A Generic Management Concept
– a way of sustainable design of enterprises

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Abstract:

Global economic processes are complex and their complexity is increasing. Tasks have to be solved by interdisciplinary approaches and by interdisciplinary teams. Having demands on interdisciplinary work groups leads to the necessity of having just one language to communicate. Language at this point is defined as a kind of methodology to work. Different disciplines refer to different languages. To use just one language is absolutely necessary because contributors can not know all languages and methods of all disciplines. One interdisciplinary language is the systems engineering approach therefore it is taken up again. This paper shows a further development of the systems engineering approach. This advancement leads to new approach including a dynamic model – the Wuppertal Generic Management Concept. The term of quality was defined and filled with substance by DIN EN ISO 9001, Quality Management Systems were defined as well. Concerning an increasing of the holistic and general considering of the customers requirements the Total Quality Management Systems have been developed (EN ISO 9004) and as a logical further development the Generic Management System approach was generated. The Wuppertal Generic Management Concept takes all requirements by all stakeholders into account having the purpose to create a requirement related design of enterprises. Two examples of application out of the field of safety and appropriation of drinking water on the one hand and keeping hot liquid on the other hand illustrate and amplify the theoretical scientific approach. The paper offers a solution to combine different requirements and different management systems and to create a new method which can be handled easily – the Wuppertal Generic Management Concept.

Purpose

This paper offers an approach how to join different demands and requirements of different stakeholders by just one management system. The approach is accentuated by two different examples.

Methodology

This concept is based on the hypothesis that an enterprise needs one all-embracing, holistic management concept. We developed a new methodology. It offers the opportunity to realize and verify an effective solution of the described problems and shows a possible application.

Research Limitation

The theoretical approach of the generic management concept is based on a module structure. These modules have to be defined and described. A lot of research work has already been

done, but there are still fields of research to continue. It has to be mentioned that this approach needs more research work to develop a practicable and easy to handle tool.

Originality/Value of paper
The theoretical approach of the Wuppertal Generic Management Concept leads to a dynamic and sustainable management concept. It presents a real-time operating system. It is a holistic and ubiquitous concept.

Keywords: systems engineering, sustainable, generic concept, holistic
Category: Research Paper

Introduction and Purpose

Tasks and demands are ruled globally today, they are described holistic and they have to be solved by interdisciplinary teams. These different contributors need a basis to communicate concerning their methods and methodologies. Systems engineering is a well known approach which is applied over all disciplines. Systems engineering offers possibilities to develop task solutions systematically (Arlt 1999, Winzer 2003, Hoeborn 2008). Originally systems engineering had been a holistic approach concerning all disciplines later on it had been split into certain special fields like safety systems engineering or software systems engineering. Our methodology starts at the original approach of systems engineering.

Methodology

The methodology of systems engineering is based on the systems philosophy. The word system is used frequently in technical and even in ordinary speech to refer to an entity of some kind that is the focus of interest. Depending on our interest, almost anything can be defined as a system, for example: the engine of a car, a city, the economy of a nation, a company, the earth atmosphere, a colony of birds, a molecule, a gas filled balloon, etc. This shows that a system is a construction of our mind for the purpose of thinking about some aspect of reality. A system is more complex than a single entity; it is understood to comprise a collection of interacting entities that we perceive as forming a whole (Sitte/Winzer 2004).
In general systems theory the word system refers to a part of reality that we wish to analyze. The rest of reality becomes the system's environment. The system and its environment comprise the universe. Our interest and intention will dictate what to include in the system and what not. The purpose of defining a system is to make a complex reality more understandable by dividing it, conceptually, into two parts.
The concept of a system implies the existence of a boundary that separates the system from its environment. Although we are free to define the boundary of the system, only some choices will be helpful in reducing the complexity of the situation while others will not.
Once the extent of a system has been delimited it becomes possible to investigate the interactions with its environment. The system can interact with its environment by exchanging matter, energy and information.
A system that interacts with the environment is called an open system while a system that does not is a closed system. The delimitation of a system allows us to describe an open system at a generic level without knowing any thing about how the internal structure or functioning of the system. This description is purely based on what we observe going into the system (input) and what comes out of the system (output). This description of a system is called a black box model. A black box model ignores all what happens inside of the system.
The first step beyond the black box model it to describe the system as made up of components that interact among themselves and with the environment. By continuing dividing the system into subsystems and the subsystems, and so on, a hierarchical model of the system including levels is created. In a good hierarchical model each level emphasizes some essential

interaction and hides the less significant details in the levels below. Hierarchical models are very powerful tools for humans for coping with the complexity of the world.
Even dynamic system engineering approaches have been developed.
The thought combining all these different system descriptions and mappings is that we need to think in systems on the one hand, and on the other hand that we need just one step sequence to solve all different kinds of tasks through all disciplines.

General Systems Engineering

The general systems engineering approach includes this system thinking as it is well known and it includes a general procedure model as. The procedure model is split into system design steps on the one side and into a combination of steps on the other side.
Fig. 1 shows the procedure model by having a defined system. The procedure is described by the system design steps and a combination of steps and their instruments.

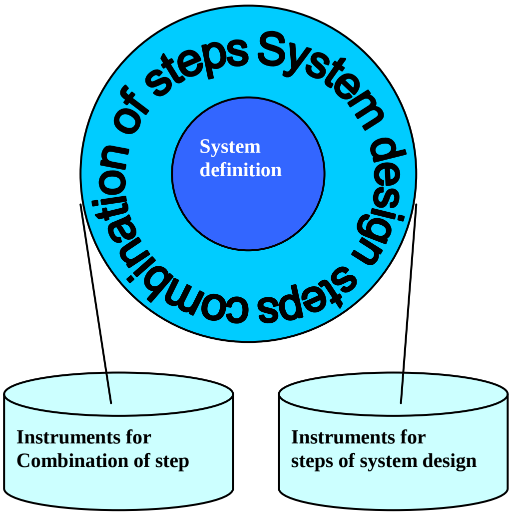


Fig.1: General procedure model concerning the Wuppertal Generic Management Concept

Fig. 2 shows the right side of a circle including the system design steps of a goal building process, an analyzing process and a design process.
The first step to solve a task is to define the system. The second step starts at fig. 2. The tools which are used are depending on the chosen system. This side of the circle is like having three drawers. The drawers can be opened as often and as intensively as needed. But all three steps (drawers) have to be complied. This is the main difference to the approach of Haberfellner. There does not exist a prescribed sequence of use just a demand of use at all.

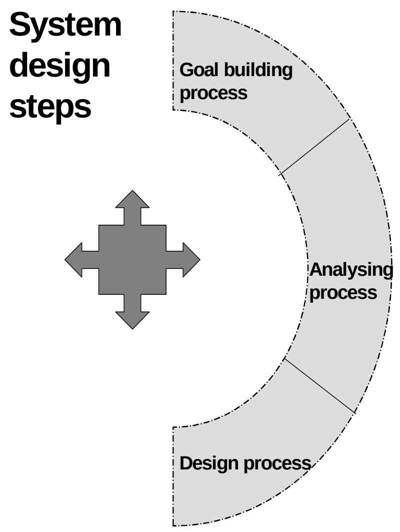


Fig. 2: Part I – System Design Steps

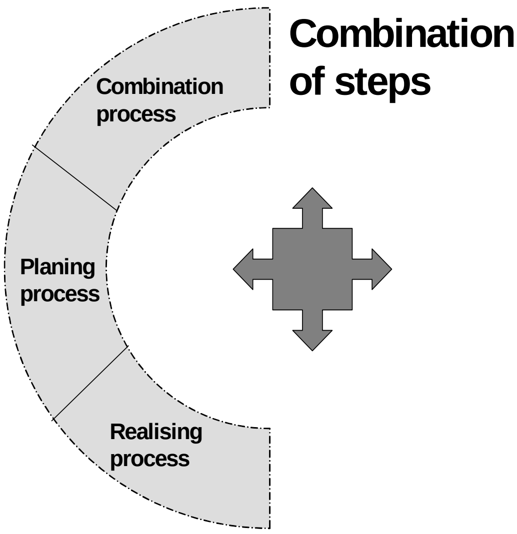


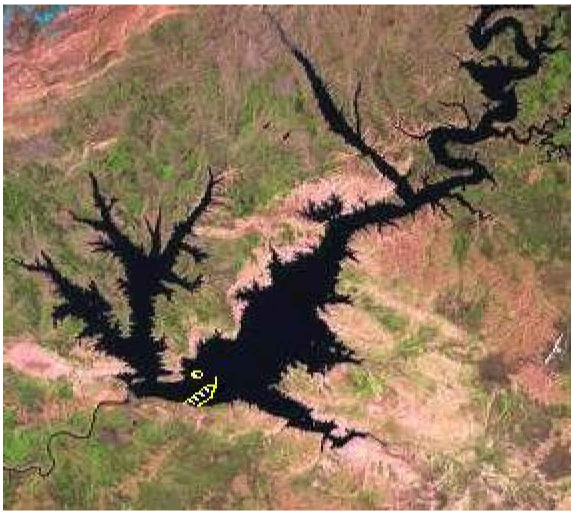
Fig. 3: Part II – Combination of Steps

The right side of the circle is describing what has to be done and the left side of the circle now offers the opportunity to find a way how to do it. The procedure is a dynamic process. The three steps as shown in fig. 2 on the left side have to be followed as well. The way how to observe these drawers is unimportant, it can be process of iteration, it can be a process going from approximation up to detail e.g. Parts or steps of the circle are sometimes stated. If an analysis is preset the following step will be a design process.
A skipping between the two sides of the circle is possible at all stages of the procedure. This designs dynamic process. It creates a general and holistic solution algorithm.
Just two general conditions have to be made:
- systems thinking
- thinking in the described dynamic procedure model
This offers the possibility for interdisciplinary work by using one language, one methodology.

Application possibilities

The chosen example is out of the field of safety as being described by (Pacaiová 2008, Hoeborn 2008, Winzer 2008). Safety is still one of the latest and quite volatile and politically charged topics nowadays. The field of safety is quite huge sphere and it includes many components concerning the necessities of mankind. The questioning itself includes the complexity of the tasks and the interdisciplinary problems. The purpose of general systems theory is to formulate concepts and methods for analyzing complex situations, processes and structures irrespective of their specific nature. The concepts of general systems theory are very general, at times they appear too general to be useful. At that point it is important to remember that the purpose of these concepts is to provide us with a general skeleton that we need to adapt to the specific situation under analysis. It is like a master plan that lays out the general architecture for a construction. It helps to find the most appropriate overall layout from which we can proceed with confidence to work out the details. When we start a construction we wish to look at our task from a distance so that we can perceive the correct proportion of the elements we have to work with. We want to avoid distorted perspectives and incomplete views that will mislead us to an unsuitable result. We will use the language of systems engineering and our general systems engineering approach to solve the tasks. The special task is to offer a certain amount of safety. Therefore two very different examples are chosen. For both examples safety is a part of quality, fulfilling the requirements of safety means to compliance the requirements and to reach for a high degree of quality. The first example is a large dam offering drinking water on the one hand and offering flood safety on the other hand. The second example is a thermos flask for coffee offering hot coffee. These examples are not directly enterprise related so they can illustrate quite obviously the possibility of transferring the methodology to different tasks.
Figure 2 shows the relation between the system definition, the system design steps and the combination of steps. These dependencies and interdependencies lead to the approach as described in the following text.

Step 1
The first step to solve the task is to define a system.
The system has to be described roughly as shown by fig. 4 through a photo out of space. Very often this system is described by political, hydrological, geographical, geological or morphological, topographical etc. maps. Figure 5 shows the system of a thermos flask. This step one is just defining the system by giving area boundaries. This is the part of systems thinking.



www.luegenjaeger.de

Figure 4: System Large Dam

www.corona.de

Figure 5: System Thermos Flask

Starting with step 2 the procedure model starts.

Step 2

Step 2 is a step out of the right side of the circle the system design steps and it starts with the analyzing process. Concerning the task of safety the analyzing process includes a detailed system definition and description. For this application the safety concerning offering drinking water is in the focus of interest. Fig. 6 shows one part of the system. It is just a part of the hydrological cycle and its interdependencies and dependencies in the system itself and with the environment. This knowledge is indispensable to solve the given task. The next part (see fig. 7) of the system is the amplification of inhabitants, their number, their distribution in the area, their age distributions etc. It is possible to describe the industry concerning kind, distribution and outbound dangers in the same system (Pacaiová 2008). Concerning the second example the thermos flask the safety aspect is to offer hot coffee. The system is partly illustrated in fig. 8.

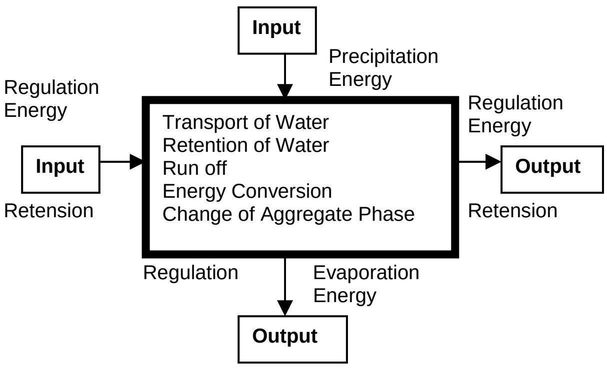


Fig. 6: System Region in the Hydrological Cycle

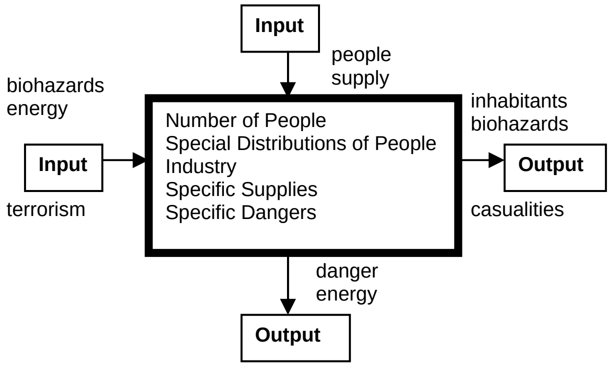


Fig. 7: System Mankind and Industry

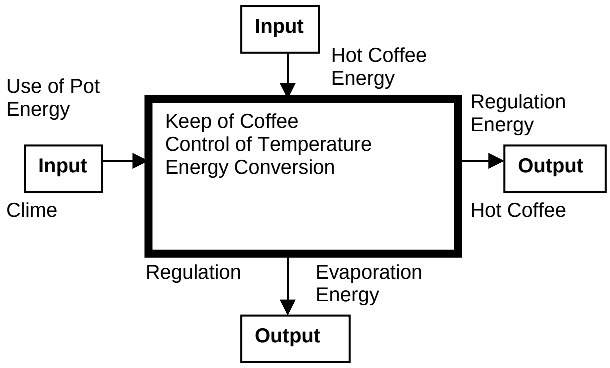


Fig. 8: System Dependencies of Thermos Flask

The specific supplies like fire departments, hospitals or police stations can be defined by the same system as well. It is possible to find as much as necessary subsystems and to describe and define them parallel to each other first. But later on all components have to be combined into one system to get all components. To know the subsystems and their elements is one result but to know about their dependencies and interdependencies is as important (Winzer/ Hoeborn 2008).

These relations have to be gathered and described carefully as well. And of course all dependencies and interdependencies with the environment have to be demonstrated. It was pointed out, that complex problems involve richly interconnected stets of "parts" and relationships between the parts can be more important than the nature of the parts themselves. New properties, "emergent" properties, arise from the way the parts are organized. Even if the parts constituting in a complex situation can be identified and separated out, therefore, this may be of little help because the most significant features, the emergent properties, then get lost.

We find out characteristic features of the system:

a) the boundary
b) the in- and output
c) the components (subsystems)
d) the interaction between the elements and the environment
e) the interaction between the subsystems
f) the hierarchy of the subsystems

Step3

Step three includes the goal building process. Concerning the task of offering drinking water and to ensure the sustenance with drinking water specific requirements have to be documented.

a) duration of drinking water supply

b) amount of drinking water per person

c) acceptance of distance to get drinking water

d) maximum time without drinking water

The given items are a first idea of important parameters for the goal building process, they may vary.

Concerning the task of getting hot coffee and to ensure the sustenance with hot coffee specific requirements have to be documented as well.

a) duration of hot coffee supply
b) amount of coffee being required
c) acceptance of temperature of coffee

Step 4

The design process is reached. We are still at the right side of the circle discussing what we have to do to solve the tasks. This design process is a first a rather rough idea to ensure the supply with drinking water. A first collection of ideas is:

a) gather groundwater springs
b) gather drilling machine
c) gather pipelines
d) gather containers
e) gather supplying people

Concerning the second example to ensure the supply with hot coffee there can also be done a first collection of ideas:

a) gather a second possibility to keep hot coffee
b) limit the number of person having access to the hot coffee
c) gather a control for the closing of the lid
d) install a temperature control

These given ideas are worked out by different instruments, by different methods. The tool which is used to create ideas is depending on the task. All these steps of the right side of the circle are leading to results which can be seen as a “big cupboard have an enormous number of drawers” and all these drawers are filled with different results in different ways.

Step 5

Doing step 5 means to jump to the left side of the circle, which seems to be like the classical project management. We have to start with a combination and planning set first. This means all the data have to be analyzed strictly and detailed to gather all the necessary information concerning resources.

a) Groundwater springs have given by coordinates. The subsurface has to be described. The productiveness of the spring has to be documented.
b) A drilling machine has to be available. The machine has to be applicable for given subsurface conditions. The drilling machine has to be in the nearby area. The transport duration has to be documented. The duration of drilling itself has to be documented as well. Possible redundancies have to proven and to be documented.
c) The pipelines have to be described concerning diameter, length, connection and the duration of installation.
d) Containers have to be described concerning capacity, number and location.

e) All necessary numbers of suppliers have to be documented. Detailed tasks and persons in charge of them have to be documented. Their reachability has to be fixed.

Concerning the example of the thermos flaks the results could be as following:

a) The second possibility to keep hot coffee has to be documented (office 3, level 4, room 5).
b) The access to hot coffee has to be controlled. The controlling person has to be available during the requested time. Time, place and responsible person have to be documented. Possible redundancies have to proven and to be documented.
c) The chosen control mechanism like an alarm contact by unclosed lid has to be described. Possible redundancies have to proven and to be documented.
d) The chosen temperature measure method like an alarm contact related thermometer has to be described. Possible redundancies have to proven and to be documented.

Step 6

Step 6 deals with the realization process and it discusses all possibilities of realizing the analyzed data and results.

Step 7

This is mainly a step of controlling but at the time of designing as well. Risk analysis has to be done. The choice of analysis depends on the task. Computer simulation and modelling has to be built up to control the analysis and design process. These results may lead to new start of the procedure module partly or totally.

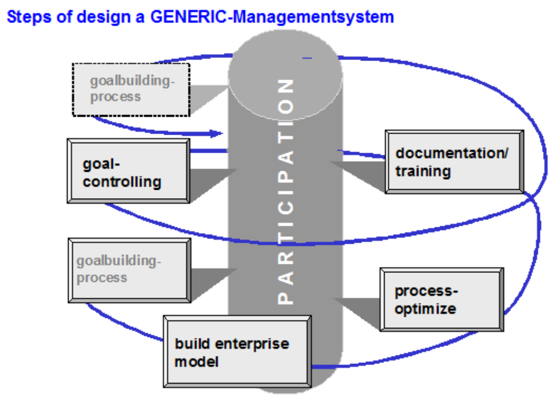


Figure 9: Dynamic Process of Compliance the Requirements

If the risk analysis leads to the result that the groundwater spring is no certain deliverer of the necessary drinking water amount the process has to start again. The detailed system definition and description has to be proven if there could be an additional spring e.g. The procedure may start at different levels and with different tasks again. This process of iteration and of taking requirements dynamically into account is not related to the task.

Conclusions

Different systems, different tasks but all of them are having just one language. We are thinking of and talking about systems. This is the first accordance, the first step, and the second compliance we have is to use the language of the general systems engineering approach. This means that we need just one procedure model to organize the operation. This model is described by the general circle including 6 steps. As the paper has shown this general systems engineering approach is a method of using one language to deal with all systems.

The big second step is the application of the Wuppertal Generic Management Concept. It is mainly described by the two half circles called ‘system design steps’ and ‘combination of steps’. This concept is based on planning, realization, controlling and advancement; which are the pillars of all management concepts. But additionally the Wuppertal generic management concept is an open, dynamic and requirement oriented system based on a holistic process oriented design concept and it is applicable to all fields.
The model of this ubiquitous management concept is modular. Actually it is based on seven modules [8] and the examples are concerning the module of risk and chance. The examples are quite different to illustrate the ubiquitous application possibilities of the model.
The Wuppertal generic management concept leads to a dynamic and sustainable management concept and it presents a real-time operating system. It is a holistic and ubiquitous concept.

Research Limitations

The theoretical approach of the generic management concept is based on a module structure. These modules have to be defined and described. A lot of research work has already be done, but there are still fields of research to continue. It has to be mentioned that this approach needs more research work to develop a practicable and easy to handle tool.

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