The VSM itself does not prescribe that no pornographic material should be sold in libraries. Through explicating that there is something like a 'control function', the VSM could help spot and categorize the parameters, but other than such indirect help no use can be made of the VSM in this phase.

In the end, the researcher must look elsewhere for input, while he identifies the parameters and decides upon their norms. Using those norms and the actual values of the parameters, problematic parameters can be identified. These are the causes of the problem.

Possible solutions

After discovering the problem and its causes, a researcher must critically examine the set of causes in order to select those which fall within the regulatory capacity of the organization or intervention team. Any parameters which cannot be influenced do not qualify as possible solutions.

This is a specifically empirical matter, in which the VSM has no say. The only thing for which the VSM might be used is to categorize the different problematic parameters so that it is clear for which function or inter-functional relation they cause a problem, but that has nothing to do with the question of whether or not they lie within reach of an intervention. So actually, the VSM can be of no real use during this phase.

Design

Once the problematic parameters which are 'actionable' have been identified, the diagnosis is over. It is time for the *design* of a solution. Creating this design

must consist of conceiving 'realizations' for each of the parameters, setting up meaningful combinations of realizations, and finally the selection of a combination of realizations to execute (see page 6). In other words, the researcher has to think of different concrete ways in which the values of the problematic parameters from the suggested solution can be made to conform to their norms.

How does this translate to the VSM? Quite frankly, *it does not*. Seeing as how the VSM is a functional model only, it contains no specific design rules for organizations; it does not "specify the relation between the design of the organizational infrastructure and the behavior of the essential variables" (Achterbergh and Vriens 2010, p.214). It is because of this, that the VSM could not contribute to identifying the parameters that influence the diagnostic variables, and can certainly not be of help in finding ways (realizations) to change the values of concrete parameters during an intervention. The boxed text on page 21 provides a nautical analogy to clarify this point.

On multiple occasions in *Heart of Enterprise* and especially in *Diagnosing the System*, Beer misleadingly uses the term 'design' in relation to the VSM. When discussing the interactions Function Three must have with Systems One and Two, to give an example, he writes "in this way [through the relations] is Ashby's Law vindicated by good design" (Beer 1979, p. 211). And again, while describing the properties of the regulatory system: "Thus in designing a regulatory system for any given situation, the first rule is to follow every significant loop through the systemic diagram, applying the variety rules that have been elucidated" (Beer 1979, p. 390). These all appear to be instructions for the "design of organizations that take account of the law of requisite variety" (Beer 1979, p.92). In fact, the whole of *Diagnosing the System* is an exposition of how to use the VSM to "design and diagnose" (Beer 1985, p. ii) an organization.

Imagine you're the captain of HMS Variety, and the first lieutenant tells you the ship has sprung a leak. This calls for an intervention in the 'infrastructure' of the ship! Fortunately, you've brought along a functional model containing the necessary and sufficient functions for ships: the Viable Ship Model. It contains functions such as 'the system should float' and 'the system must be capable of propulsion'. Using this model, you graciously produce a diagnosis *of the problem: 'the functional model tells us that our ship should float, and it's failing to perform this function'. From the disgruntled looks of your subordinates, you quickly deduce that this information was not very helpful. Perhaps the* design *of a solution would be more appropriate at this stage. During the diagnosis, you've learned the cause of the problem: the value of the parameter 'hull integrity' is below its norm, on account of there being a hole in the hull. 'We should fix the hull, to such a degree that it allows our vessel to remain afloat!', you exclaim. 'That's simply a paraphrase of the outcome of the diagnosis', your crewmen shout out, 'give us an actual realization for fixing the problematic parameter!'. What they mean is that they want to know which material to use for repairing the hull. At this point, the VSM can help you no further. It helped you understand what was wrong, but it tells you nothing about which materials allow for buoyancy, and which do not. Without specific design rules, Captain Cybernetics cannot save his ship...*

What Beer does on these occasions is *not* providing concrete directions for the design of an organizational infrastructure. He merely points out that any design should allow for the critical functions to be performed. There is a crucial difference between designing a system with certain functionalities in mind, and using a model as a direct source of concrete realizations. Doing the former may very well help 'design' an organization, but only through 'backwards reasoning'. By selecting an infrastructure, and then

going back to the VSM to test it using the model's criteria[10]. This does not allow one to say that it was the VSM which provided this concrete design cue, merely that through trial and error, some link between a certain design and a diagnostic variable was discovered. So in a way the VSM can be used during the 'design' of an organization, but only in a 'diagnostic sense'. If you look at the process of designing an organization as a regulative cycle of diagnosis, design, implementation and evaluation[11], the VSM can only play a role during the 'diagnosis of the design' – i.e. it can supply "the functional requirements needed for organizational design" (Achterbergh and Vriens 2010, p.215). During the design phase it can be of no help – just like it can be of no help during the design phase in the regulative cycle of intervening in the organization.

This is a very important point, which I believe causes major misconceptions about the applicability of the VSM. I'd like to clarify it further by introducing a distinction between uses of a model:

Model as model This is the classical use of a model. From art class to cybernetics, models are used to depict some image or functionality which the product of your design should mimic as closely as possible. It is an ideal image of the product one wishes to recreate, but confers no information about *how* to create it. A nude model will not be actively instructing painters on how to paint her. Likewise, to the extent that models are functional, they can only act as model-models: they only specify what the product of design should do (or: look like), not how one should go about constructing it. For example: a functional model of a telephone would include functions like 'allowing the user to transmit his voice to other telephones'. This is crucially different from 'allowing the user to transmit his voice to other telephones, by using radio waves'. This last instruction includes a design rule – a rule which tells a designer something (albeit not much) about the way in which he should realize the specified function. But a purely functional model can do no such thing.

Model as instrument Rather than depicting an end-state, models can also function as an instrument for realization. Art students have knowledge of different methods of sculpting, while in cybernetics, authors like De Sitter (1998) provide extensive models containing design rules for organizational infrastructures. His model specifies how division of labor should be designed, in order to make cybernetically sound organizations. His design rules are *aimed at* functional cybernetic principles, but they go on where the VSM stopped: they describe a link between realizations and functions. De Sitter makes claims about which concrete infrastructures result in cybernetically sound organizations, and which do not. These instrument-models, contrary to model-models, *can* be used to guide design.

By now it should be clear that the VSM, being completely functional, can only function as a model-model, not as an instrument-model. That is: the VSM can be used to 'design' an infrastructure, but only in a 'diagnostic' sense, never for determining concrete organizational structures. One can take an infrastructure and compare it to the model, to see if it properly 'portrays' it (performs the specified functions), but the model itself can not determine how the infrastructure should be made. I have noticed that these uses are frequently mixed up, leading some to claim that they have used the VSM as an instrument during design of (solutions to problems in) organizational infrastructures. I will briefly review some of these claims.

In *Organizational Transformation and Learning* (1996), Espejo, Schuhmann, Schwaninger and Bilello take a 'cybernetic approach to management'. At one point, they discuss how the VSM can be used to give requisite variety to an organization. In fact, they attempt an "application of this conceptual framework [VSM]" (Espejo, Schuhmann, Schwaninger, and Bilello 1996, p.105) to a business unit, and deduce

[10] As Achterbergh and Vriens (2010, p.220) put it: "Each decision concerning the organization's infrastructure should be evaluated in terms of its contribution to these desired effects".

[11] Which is what the 3D-model model did for organizational change.

several 'principles for organizational design'. Here are two examples:

- Effective policy making requires creating and maintaining the structural context for people in the organization to contribute to the best of their abilities to the policy process.
- An organization's effective performance in its environment requires a structure of autonomous viable units within autonomous viable units. (Espejo, Schuhmann, Schwaninger, and Bilello 1996, p. 144–145)

These are clearly functional requirements. They are a specification of what it means to adhere to the VSM, functionally, which can be helpful in better understanding the requirements of a design. But it does not help one actually make an organizational infrastructure. However, the authors claim to "propose and implement structural adjustments based on the VSM; for example, we would bring together those activities which naturally 'belong' to the same process, and which logically should be highly interconnected" (Espejo, Schuhmann, Schwaninger, and Bilello 1996, p.118–120). Again, this is not a concrete design rule, but a restatement of one of Beer's relations. They never explain what this 'bringing together' means, in terms of design of an organizational infrastructure. They mention some concrete measures (like the use of autonomous teams or 'just-in-time' supply management), but refrain from explaining how these follow from the VSM. Either that, or they apply the 'backwards reasoning' I have claimed to be of an essentially diagnostic nature.

Ben-Eli describes how the VSM was used "in assisting diagnosis and design" (Ben-Eli 1989, p.299) at an academic medical center. He repeatedly claims the VSM provided 'important guiding concepts' for both. In fact, by offering a set of concepts, the VSM can even 'guide actions' (p.302) and is 'immensely potent' at guiding organizational design (p.327). How does he substantiate this? He describes the way in which he 'deduced' his design principles ('planning principles') from the VSM as follows:

> Fundamental concepts developed in management cybernetics, and particularly those embodied in the VSM were helpful in sorting things out, separating the essential from the trivial, giving events a clear definition as well as a coherent structure ... (Ben-Eli 1989, p.304)

Clearly this is a description of a diagnostic use of the VSM. Sorting things out and separating the essential from the trivial is what must be done during a diagnosis. It is not the same as determining concrete realizations. He goes on to say that the VSM's functions define 'levels of management' (p.308), by which he means that the functions define functionally separated domains of management concern. The separation of these domains helped him structure the planning[12] process, and moreover: "It helped in organizing the content and sequence of issues that had to be dealt with" (Ben-Eli 1989, p.309). A model that prescribes design precedence rules[13], undeniably has non-functional, instrumental aspects. But unfortunately Ben-Eli does not explain how exactly the VSM helped him find this sequence. He does add that it helped filter out issues that were not relevant at the level of recursion at which he operated, but knowing not to confuse levels of recursion is something else than knowing at what level of recursion to start designing, or how to sequence the design of a single level.

Ben-Eli also argues for the use of a participative structure in an intervention. But only after explaining that local circumstances practically forced the intervention into such a structure (p.310) he justifies this choice as complying to cybernetic principles: "the notion of broad-based participation relates directly to the idea of making full use of an organization's potential variety and enhancing its own self-organizing capabilities" (Ben-Eli 1989, p.311). This

[12] Ben-Eli defines 'planning' as "the activity of searching and specifying viable options in the dynamic process of managing complex affairs" (Ben-Eli 1989, p.300), that I take to be synonymous with 'design' – the specification and selection of concrete realizations to deal with organizational issues.

[13] De Sitter (1998) postulates such rules, claiming that the production structure should be designed by going from macro-level to micro-level, while the control structure must be designed bottom up. His model clearly is an instrument for creating cybernetically sound organizations.

'direct relation' is not one in which the VSM determines the choice for a participative structure[14]. Maybe such a structure fits in well with the cybernetic principle mentioned, but it is not the only way of amplifying variety. So again, this is not a convincing example of the VSM determining a design rule, or guiding design.

As a final example, consider his solution to a diagnosed lack of policy-guidance (function five). While considering this problem, the idea of organizing a structure around centers "emerged" (Ben-Eli 1989, p.320) (he does not explain how, or why this should relate to the VSM), and without any further explanation it is concluded that the solution should be the embodiment of the function in "an office of the center's president" that would deal with "questions of effective adaptation and the continuous balancing of external events with the institution's own aspirations and needs" (Ben-Eli 1989, p.320). This is simply a restatement of the function that is to be performed, with the addition that it should be embodied by 'an office'. How this office should perform this function, or why this approach follows from the VSM, is not clear.

So upon examination, Ben-Eli's use of the VSM turned out to be that of a model-model[15]. At no point does he specifically address the issue of how the VSM provided him with concrete guidelines for design, all he does is justify his choices by arguing that they are in line with the spirit of the VSM. Indeed, for Ben-Eli, "the underlying spirit is more significant than the technical details" (Ben-Eli 1989, p.327).

Espejo (1989a, p.368) describes the difference in methodology between using the VSM diagnostically and for design purposes. When redesigning an existing infrastructure, "the implied VSM for that organization will naturally have to be different" (Espejo 1989a, p.368) from 'the VSM' of the 'old' organization. This usage of 'VSM' is misguided. It is not that 'the VSM' of the old organization is wrong, and that it needs a 'new VSM'. The VSM is static, so what Espejo is really saying, is that there is a difference between the way the functions are distributed in the organization. The mapping has to be adjusted, if you will. But Espejo does not discuss how this shift is realized, or what the specific design rules are that determine how the functions should be redistributed. So really, he does not show how the VSM can be used during design.

Jackson makes a case for the managerial significance of the VSM: "Beer's model can be employed to assist with the design of new organizational systems, which should be constructed so as to ensure that they adhere to the cybernetic principles elucidated in the VSM" Jackson (1989, p.418). Again – a perfect description of model-model use of the VSM. But Jackson, also, makes the leap to instrument-model use of the VSM. He defends this by saying that the VSM can integrate insights from other theories, making it into "an applicable management tool that can be used to recommend specific improvements in the functioning of organizations" (Jackson 1989, p.420). This is indeed true – as long as the VSM is coupled with models that "specify the relation between the design of the organizational infrastructure and the behavior of the essential variables" (Achterbergh and Vriens 2010, p.214), these can be of service during an intervention. The VSM itself, however, still does not contribute to concrete design.

Perhaps Schwaninger aptly describes the intentions of these authors, when he writes that the VSM has "turned out to be an extremely effective device to orientate organizational design" (Schwaninger 2006, p.413). The word 'orientate' is crucial here. The VSM *should* be used to orientate design (through a proper diagnosis), but not to dictate design, which is what the majority of the authors referred to seem to advocate when they describe the concrete organizational infrastructures which apparently 'follow from' the VSM. Actually, they all either provide no real design rules (just further specifications of the functional criteria), or they do give rules, but fail to show how they follow from the VSM. This is unsurprising, since the VSM simply does not contain design rules,

[14]Participation as the appropriate approach to management was "advocated by those concerned" (Ben-Eli 1989, p.323).

[15]In fact, Ben-Eli writes he often thinks about the VSM "as about a work of art. For there is passion in this work and poetry, love and desperation, and deep concern for humankind" (Ben-Eli 1989, p.303). He quite literally looks upon the VSM as an art student would look upon a model to be painted.

nor can they be deduced from it. Even if Beer himself at some point would prescribe a concrete infrastructure, he cannot justify this prescription using only the VSM. It is logically impossible to deduce design rules from the VSM, on account of it being a functional model.

If we put their arguments in logical form, this all becomes clearer. Consider:

1. $P \rightarrow Q$ ass
2. P ass
3. Q E$\rightarrow$ 1,2

Where:

- Q : No dangerous oscillations between the primary functions occur
- P : Autonomous teams are established throughout the organization.

In this deduction, we see a realization (P), a design rule ($P \rightarrow Q$), and a functional 'conclusion', or a certain functionality you want your design to display (Q). And clearly, it is valid.

However, the VSM *only* provides the desired 'conclusion'. Remember: it is a model-model. No design rules or specific realizations follow from it, so both P and $P \rightarrow Q$ must have come from elsewhere. These conditionals or design rules are what instrument models supply, allowing functional models to be acted upon. But the VSM is not an instrument-model. So although the arguments produced by these authors (at least those who specify their design rules) may be perfectly valid, the origin of their assumptions is hazy. They claim to have gotten $P \rightarrow Q$ from the VSM, but that is impossible.

I'm not saying that no connection between realizations and the VSM's functions can be discovered or justified, but it should be pointed out that the VSM could not have determined it. The connection must have been based on some external knowledge. Intuition perhaps, or other models.

Summing up and returning to our current project, it is clear that the VSM can play no role in the design-phase of a solution to a problem in an organizational infrastructure. During design, the researcher is confronted with concrete problematic parameters, for which concrete solutions have to be found. This is completely outside of the VSM's jurisdiction, so it cannot be used to support this phase.

Implementation

So far, the VSM has proven to be useful during the early stages of the diagnosis, but not during identification of parameters, or during the design phase. Next up is the implementation phase. This phase consists of the construction and execution of an implementation plan (see page 6). This means identifying implementation variables for the chosen realizations, and relevant parameters which influence these variables (as well as both their norm values and actual values). This will yield the implementation plan: the elevation of the parameters to their norm values. Can the VSM be of assistance during any of these activities?

By now, the answer should come as no surprise: it cannot. A functional model containing criteria for the viability of organizations has nothing to contribute when it comes to implementing concrete realizations. The discussion in the previous section pointed out that the VSM, being a 'model-model' cannot be used for anything but diagnosis of organizational infrastructures. Anything more concrete than that is outside of its domain, and setting up an implementation plan is about as concrete as it gets.

Evaluation

The final phase of the actual change in the organizational infrastructure is the evaluation of the implementation. Once again, the values of the diagnostic variables (supplied by the VSM during the diagnosis) are compared to their norms, which will show whether or not they have improved. The implementation variables are checked in similar fashion. This allows a researcher to assess whether the structural change was a success, and whether the implementation of the solution is likely to have contributed to that (see page 6).

Because it supplied the diagnostic variables and their norms, the VSM's contribution reappears

during this phase. But it does not offer guidance in measuring and interpreting the results of the change-effort. So no real contribution is to be expected during evaluation.

This concludes the discussion of the functional dimension of organizational change, and the possible use of the VSM to achieve its goals. See table 2 (page 26) for an overview. Due to the functional nature of the VSM, it was only possible to use it during the early stages of the diagnosis. These are crucial for the direction of the intervention, but apart from 'setting the stage', the VSM cannot contribute in a meaningful way in the later phases of the structural change.

The social dimension and the VSM

Whereas the functional dimension was concerned with the actual change in the organizational infrastructure, the social dimension contains functions needed for the acceptation of this change by the members of an organization, and its integration into their behavior (see page 7).

The VSM has been said to ignore this crucial aspect of organizing: "The emphasis it places on organizational design may preclude proper attention being given to the generation of shared perceptions and values" (Jackson 1989, p.435). At first sight, one might be tempted to agree: none of the functions directly relate to people or their behavior. This, again, can be traced back to the functional nature of the VSM. It specifies the *functions* required for organizational viability. Clearly, these functions have to be *realized* through behavior of some sort, but – being functional – the VSM does not concern itself with realizations. As far as the VSM is concerned, people can behave any way they like, as long as their behavior realizes the critical functions.

So it is not that the VSM *denies* the existence of social aspects to organizing. In fact, Beer writes that "humankind has by no means been excluded" (Beer 1979, p.141) from the VSM. He discusses the psychosocial adequacy of organizations (Beer 1979, p.373), and also mentions the proliferating effect on variety caused by people in the organization (Beer 1979,

Phase	**Contribution by VSM**
Diagnosis Problem analysis	- Supply DV's - Guide operationalization - Provide norms for DV's - 'Mapping' the organization
Analysis of causes	—
Possible solutions	—
Design Create realizations	No direct contribution
Combine realizations	
Select design	
Implementation Identify implementation variables	No direct contribution
Determine parameters	
Construct and execute implementation plan	
Evaluation Measure DV's	No direct contribution
Measure implementation variables	
Evaluate process and content of intervention	

Table 2: Use of the VSM on the functional dimension.

p.57). But, although "the role in the enterprise of the people who actually constitute the organizational structure is paramount", the VSM only displays "the regulatory principles that necessarily bind them together" (Beer 1979, p.141). This is really the key point. The VSM is not a model of human behavior, it stipulates the functions required for the viability of the system in which they behave. How these functions are performed (or whether it is people, robots or moose running the organization), is of no concern to the VSM.

Still, some say that "the VSM favours and facilitates the emergence of shared purposes as well as permitting reflection on how purposes are actually derived" (Jackson 1989, p.420). If understood by all those involved in an intervention, the VSM can provide a language for change, a banner under which to come together. As such, it can be used during the unfreeze phase to provide disconfirmation, during the change phase to provide a new point of view, and during refreeze for inter-personal integration. However, such usage is in no way related to the content of the VSM, but instead purely secondary. The VSM *itself* provides no meaningful information relevant to unfreezing, changing and refreezing individuals. That it can be used to achieve such goals (much like a novel can be used as a coaster) might be relevant to note during the discussion of the infrastructural dimension, where the categories of means to achieve the social and functional goals are placed.

Alternatively, one could argue that the humans in an organizations are themselves viable systems, which should be performing all five functions of the VSM. Would modeling their behavior using the VSM provide insights that could help to change it? No: again, some additional theory would be required. One could diagnose their behavior using diagnostic variables stemming from the VSM, but changing this behavior requires design rules which link concrete behavior to its functional outcome. This cannot be done using only the VSM, for the same reason that the VSM cannot support the design of a solution to organizational change (see the discussion on design, starting on page 20).

In conclusion, the answer to the question if the VSM can help change behavior during an intervention is 'no'. The model specifies the functional requirements for viability of an organization. These provide no information concerning the unfreezing, changing and refreezing of organization members. An elaborate discussion of each of these aspects would be superfluous, especially since I have not found explicit use of the VSM as a tool for behavioral change in the literature – which would require examination. Without further ado, therefore, we shall proceed to the final dimension of organizational change, the infrastructural dimension, and assess whether the VSM can be of more use there than it could be on the social dimension.

The infrastructural dimension and the VSM

The infrastructural dimension (see page 8) is concerned with the infrastructure of the intervention. It contains the categories of 'structural' decisions which have to be made concerning the means with which the functional and social goals will be realized. Any intervention needs to be organized (needs an organizational structure of its own), must give heed to HRM-measures and needs to take into account the technologies (in a broad sense) used for communication and research. The 3D-model demands each of these categories to be taken into account, but, being functional, prescribes no specific realizations. But does the VSM provide cues for specific realizations in these 'executional functions'? This is the topic of the current section, in which the VSM is tested for its ability to contribute to the third and final functional dimension of organizational change.

Structure of the intervention

Interventions can be structured in a virtually limitless number of ways. The number of people involved, the impact and scope, the speed with which it is rolled out: all these variables are subject to change. The 3D-model does not restrict their values in any way, but does the VSM?

If the VSM had specified any link between organizational structures and the diagnostic variables (func-

tions), then maybe it would have had something to say about the way in which an intervention should be structured. As it is, however, no such link is provided by the VSM, thereby also rendering it impotent when it comes to selecting a structure for an intervention. Think about it: if the VSM has nothing to say about the structure of an organization, how could it provide cues for changing it? With the exception perhaps of in the same kind of backwards, diagnostic way as I have observed during the design phase. Although this may be helpful, it does not allow one to say that some structure for an intervention was deduced from the VSM. All that can be said for it, is that through trial and error, its suitability to realize an intervention that acknowledges that the resulting organizational infrastructure should allow for the VSM's functions to be performed, has been established.

Of course, because the VSM has been used during the functional diagnosis, informed choices can be made as to who should be involved. In particular, the level of recursion at which the intervention takes place will dictate much of the scope of the intervention. Indeed, "approaching problems that are related to each such level [of recursion] requires a different conceptual orientation, a different language, a different method of handling, different emphasis, information aggregated at different level of details and, more often than not, a different group within an organization" (Ben-Eli 1989, p.308). What these methods and languages are, however, and which should be chosen at a specific level of recursion, is not specified by the VSM.

A final, general remark is supplied by Ben-Eli, who notes that when the VSM is applied during an intervention, the change process "should itself be constructed to embody the principles of viability" (Ben-Eli 1989, p.327). In effect, an interventional infrastructure has an organizational (infra)structure of its own[16], which, in turn, should allow for the five functions to be performed. This point refers back to one that Ashby himself made in 1970: "any regulator that is maximally both successful and simple *must* be isomorphic with the system being regulated" (Conant and Ashby 1970, p.89). However, this teaches us nothing in terms of the concrete design of the interventional (infra)structure since, again, no design rules can be deduced from functional criteria. So in the end the VSM cannot provide instructions relating to the organizational structure of the intervention.

[16]The 3D-model also has a recursive element.

HR-measures

What guidelines for the reward structure, leadership and consultant-role can be distilled from the VSM? None can. Again, the objection can be made that some types of leadership, for example, would not fit well with the VSM, but the reason why this is so, the reason why leading in such and such a way does not contribute to performance of the critical functions, is *not* supplied by the VSM. Only through 'trial and error', or backwards reasoning, can a selection be made. It all boils down to the same argument: the VSM contains functional criteria, and they provide no instructions when it comes to selecting concrete styles of leadership or reward structures. Beer himself is forced to conclude that "We cannot legitimately talk about managerial style independently of circumstances" (Beer 1979, p.381).

Technology

The final functional aspect of organizational change, and of this entire investigation, is the 'technologies' used during the intervention. Choices have to be made concerning methods of communication, research technology, problem solving techniques and modeling techniques. The 3D-model, as always, does not restrict these choices in any way – it merely acknowledges that they should be made (a functional demand).

This aspect has actually been the entry-point of the VSM into the 3D-model. I have tried to assess the suitability of the VSM to contribute to organizational change, which meant using it as a technique for problem solving / research. So far, I have argued that this had significant impact on the early stages of the diagnosis (on the functional dimension), but that no other aspects were really influenced by this 'technique'. What remains is the question whether a

choice to use the VSM as a technique influences the other 'technological' decisions. I believe it does not.

It has been pointed out that the VSM can be used to create a 'common language': "It is [a] tool to support conversations about the management of complexity spread throughout the enterprise" (Espejo and Harnden 1989, p.459). Some even claim that "an individual may never *communicate* what is accessed to another individual, except in terms of models. This is not a limitation, but is precisely the *motor for the generation of a consensual domain*" (Espejo and Harnden 1989, p.446). The VSM can play this communicative role, but not in virtue of its content. Merely in virtue of it being a model. The way *in which* it is communicated is in no way steered by the VSM itself. So, again, the VSM does not place any prior constrictions on the choice of communication- or other techniques.

General remarks are made here and there, concerning the use of the VSM's ideas, such as that a manager "should understand the systemic nature of the viable system in which he participates" (Beer 1979, p.388). And that "time is needed for common concepts, for a common language, as well as agreement, to emerge" (Ben-Eli 1989, p.314). But these are by no means derived from the VSM, or follow necessarily from it.

This concludes the discussion of the infrastructural dimension. Again, as with the social dimension, the VSM cannot offer concrete instructions for the execution of the attached functions. It appears that the only time during which the VSM could be made of use was during the early stages of the diagnosis.

Now that the VSM has been tested for use on each of the functional dimensions of organizational change, the question whether the VSM can be used as a tool for change, can be answered. It is time for a recap followed by the general conclusion.

CONCLUSION & DISCUSSION

Organizational change has three dimensions, functionally speaking. The actual change in the infrastructure, consisting of a cycle of diagnosis, design, implementation and evaluation, is concentrated on the functional dimension. Organizations, being human systems, have social aspects. For any infrastructural change to succeed it has to be accepted by the members of the organization and it has to be integrated in their behavior. The social dimension consists of the functions concerned with realizing this aspect of change (unfreeze, change and refreeze). No organizational change can happen if it does not have an infrastructure of its own. Its structure, HRM-aspects and technologies need to be addressed; it is the infrastructural dimension on which these aspects are bundled. Aptly realizing all of these functional dimensions, which together form the 3D-model of organizational change, is what organizational change consists of.

Some have attempted to use the Viable System Model, a model containing the necessary and sufficient functions for organizational viability, to perform some of these functions related to organizational change. Claims have been made to the effect that the VSM guided diagnosis and design of organizational infrastructures. This makes sense when it comes to diagnosis. Knowing which functions should be performed by an infrastructure allows one to diagnose an existing structure by assessing to what degree it performs those functions. In other words: the VSM can supply the relevant diagnostic variables. However, being a functional model itself, the VSM (like the 3D-model) does not specify *how* its functions should be realized. As such, it can be of no help in the realization of the design-function which consists of conceiving concrete realizations (ways of organizing) which will help to improve the value of problematic diagnostic variables. Although realizations can be *justified* by claiming that they will lead to an improvement of the VSM's functions (or: the diagnostic variables), they cannot be determined by the VSM. To determine realizations, an assumption about *why* they will be beneficial to the performance of a function is needed, which cannot be supplied by the VSM. Claiming that the VSM guided design amounts to claiming that knowing *what* to do, automatically entails knowing *how* to do it.

None of the other functions that make up organizational change, be it on the functional, social

or infrastructural dimension, can benefit from an analytical model detailing the viability constraints of organizations. They do not require diagnosis of the system, and they involve concrete methods for their realization, which the VSM cannot provide.

So in the end it must be concluded that optimism concerning the use of the VSM as a tool for organizational change is unjustified. Rather, when using the model during change-efforts, caution is required. It can support diagnosis, and a researcher could say that his understanding of the viability-constraints of organizations is based on the VSM. As such it could play a major role in forming his perspective on organizations, but at no point should he claim that an intervention which he performed was completely guided by the VSM. Such is impossible. If Beer and those who adhere to the VSM want to insist that the VSM is completely functional, which they should, as it is this quality that grants it its universal applicability, they must also accept that it cannot be used to design concrete organizational infrastructures. In the words of Achterbergh and Vriens:

> If we want to use the VSM for the diagnosis and design of concrete viable systems, we need to have knowledge about the way these concrete systems work, for otherwise we could neither spot their dysfunctions nor design system-specific infrastructures with the purpose of increasing their potential for survival. (Achterbergh and Vriens 2010, p.221)

Thus, for performing any of the functions of change other than the (first stages of) diagnosis, design rules are required. And it is principally impossible to deduct design rules for concrete infrastructures from functional criteria. This points directly at the relevance of my critique: apparently, those who have effectuated organizational change using solely the VSM, must have implicitly used other sources. Consequently, they have ascribed praise or blame to the VSM of which it is undeserving. Researchers using the VSM during post-diagnostic phases of organizational change should realize that their intervention is being steered by other forces. In fact, Beer himself is aware of this:

> Perhaps the rigorous test would be to build an enterprise on the model, and to see whether that enterprise survives. In fact, this has been done, and the test worked. But all the rigor was lost in the evident fact that all the people engaged in building an actual enterprise are constantly pumping variety into it. They may conscientiously be adhering to the model, but what *else* are they unknowingly supplying? (Beer 1979, p. 115)

This 'implicit supply of knowledge' should be revealed, since if is not, it might be deprived of criticism when an intervention is scrutinized. Organizational change often fails[17], and in such cases a critical examination of the tools used is needed. This requires that they be identified, and not mistakenly labeled as 'VSM'. If they are called out, this opens the way for criticisms aimed specifically at design rules, not at the VSM. Authors who claim that the VSM has provided them with design rules, hide their own input, shielding it from criticism. Their opponents are left to argue against the VSM, instead of against the 'variety' added by the author. This muddles up the debate. The question whether the VSM's functions are indeed necessary and sufficient for organizational viability differs from the question whether specific infrastructures allow for the performance of the VSM's functions. So asking whether a specific infrastructure 'follows' from the VSM is misleading. An infrastructure can be justified by the VSM – its use can be defended by stating that it allows for execution of the VSM's functions – but at no point should anyone claim a privileged position for a single infrastructure by saying that it follows from the VSM. Claiming such 'heritage' for an infrastructure immunizes it from criticisms *not* aimed at the VSM itself. This leads to confusion which should have no place in an academic discussion.

[17] Up to two thirds of change initiatives fail, according to Beer and Nohria (2000, p.2).

Trying to uncover sources of implicit knowledge in intervention processes does more than simply straighten up the debate. It allows us to move forward. Because although the 'implicit knowledge' may seem trivial to an author or to an entire school of thought, the difficulty in making it explicit usually reveals that it is not. Uncovering the assumptions that underly an academic discipline is a very difficult, yet rewarding venture. It is oftentimes these trivial assumptions that are used, when looking back, to describe the paradigm in which current researchers operate. Being aware of such assumptions allows one to be aware of the way in which the current paradigm effects contemporary work. Also, it ensures they can be made subject of careful scrutiny, and as such we may continue to learn about what we believe and why, and discover errors or inconsistencies in our assumptions. This, I believe, is essential to science. Indeed, "To be self-contented is to be vile and ignorant, and to aspire is better than to be blindly and impotently happy" (Abbott 1884, p.75). No one should pretend that we are finished. Or, more specifically, that the VSM is a panacea, and that in it is contained all the knowledge needed for organizational change.

Finally, I want to emphasize the role and usefulness of the 3D-model of organizational change. It has proven most helpful in thoroughly judging whether and to what degree the VSM could be used as a tool for change. By providing a highly structured functional definition of organizational change, it allowed for a concise demarcation of the VSM's jurisdiction over it. But more importantly: its potential as a *general* reference model of organizational change is significant. Using the 3D-model, any model can be systematically tested for its suitability to contribute to change. Models focusing on some aspects of interventions can be recognized as such, and given a place in the model. This allows researchers to clearly design and understand the interplay of different models used during an intervention. On a theoretical level, disputes between authors who defend models of change which they believe are incommensurable, but simply focus on different aspects of change, can be settled. I strongly recommend future use of the 3D-model for these purposes.

LIMITATIONS

This article contains a critical examination of the way the VSM is used, not of the VSM itself. While ascribing certain uses to the VSM I have assumed it to be valid, i.e. to be accurately describing the necessary and sufficient functions for organizational viability. Using the functions as diagnostic variables during diagnosis, for instance, is only useful if these functions make sense. On this matter, however, I have no strong opinion either way. I just wanted to point out that given the qualities of the model, be it valid or not, it cannot be used post-diagnostically. In the process I have specified how it *can* be used[18], but this does not constitute a defense of the validity of the model.

The same goes for the 3D-model of organizational change. Although I am very sympathetic towards the model, the point of this article was not to defend its validity. The only justification for choosing the 3D-model I can give right now is that I believe it is an accurate, well-conceived model. I can think of no other functions involved in organizational change than those mentioned in the model, nor can I imagine change to happen as intended if any of these functions are not executed. Furthermore, I believe that although the 3D-model has been conceived of with episodic change in organizational infrastructures in mind, its functions are perfectly general for conscious change of any human system. Sadly, a defense of these claims, and further validation and discussion of the model, falls outside of the scope of this article. This is particularly unfortunate because the entire analysis of the VSM's suitability to contribute to change depends on accuracy of the definition of change used, which is provided by the

[18] I have not provided an extensive elaboration of how it can be used, but merely indicated the options available. For instance, I have only provided examples of how the functions can be operationalized, not a full operationalization. Likewise, my explanation of how norms for the diagnostic variables follow from the VSM does not include actual, useful norms. I have only opened the door, someone looking to use the VSM for diagnosis still has to walk through it.

3D-model.

A critical remark concerning use of the VSM during the diagnosis of organizational infrastructures (see page 17) must also be made. I have claimed that if the VSM is valid, it can be used to supply meaningful (necessary and sufficient) diagnostic variables for an infrastructure. Yet, necessary as they may be, they overlook a critical aspect of human social systems: these are entities that persist through time, and continually experiment with their viability. For such an entity, it is crucial to know not only that some functions are being performed right now, but also whether it can expect that performance to be sustained. This depends on the amount of resources used to fulfill those functions. An organization that is performing all the functions, but doing so in a very inefficient way, may face problems nonetheless. If not now, than probably in the future. If a painter perfectly reproduces his model, but uses up all of his paint, he won't be able to make any more paintings. Likewise, businesses are continually working to adhere to their viability constraints, but if they use up too much resources now, they may not be able to continue being viable. So one does not want a diagnosis to focus purely on the here and now. This could result in diagnoses according to which all is perfectly fine *right now*, but where the company is in danger of going bankrupt tomorrow. So asking not merely *if* a function is performed, but also *at what cost*, some future-oriented aspect is introduced into the diagnosis. Yet Beer only specifies that certain functions need be fulfilled and not at what cost[19]. So in order to include some measure of sustainability, the efficiency with which the functions are performed has to be accounted for in the diagnostic variables. If it turns out that some functions are performed at too high a cost, endangering its future execution, this should be recognized as a problem. And as the VSM's functions can not do this, the model can not provide all the diagnostic variables needed for a meaningful diagnosis.

Finally, I must say that my examination has been somewhat uneventful and overly methodical at times. The VSM can only be used during problem analysis, and only during design did I find authors who used the model inappropriately. None of the other functions of organizational change can be supported by the VSM, and neither did I find authors who tried to do so. This makes my discussion of the VSM's relevance for these functions rather repetitive, as it revolves around a frequent use of virtually the same argument.

[19] With the exception of Function Three, which sets and controls demands for efficient production for the primary functions. Thus, a proper operationalization of Function Three should provide measures of efficiency for Function One. However, none of the 'meta-functions' (Two through Five) are constricted as far as efficiency is concerned. The VSM merely requires they be executed, and does not specify *how* or *at what cost*.

Acknowledgments

I would like to thank Dirk Vriens and Jan Achterbergh for their inspirational lectures and invaluable guidance and criticism. Their approach to management science is truly academic, and is what motivated me to write this thesis. My gratitude also goes out to The Radboud University and the Nijmegen School of Management for allowing me the freedom to pursue multiple academic interests.

References

Abbott, E. A. (1884). *Flatland: A Romance Of Many Dimensions*. Dover Publications, Inc.

Achterbergh, J. and D. Vriens (2002). Managing viable knowledge. *Systems Research and Behavioral Science 19*, 223–241.

Achterbergh, J. and D. Vriens (2008, september). Organization as intervention. Lecture series.

Achterbergh, J. and D. Vriens (2010). *Organizations: social systems conducting experiments* (Second revised ed.). Springer Verlag.

Achterbergh, J., D. Vriens, and H. Doorewaard (2009). Het praktijkgerichte diagnostisch onderzoek. In I. Bleijenbergh, H. Korzilius, and J. Vennix (Eds.), *Voer voor methodologen: een liber amicorum voor Piet Verschuren*. LEMMA.

Ashby, W. R. (1957). *An Introduction to Cybernetics*. Chapman & Hall Ltd.

Beer, M. and N. Nohria (2000). *Breaking the Code of Change*. Boston, MA: Harvard Business School Press.

Beer, S. (1979). *The Heart of Enterprise*. John Wiley & Sons.

Beer, S. (1984). The viable system model: Its provenance, development, methodology and pathology. *The Journal of the Operational Research Society 35*, 7–25.

Beer, S. (1985). *Diagnosing the system for organizations*. John Wiley & Sons.

Beer, S. (1989). National government: disseminated regulation in real time, or 'how to run a country'. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Ben-Eli, M. U. (1989). Strategic planning and management reorganization at an academic medial center: use of the vsm in guiding diagnosis and design. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Bennis, W. (2000). Leadership of change. In *Breaking the Code of Change*.

Boukema, H. P. (2010). *Russell's Second Paradox*. Ph. D. thesis, Radboud University Nijmegen.

Conant, R. C. and W. R. Ashby (1970). Every good regulator of a system must be a model of that system. *Int. J. Systems Sci. 1*, 89–97.

Conger, J. A. (2000). Effective change begins at the top. In *Breaking the Code of Change*.

de Sitter, U. (1998). *Synergetisch produceren : human resources mobilisation in de produktie: een inleiding in structuurbouw* (2nd revised ed.). Van Gorcum.

Espejo, R. (1989a). A cybernetic method to study organizations. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Espejo, R. (1989b). P.m. manufacturers: the vsm as a diagnostic tool. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Espejo, R. and R. J. Harnden (1989). The vsm: an ongoing conversation. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Espejo, R., W. Schuhmann, M. Schwaninger, and U. Bilello (1996). *Organizational Transformation and Learning: a cybernetic approach to management*. Wiley.

Holmberg, B. A. (1989). Developing organizational competence in a business. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Howard, N. (1995). Organisational fitness: Corporate effectiveness through management cybernetics. Book review.

Jackson, M. (1989). Evaluating the managerial significance of the vsm. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Ledford, G. E. and R. L. Heneman (2000). Compensation: A troublesome lead system in organizational change. In *Breaking the Code of Change*.

Leonard, A. (1989). Application of the vsm to commercial broadcasting in the united states. In *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*.

Marshak, R. J. (1993). Lewin meets confucius: A re-view of the od model of change. *The Journal of applied behavioral science 29*, 393–415.

Schwaninger, M. (2004). Methodologies in conflict: Achieving synergies between system dynamics and organiational cybernetics. *Systems Research and Behavioral Science 21*, 411–431.

Schwaninger, M. (2006). The evolution of organizational cybernetics. *Scientiae Mathematicae Japonicae 64*, 405–420.

van Amelsvoort, P. (1998). *Het programmeren en regisseren van veranderingsprocessen*. ST-Groep.

Weick, K. E. and R. E. Quinn (1999). Organizational change and development. *Annual Review of Psychology 50*, 361–386.

Wruck, K. H. (2000). Compensation, incentives, and organizational change: Ideas and evidence from theory and practice. In *Breaking the Code of Change*.