Applied

'KNOW WHY' THINKING AS A NEW APPROACH TO SYSTEMS THINKING

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This paper is on the background of so-called KNOW WHY Thinking—a systemic approach that can be used to reflect on all kinds of complex situations. The approach is based on evolutionary logic, according to which everything in the world, whether it is a product, an organization, a project or an individual needs to both adapt and develop in order to be successful. It needs to adapt to its environment and surrounding circumstances: this is referred to as its need for integration. It also needs to develop with the changing environment and in many cases also beat out the competition: this is referred to its need for development. While many systems theories describe how certain systems work, this approach describes why they work and also why other systems do not. This paper provides a range of examples illustrating this. One very useful way of applying this mode of reflection is using it to explain the motivation of human behavior. Humans either act based on rationality and discipline, or they are motivated by feelings. All our feelings can be categorized into two groups: they either help us to integrate into our environment or to develop so that we can adapt to changes or compete with others. No human emotion exists that cannot be categorized into one of these two groups: we follow evolutionary logic. Reflecting on human behavior in this way allows us to understand other—in many cases contradictory—approaches that explain human motivation. Both the KNOW WHY of success (of systems) and the KNOW WHY of human behavior can be used to reflect on our daily challenges. Together with a cause and effect modeling tool, all of the ideas and principles behind KNOW WHY can be applied as the so-called KNOW WHY Method. This method helps you to include the crucial factors within a model. Not only is this approach very powerful—it is easy to use, and therefore has the potential of being applied by many more people than other, rather complicated and abstract systems approaches are.

INTRODUCTION

Although it is common to call everything that isn't easy to grasp complex, we should differentiate between the kinds of challenges we are faced with: some are *complex* and others are *complicated*. Things that are complicated can be understood and predicted if we have enough time, knowledge and the right tools for dealing with them. Things that are complex, however, cannot be fully understood, and hence their behavior cannot be exactly predicted (Mitchell, 2009). The rules for taxation, for example, are complicated, whereas trying to estimate the tax income in the future is a complex challenge, because there are too many variables involved that cannot be forecasted. Things that are complex can only be approximated. It is also safe to say that everything that involves human behavior is *complex*.

What this also means is that things become complex as soon as there are crucial parts involved, i.e., unpredictable variables, the behavior of which cannot be predicted. Complexity can also be described as a quality or condition that features a large number of interacting variables and their dynamics that stem from so-called feedback loops, when one variable depends on the status of another variable that again is influenced by the first variable. The interdependencies of a larger set of variables can be calculated—or at least approximated—with the aid of computer models. Our human brain, however, faces a mental limit, if we try to grasp the interplay of more than four variables (Halford, 2005) without the help of the tool.

The crucial challenges of today are complex. They include everything from the financial markets to demographic change, environmental concerns, wars in various parts of the world as well as the success of a product or a company. Our own lives, too, and the behavior of the people around us also often present us with complex challenges. Even the work and projects we are involved with on a daily basis require that we face complexity: we must make decisions all of the time—and these decisions are only the right ones if the way that we perceived the complex situation was correct.

Today's decision makers seldom use tools. There are several reasons for this. Some fear transparency, many don't know that there are methodologies and tools available to them and others simply don't understand how to use them. Most of us shy away from making the effort it takes to reflect on the complex challenges we are faced with. Therefore it is common to rely on our gut feeling/intuitive intelligence and best practices. However, our gut feeling is emotionally deceptive (Kahneman, 2011) and cannot predict the future (Gigerenzer, 2007), and best practices are in most cases recipes that worked in the past and in a different context. If best practices always worked when we applied them, everything would always be successful to the same degree.

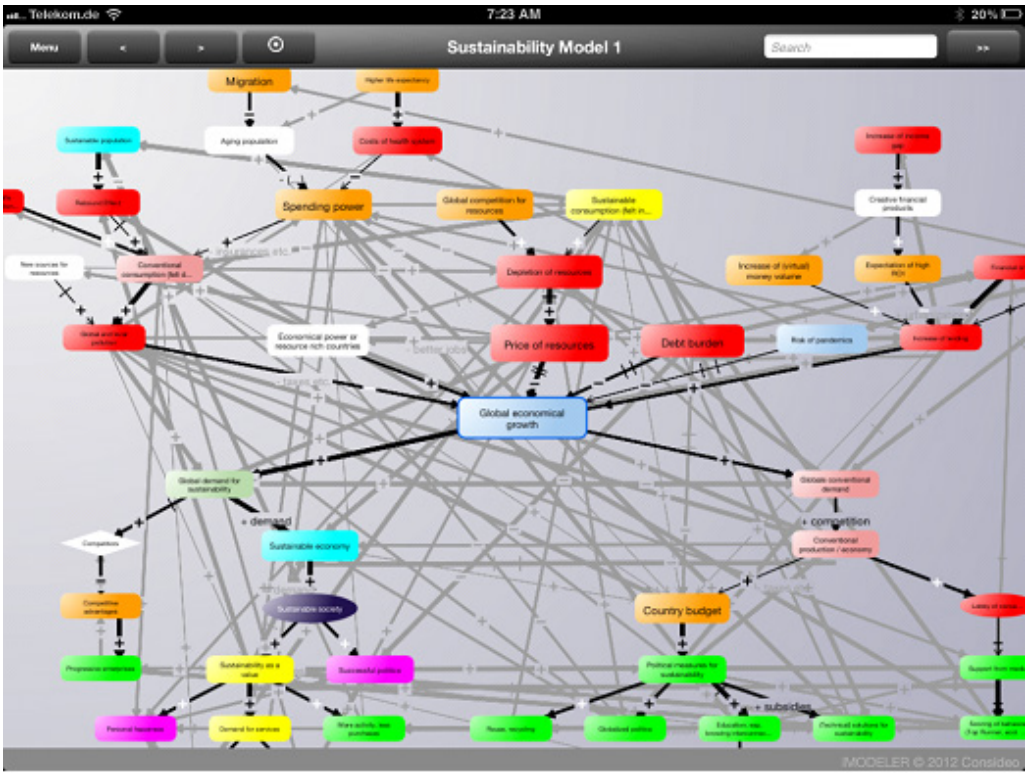

Figure 1 *A cause and effect model of the complex challenge of developing a more sustainable country. The model has 54 factors and 152 connections that form 1.5 million feedback loops.*

It is therefore better to consciously reflect on the present and the individual complex challenges at hand. And this means that we must look at the systems (Jackson, 2000) in a mental or a computer model (Sterman, 2000). These systems are abstractions of reality. They describe the interplay of factors as we perceive them with the connotation we add to them and according to the understanding we have of the cause and effects between them. To develop such a model we also use our gut feeling and apply best practices in the form of knowledge and experiences from our past (Neumann, 2012).

There are different tools available as decision support—mostly computer software—that offer so-called qualitative modeling or quantitative modeling methodologies, e.g., cross-impact matrix, fuzzy cognitive maps, Ishikawa diagrams, neural networks, agent based modeling and system dynamics. They are not topic of this paper, but regardless of the tool we use (and even if we use no tool at all) it is crucial that we always include the decisive factors into our models and think of the important relations that exist between these factors. We can refer to systems theories in this regard.

SYSTEMS THINKING

Systems thinking basically means that we try to gain a better understanding of something by reflecting on the interactions of the crucial factors that define it. We look at a system in a so-called model. Systems theories should help us to come up with a useful model. As George E. P. Box noted: "Every model is basically wrong, but some are useful"

There are numerous fields of systems theory, ranging from cybernetics and systems psychology to systems engineering and systems biology. Also included are concrete principles that should describe how systems work. Very prominent examples are the viable systems model (VSM) developed by Stafford Beer (1972) and the AGIL scheme developed by Talcott Parsons (1970).

According to Beer's VSM, an organization is viable if it features five functions that he calls subsystems. In a nutshell: an organization needs to do what it does. It needs a functioning communication system. It needs some control mechanisms. It needs to monitor the environment and never lose sight of the future. In addition to this, it also needs to decide about the course of the future. Beer, of course, adds much more sophisticated aspects to his great theory, but in principle this is what VSM is all about.

Parson's AGIL scheme states that in order to be successful a society needs Adaptation, Goal Attainment, Integration and Latency. Any larger disturbance can be explained by the lack of at least one of these four functions (Parsons, 1970).

I will address both examples of systems theory again later. Although it is logical that we should look at the interplay of several factors or variables in a computer or mental model to understand the complex challenges we are faced with few people actually use the systems theories that are available to them. The main reason for this is that these theories are too complicated to apply and that in many cases it is difficult to see the parallels between the situation we observe and the general principle of a systems theory. It is, for example, almost impossible to reflect on the success of a product or the change of a regime, for example, using the AGIL scheme. Even thinking about the success of Apple as a company and an organization is difficult to do with a VSM, on account of the fact that crucial elements and their functions are not with any of the VSM's five subsystems. It is not the scope of this paper to provide proof this, but– it is interesting that KNOW WHY Thinking is able to explain why and to what extent existing systems theories work.

REDUCTIONISM VS. HOLISM

Before I continue explaining what KNOW WHY Thinking entails, it is important that I mention that KNOW WHY Thinking is less reductionist than other system theories are—or, in other words, more holistic or meta-systemic than they are. Expressions such as linear thinking, mechanistic thinking and reductionist thinking imply that we do not try to understand the complicated or complex interplay of several factors, and in this way these modes of thought are the direct opposite to systems thinking. However, "reductionist" in the truest sense of the word also defines systems thinking as a reductionist approach, but without the bad connotations. It just means that in order to make a model of the reality we observe its various components, and then analyze their interactions and dynamics, which is more than just the sum of its parts. Whether we consider more or less components (or factors) defines whether we are more or less reductionist. Whether we make use of more or less general constituents of certain types of systems, e.g., the five subsystems of the Viable Systems Model or the four functions according the AGIL scheme, it is more or less reductionist. It is not necessarily a disadvantage to be reductionist. In fact, it helps you to come up with a useful model for any given thing: if we use as few factors as possible our model is easier to grasp and can be communicated successfully. On the other hand, a model is not useful when it lacks explanations for phenomena we can observe. In this case, we need to become less reductionist and more holistic. Holism in its purest sense, however, means that we can explain why something is without being able to make any predictions about it or having a deeper understanding of the underlying reasons. It remains a so-called black box—and it is unable to help us make the right decisions.

To be less reductionist and yet not purely holistic we need to seek approaches in between, as Arthur Koestler did when he came up with his Open Hierarchic Systems, or OHS (Koestler, 1978), which he referred to as holarchic and holonistic. Personally, I like Koestler's OHS, but similar to other systems approaches it is too arduous to be applied to the daily challenges we are faced with. It is for this reason that I have developed KNOW WHY Thinking—it is a very easy way to apply the basic principles of a successful system and a methodology to develop models with as many factors as are necessary to explain something.

THE ANSWER TO THE QUESTION OF WHY: EVOLUTIONARY LOGIC

In 1996, I took a course on management cybernetics and found myself wondering why so few people had signed up for it. I also asked myself why so many practical challenges couldn't be explained by the professor, the students or the consulting firm of the professor. One reason was that the systemic approaches that existed were too complicated to apply and the other was that they were too reductionist. I therefore started thinking about how it might be possible to alter and/or simplify the very sophisticated explanations for certain systems that already existed, e.g., from Niklas Luhmann, and I ended up inventing KNOW WHY Thinking. I simply asked WHY? Why are things they way they are? Not because of some system, but because the system is there for a reason. For every single answer I came up with, I continued by asking what the reason for it was, and the ultimate answer was, that in order to exist a given thing somehow needs to find a way to both adapt to its environment and its surrounding circumstances, but also to develop in order to continue adapting to the changing environment it is in and/or in order to compete with others. To put it very simply, I concluded that it was a question of "integration" and "development". In order to remain successful in the long run, everything in the world needs to do both: integrate and develop.

KNOW WHY Thinking is really this simple. We don't even have to explicitly ask for how integration and development are involved—all we need to do is continue asking WHY, the same way that children do until their parents tell them that something is the way it is because it just is—unless, of course, they suggest that the child go ask their mother or father for the answer to their question .

The need for integration and development for everything in the world is a kind of meta-systemic explanation. It is not quite holistic, but since it does not provide a fixed answer to anything and only helps you to come up with individual answers, it is less reductionist than other system theories are. In fact, the VSM is a good choice for organizations because the five subsystems can lead to integrated development. The AGIL scheme, too, can be used successfully when it results in the integration and development of a society.

Some people may think that this approach is not clear enough or even arbitrary. This weakness is actually its strength. We do not come up with explanations for the individual challenges through more or less reductionist views on something—not if the systems theory is hard to make sense of or cannot even really be applied to the given

situation. Evolutionary logic, however, helps us to easily come up with individual—and hence fitting—explanations.

KNOW WHY Thinking can be called evolutionary logic as life itself is a process in which something needs to adapt and develop in order to be successful. And any system, whether we call it emergent or autopoietic, whether we reflect on products, projects, organizations, ideas, societies, individuals or strategies, even this paper, is a part of life: it is successful if it integrates and develops.

KNOW WHY THINKING AND THE KNOW WHY METHOD

I also created the so-called KNOW WHY Wave to facilitate the reflection process. It is an iconographic representation of an event horizon, comparable to the visualization used in catastrophe theory (Zeeman, 1976). We can place everything that we are reflecting on somewhere on the wave. The higher it is on the wave, the more successful it is. The wave itself is constantly moving. If something develops upwards on the wave, that thing is becoming more successful. If it develops too much, however, it might suddenly simply fall off of the wave. If it doesn't develop, the wave will roll on and sooner or later this will cause any given thing to become less successful.

If the answer to the question of whether something might be experiencing not enough or too much development becomes more differentiated we should start modeling the factors and their interplay. I have developed the KNOW WHY Method,

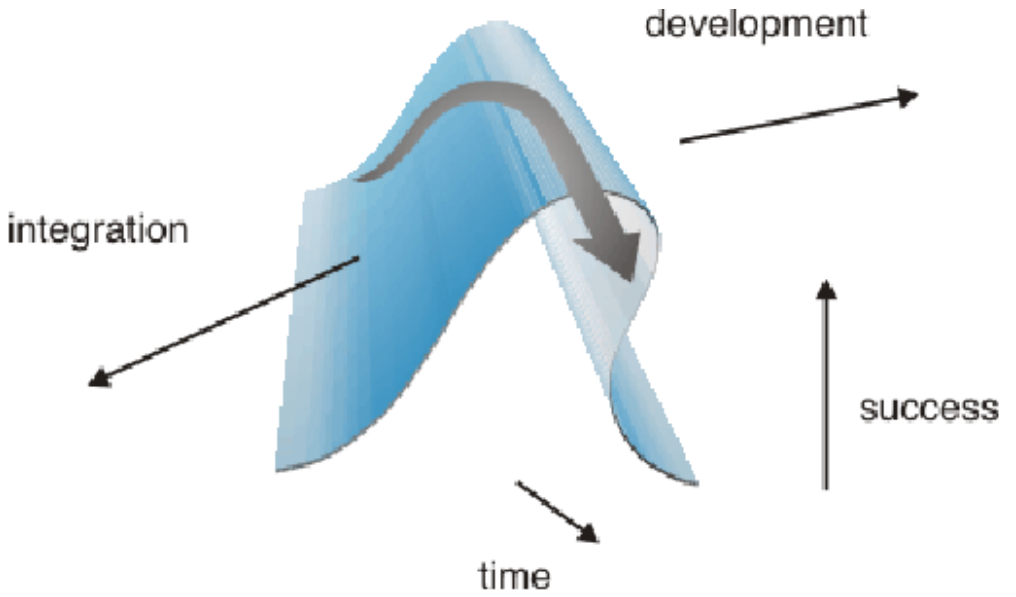

Figure 2 *The KNOW WHY Wave*

which only requires that you ask the four KNOW WHY Questions for any factor within your model:

1. What leads directly to more of it right now?
2. What leads directly to less of it right now?
3. What might lead directly to more of it in the future?
4. What might directly hinder it in the future?

These four questions allow you to determine whether something is integrated and developing. If a large number of factors serve to define the existence of certain factors, a software tool allows you to analyze their resulting impact—either qualitatively or quantitatively.

The software tool called the Consideo iMODELER has this methodology "built in" to assist the user to determine what the crucial factors in a model are.

It cannot be guaranteed that we will discover the crucial factors that determine the destiny of the given factor—but it is more likely that we will. It also becomes even more likely if we ask people with background knowledge to help us and even more so if we facilitate creativity. We may know what some of the potentially influencing factors are from the past. Determining what the others are, however, is simply a question

Figure 3 *The KNOW WHY Method in the iMODELER*

of creativity—thinking about them in the present. KNOW WHY Thinking is hence a methodology that does not just incorporate existing knowledge—it is also an explorative approach that requires you to create new knowledge. It is a vehicle for exploration and communication.

PRACTICAL EXAMPLES

The list of examples for all the different ways that KNOW WHY Thinking can be applied is endless. I would like to give just a few here. It is very likely that some of you will look at these examples and feel that other additional aspects need to be considered—this means that you are already using KNOW WHY Thinking.

Let us begin by taking this very paper I have written. Its integration stems from the attractiveness of the topic and the significance it has in terms of being able to help us get a handle on various challenges we are faced with at present. There also has to be some new aspects involved—something that is developing. However, if there is too much development without any reference to works that have already been written, for example, it might lack the much needed integration. If it doesn't follow the rules that govern scientific work to a certain extent, it might also not be integrated. And if it is too complicated, it won't be integrated either.

Another example is the shift in energy supply from fossil fuels to renewable energy. Fossil energy needs to develop because resources are dwindling. The KNOW WHY Wave is slowly rolling on and at some point the way up the wave might be too long. Renewable energy lacks integration—an adapted power grid and the possibilities to store energy from wind and solar are either not yet feasible or extremely costly. Above all else, integration is lacking because support from the population is lacking, who have not yet integrated the need to change. One reason for this is that lobbyists for the conventional energy industry need to be integrated—to gain their support for change. While change represents too much development for many people and industries alike, the project itself is not developing fast enough. There are a lot more aspects to consider and hence we should model it with the help of a tool.

A good example that involves a product is Microsoft's latest operating system, Windows 8. In the past, Microsoft was famous for not developing fast enough, concentrating on backward compatibility instead. Now they are introducing a system that some people fear might mean too much development for the average desktop PC user.

The financial markets are, of course, an excellent example of too much development beyond the crest of the KNOW WHY wave. The lack of adaption to cultural shifts and the social realities of some religions can be seen as their lack of development. A party or a concert where too many new songs are played might also be too much development. A much too complicated pick up line also means too much development. However, by the same token, if we are too unoriginal, it could mean not enough development. An individual who doesn't engage in lifelong learning and isn't willing to change his or her work location might lack development. On the other hand, a person that continuously changes his or her workplace and the topics they are learning about might face the problem of too much development.

And one last example: the explicit use of systems thinking in many organizations means too much development without integration. Being faced with growing complexity, however, could be a reason why an organization that doesn't apply systems thinking and modeling is not developing enough.

It is easy to recognize whether something has too much or not enough development after the fact. The challenge is then to think about all of this in advance—to determine if something might not be integrated or lack development. Already consciously considering this will lead to greater insight. The measures that are necessary for success simply need to lead to more integration or more development.

THE KNOW WHY OF HUMAN BEHAVIOR

Probably the most important use of KNOW WHY Thinking is in reflecting on human behavior. When we continuously ask why people do what they do, we will again gain insights into evolutionary logic. In order to survive our human ancestors needed to adapt to their environment and they needed to develop in order to adapt to changes and to succeed in competition with rivals. When we decide to do something we are basically motivated by three different things: we do something because we know that we have to, because we are forced to, or because we want to. The most powerful motivator is, of course, wanting to do something . And why do we want to do a certain thing? Because it feels good. And why does it feel good? Because neurotransmitters and hormones give us that great feeling. Why do they do so? Because it is crucial for our existence that we develop and integrate, and in the course of evolution it turned out that humans who were motivated in this way survived.

As I mentioned earlier, no feeling exists that does not either lead to integration or development, or gives us the bad feeling of lacking integration or development.

Adrenaline and dopamine, for example, make us feel development, and serotonin and oxytocin make us feel integrated. Feeling fearful threatens our integration and feeling frustrated or bored means that we feel a lack of development.

In other words, buying things, achieving things, doing sports, having a conversation, having friends to share things with, etc. is all the result of hormones that help us to evolve and develop and also to integrate. In fact, all of civilization is a result of this evolutionary logic. We have subcultures, religions, technological achievements, wars, sports, etc. simply because we have a need for integration and development (Neumann, 2012).

Other explanations for human motivation exist as well, e.g., the famous hierarchy of needs by Abraham Maslow and the 16 basic motivations of Steven Reiss (Reiss, 2002). There are also many other theories that describe what ought to motivate us. KNOW WHY Thinking helps us to discover what really motivates each individual.

The things that make us feel good are interchangeable. By what criteria we feel integration or development depend on our environment, our history. And this is the reason why some theories on human motivation seem to contradict themselves. Some people need to be a leader to feel good, to feel that they are integrated and developing, while for others being a leader would mean too much development. This also implies that some people will get the same feeling of integration (with the same flow of neurotransmitters) when they are chatting in front of a computer the way others do when they are sitting and talking to their soccer team buddies. Buying a new T-shirt, discovering a new computer function or learning a new skateboard move can all result in the same feeling in different people.

This mode of thinking not only allows us to systemically understand the development of different cultures and subcultures, it also allows us to understand the behavior of juveniles, of consumers, of voters, of our partners, our friends or our employees. We can reflect on whether our partner, our employees, our children, etc. have the possibility of feeling that they are integrated and/or developing. And even more importantly, it gives us some important insights on how we can change people's behaviors. Whenever we want to stop people from doing something that gives them the good feeling of integration or development, we need to offer an alternative that can provide them with the same good feeling. Whether it will be able to do this, however, is difficult to guarantee because feelings are highly individual.

People don't buy things simply because they want to be in possession of status symbols. They buy things that are status symbols because they make them feel integrated and/or that they are developing.

Interestingly enough, in most models created to explain on our daily challenges human behavior plays a crucial role—both rational and emotional behavior. For a more comprehensive understanding of human behavior we should also be aware of the degree of consciousness involved, and whether we are able and accustomed to reflecting on our behavior (Jaynes, 2000), as well as the influence of emotions and whether our ratio is suppressed by emotions (Kahneman, 2011). All of this also has an impact on what we feel and that we feel.

CONCLUSION

KNOW WHY Thinking and the KNOW WHY Wave and its applications to explain the motivation of human behavior as well as the use of the four KNOW WHY Questions of the KNOW WHY Method (to include the crucial factors into cause and effect models) are less a descriptive systems theory and more explorative. They are all easy to understand and to use, and yet their application still depends on the knowledge, the creativity and the efforts of its users.

The ease of use is meant to be a strength. It is easy to further elaborate on this methodology, not just to think about the integration involved in a project in general, but also in terms of its technological, organizational, psychological, monetary, etc. integration and development. In some cases this might help, in other cases this might be again too reductionist.

There are further applications of this evolutionary logic for algorithms, agent-based models, artificial intelligence, trend forecasts and much more.

I have spent nearly 15 years now applying this approach in my daily life and have learned that we can start thinking about anything we are faced with– something we have read in the newspaper or an issue from our private life—and by thinking about its position on the wave, how its integration and development is influenced and might be influenced in the future, we can gain amazing insights. When we have to consider more than four interdependent factors, we should always use the help of a tool for modeling.

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