

Introduction to Management Cybernetics Management's awareness for reciprocal effects



## Learning **Objectives** Session IV

### In this section...

- You will learn about managers' limited direct influence on the properties and capabilities of their organizations
- You will acknowledge the need to perceive the "big picture" and operate in an integrated way
- You will understand the significance of variance and the need for complexity
- You will get to know "CyberPractice", a proven management model

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The sustainability of enterprises strongly depends on the management's awareness of reciprocal effects and their leadership attitude.

# **1. Why Awareness of Reciprocal Effects?**

- Living beings in nature adapt to changing environmental conditions and dynamically improve their capabilities. Evolution works because the full complexity in the eco-system of the interaction between all plants and animals happens naturally.
- In human society, as in politics and in enterprises, it is different because humans tend to improperly simplify existing complexity, leading to myopic decisions which do not consider the whole pattern of interlinked effects. This creates cascades of knock-on effects.

The better we acknowledge the complex reality, the more effectively we can decide and act.

Therefore, nature has the edge over societies with human involvement.

### Stop believing that you can solve the problems because you are in a management position. Try to understand and to use your system!

Managers are paid for results. The sad fact is that a single person can never have the overview of the whole picture in order to take good decisions alone.

"The image of the world around us "People are only role players in a which we carry out in our head is system. They act within the system, just a model. Nobody in his head even though they believe that they imagines all the world, govern- are managing it. This is not a popument or country. He has only se- lar idea for those who believe that lected concepts and relationships they are real "men of action" between them, and uses those to represent the real system"

Jay Wright Forrester

### Our decisions and actions have reciprocal effects. Make decisions based on expected longterm effects, not for apparent quick results.

"Everything is connected to "Science" is derived from the everything. It is not that A acts on Greek "ski" that means "cutting B, or B on A, but everything si- off". This illustrates that we are multaneously affects everything rather used to analyzing sections else. Jupiter is far away; never- of our reality instead of trying to theless, our personal decisions capture the whole picture. Managand actions have an effect on ers should seek to recognize rela-Jupiter and vice versa"

tions and interactions, instead of thinking in a mono-causal "cause and effect"-scheme"

Heinz von Foerster

### Use the knowledge and the experience in your system as the key source for good and sustainable solutions.

The specific interaction of a sys- "The purpose of a system is what tem's elements defines the proper- it does." ties and the behavior of the system.

Stafford Beer

### In complex environments, the complexity of your organization is the basis for survival. Increase the degrees of possibilities for action (variance)!

tem should be at least as high as to find solutions! the variance of the emerging disturbances to be able to control them"

Do not try to replace complexity

by mono-causal reasoning. Accept

complexity. You cannot reduce it.

Build at least the same complexity in your organization as the

environment of your organization

Promote open interaction within

your organization. Foster diver-

sity! Facilitate inter-disciplinary

discourse. Build trust in the joint

competence of your teams by in-

William Ross Ashby

possesses.

"The variance of a controlling sys- viting and authorizing your teams

Promote far-sightedness and attentive behavior.

Allow initiatives at the borders of your core business activity, because innovation arises from the borders - from the interfaces with others.

Strive for well-aligned decisions involving all relevant needs and interests.

In dynamic-complex environments, do not try to strictly follow a plan, but always be alert to spontaneously arising opportunities and threats! Make use of the power of the moment!

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Do it like nature does: Use your staff's competence in a cybernetic discourse and achieve well-aligned and sharpened solutions with high staff acceptance.

## **The Management Model** "CyberPractice"



## **Formal Management**

- · Managing Director
- · Business Unit Directors
- · Department Heads

Self-regulation needs a starting impulse from top management. Are you personally ready for cybernetics?



Heinz von Foerster

"Everybody in the company should act as a manager - in their expert role and regardless of their hierarchical level!"

"If everybody is a manager, selfregulation arises; a circular interaction is implemented in which everybody steadily influences everybody in the interest of the company."

In a world characterized by uncertainty, your "Inner Form" becomes in-creasingly relevant for your orientation and to become effective.

"We build a personality cult around the conductor, but we should know that not he makes the music, but the music makes him."

Bernd Linder-Hofmann et al.: Integrale Aufstellungen, p. IX

### The Western Way

"Scientific" approach, based on functional skills and oriented towards benefit, measured by the criteria of efficiency and effectiveness, making use of all resources.

- In turbulent environments, gain your own orientation from your inner balance - your "Inner Form" (Linder-Hofmann, Zink).
- Be present and alert, supported by your awareness that you are connected with

### **The Eastern Way**



A relationship approach requiring parties to cooperate, to develop ideas in co-existence with different opinions, to pause for a moment, to disengage and to get involved again, to tolerate and to resist.

everything, by your attitude of attentiveness and by an integrative comprehension of the world.

• Do not try to be the hero. For effectiveness and sustainability, rather rely on your organization and on your personal relationships.

# **Questions** for Reflection

- 1 Are you aware of the degree your management unerringly acknowledges market developments and tendencies within the organization?
- 2 To which degree is the mode of operation in your organization initiated by the employees?

3 Does the capability of reaction correspond with the possible market scenarios (e.g. loss of an important customer, decrease of the demand for certain technologies or certain techniques)?



**5** How punchy is your organization?

# Summary of Section

- Stop believing that you can solve the problems yourself because you are in a management position. Try to understand and to use your system.
- Our decisions and actions have reciprocal effects. Make decisions based on the expected long-term effects in the system, not for apparent quick results.
- Use the knowledge and the experience in your system as the key source for good and sustainable solutions.

- In complex environments, the complexity of your organization is the basis for survival. Increase the degrees of possibilities for action (variance).
- Do it like nature does: Use your staff's competence in a cybernetic discourse and achieve well-aligned and sharpened solutions with high staff acceptance.
- Self-regulation needs a starting impulse from top management.
- In a world characterized by uncertainty, develop your "Inner Form" for your orientation, in order to make good decisions and to become effective in a natural way.

# **Relevant Sources for Further Reading**

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Introduction to Management Cybernetics

## Systems thinking





## **Learning Objectives** Session V

### In this section...

- You will understand the effect of positive and <u>negative</u> feedback loops
- You will get an understanding of the "system dynamics" method to model and simulate the behavior of (complex) systems
- You will become aware of system dynamics resulting in exponential developments, tipping points and trend inversion

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The sustainability of enterprises strongly depends on the management's awareness of reciprocal effects and their leadership attitude.

If you do not wait with reinforced action until your basic action becomes effective ("time-delayed balance"), the result may become uncontrollable.

# 1. Why "Systems Thinking"?

- "Systems Thinking" is a disciplined way of understanding dynamic relationships in order to make better decisions and to avoid undesired consequences.
- With the help of Systems Thinking practitioners gain a better understanding of interdependent components which make up a system and this enables them to recognize levers for effective action.
- We constantly create mental models without being aware of doing so. But research has shown that we are not always good at understanding the implications of our mental models.
- By creating a "computer model" which corresponds to our mental model we can simulate scenarios and achieve analytical results which are not biased by personal influences.
- System Dynamics is a method of implementing systems thinking with the aid of computers. This is particularly useful in the event of complex problems.

Approach to solution: Observe the effect of introduced measures before reinforcing the action.



Approach to solution: Active de-escalation by an intermediary; avoid future escalation by introducing negative feedback mechanisms.

### You can only act in a system-orientated way and compensate deviations if you acknowledge the behavior patterns.

Typically, complex systems are Peter M. Senge systematically terns which can be copied into terns (The fifth discipline). qualitative models.

terns have to be identified within patterns. their structures.

driven by repetitive behavior pat- described 10 typical behavior pat-

Finally, conceptual approaches to To purposefully change the behav- solutions are drafted to facilitate ior of systems, these behavior pat- the handling of these behavior

End-to-End Value Chain

V. Systems thinking



### Relatively successful systems enjoy a larger feed of resources, making them even more successful ("success for the successful").



Approach to solution: The disadvantaged party can improve its position only by a strongly motivated survival fight (increasing performance, high creativity, smart positioning), if the constellation is not balanced out by the intervention of a higher-order institution (e.g.: the state, competition/cartel law).

If stability is required, positive feedback mechanisms should be replaced by negative ones ("limit to growth").



Homeostasis: Coping with crisis by limiting or replacing positive feedback mechanisms by negative, stabilizing feedback mechanisms (homeostatic equilibrium = floating equilibrium)

### The "treatment of symptoms" may result in a temporary alleviation, but it leads to the dependence on further treatment of symptoms.



Approach to solution: An intensive discussion of the situation's real complexity can help to acknowledge and to accept the true cause of the problem. An extensively applied system analysis, even utilizing the collective intelligence of teams, should be preferred to short-sighted measures.

Inappropriate corrective measures can - in the course of time increase problems, even though the problem seemed to be solved.



Approach to solution: Introduction of mechanisms ensuring that initiatives are always scrutinized as to whether they contribute to success or not. Avoid the perception of any illusory stabilization. Decide as close as possible to the point where things are taking place.

If you do not wait with reinforced action until your basic action becomes effective ("time-delayed balance"), the result may become uncontrollable.



Approach to solution: Keep the objectives valid and scrutinize whether all possibilities to act have been tackled (different approach?). But do not "hunt a phantom": If it becomes evident that the objective cannot be achieved, set realistic ones (different direction?).

Two inherently stable systems linked by means of a variable can wind each other up ("escalation").



Approach to solution: Mitigation by a sound analysis and alignment of the system resulting from the cooperation; make sure that future cooperation relationships are equipped with stabilizing negative feedback mechanisms.

If you do not wait with reinforced action until your basic action becomes effective ("time-delayed balance"), the result may become uncontrollable.



Approach to solution: By a meaningful alignment among the involved parties (comprehension) cyclical oscillation can be reduced and a quasi-stable situation around the optimum can be maintained; an intervention can mitigate the situation.



Approach to solution: As resources become scarce, transitional decreasing capabilities and results should be accepted while new resources are made available. This step should be regarded as an investment in a new prosperous phase.

## With "System Dynamics" methodology, dynamic-complex systems can be modeled and their behavior can be simulated.

- System Dynamics is a methodology developed by Jay Wright Forrester at the Sloan School of Management at the Massachusetts Institute of Management (MIT) for the holistic analysis and simulation of dynamic-complex systems.
- The effects of management decisions on the systems' behavior can be derived from the simulation.

- Qualitative models
   (influence diagrams):
  - » Help to generally discuss dynamic-complex problems and to identify feedback and missing feedback in the processes

Quantitative models

» Offer quantitative

scenario analyses,

» Help to substantiate

corporate, political or

ecological planning

forecasts and insights

- » Can provide valuable insights and lead to mind changes
- » Can easily be transferred in equations and are the basis for quantitative models

### Meanwhile, appropriate system dynamics software is commercially available.

| Proven SD software         |  |                      |
|----------------------------|--|----------------------|
| ANYLOGIC                   | Agent-based SD simulation, Java-based  |                      |
| HERAKLIT                   | Authoring software for simulation and strategy games   |                      |
| IMODELER                   | Java-based SD tool for qualitative cause-effect analysis   |                      |
| ITHINK UND STELLA          | SD simulation tool   | isee Systems         |
| POWERSIM                   | SD simulation tool   | Powersim Software AS |
| SAVANNAH<br>SIMULATIONS AG | Simulation software for traffic planning, city planning,<br>Production and supply-chain management |                      |
| VENSIM                     | SD simulation tool   | Ventana Systems Inc. |

### With SD software, challenging dynamic-complex systems can be modeled and simulated. Some experience is necessary for meaningful models.



Example of an SD model. Source: https://www.semanticscholar.org/paper/On-developing-system-dynamics-model-for-business-An-Jeng/8e-7ab9136fe0baf7794c0e1a6e15f193c9015133/figure/3

SD has successfully been applied to meaningful complex topics and has led to significant insights.



Limits to Growth, 1971.

• Given business as usual,

i.e., no changes to historical

growth trends, the limits to

evident by 2072, leading to

"sudden and uncontrollable

decline in both population

and industrial capacity".

growth on earth would become

Results





### Extract

successfully be applied to solve business and organizational problems.

Industrial Dynamics, 1991.

Explanation of how SD can

### John D. Sterman.:

**Business Dynamics – Systems** thinking and modeling for a complex world.

BUSINESS

DYNAMICS

Modeling for Complex World

Systems Thinking and

### Extract

System dynamics is both a currently utilized approach to organizational problem solving at the professional level, and a field of study in business, engineering, and social and physical sciences.

# Questions for Reflection

**1** Does your organization think in system contexts?

2 How well are the decision makers in your organization aware of the limits of their mental models in a dynamiccomplex world?

- Growth trends existing in 1972 could be altered so that sustainable ecological and economic stability could be achieved.
- The sooner the world's people start striving for the second outcome above, the better the chance of achieving it.

V. Systems thinking

**3** How well are the effective relationships in your organization really known?

**4** Have you ever modeled important dynamic relationships and simulated scenarios to support decisions?

# Summary of Section

- "Systems Thinking" helps to perceive the big picture of interrelations and interactions instead of "stopping short" and analyzing only fragments.
- You can only act in a system-orientated way and compensate deviations if you acknowledge behavior patterns.
- Peter M. Senge systematically described 10 typical behavior patterns (The fifth discipline).
- By means of the "System Dynamics" (SD) methodology, developed by Jay Wright
   Forrester, dynamic-complex systems can be modeled, and their behavior can be simulated.

- Meanwhile, appropriate SD software is commercially available.
- With SD software, challenging dynamic-complex systems can be modeled and simulated. Some experience is necessary for meaningful models.
- SD has successfully been applied to meaningful complex topics and has led to significant insights. For example, in 1971, Donella and Dennis Meadows conducted an SD-powered analysis about the future of humankind at Jay Wright Forrester's institute for system dynamics at the MIT, commissioned by the Club of Rome: "The Limits to Growth".

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