Modeling for everyone

How to make cause and effect models for any complex challenge, how to include the crucial factors by using of the KNOW-WHY-Method; how to gain insights with qualitative weighting and the Insight Matrix offered by both the CONSIDEO MODELER and the iMODELER.

by Kai Neumann

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Introduction

The new iMODELER and the Consideo MODELER offer a revolutionary way to both visualize and analyze complexity, thus allowing for better planning, communication, and decision-making.

The biggest challenge that we face today and will face in the future is ever-increasing complexity. This applies to economics (projects, strategies, products, technology, organization), politics (ecology, the economy, culture, demographics), society and also to our private lives (5-year-plan, life balance, family, relationships). Their success all depend on our ability to see the factors involved and how they are interconnected.

Studies have shown that we reach a mental barrier when we try to grasp the interconnections between more than 4 factors. In such cases, we naively listen to our gut feelings—which emotionally deceive us—and so-called best practices—which have been applied under other circumstances in the past.

It has been seemingly problematic and arduous to analyze individual cause and impact interconnections because up until now the tools and methods that were used to do so were far too complicated.

The CONSIDEO MODELER and the KNOW-WHY-Method, however, eliminate the obstacles formerly associated with analyzing individual cause and impact interconnections. The CONSIDEO MODELER is the first successful and easy-to-use modeling software of its kind. Its practicality is evident in the wide variety of its users, who range from renowned companies, organizations, institutions, consultants, private users, and students around the globe.

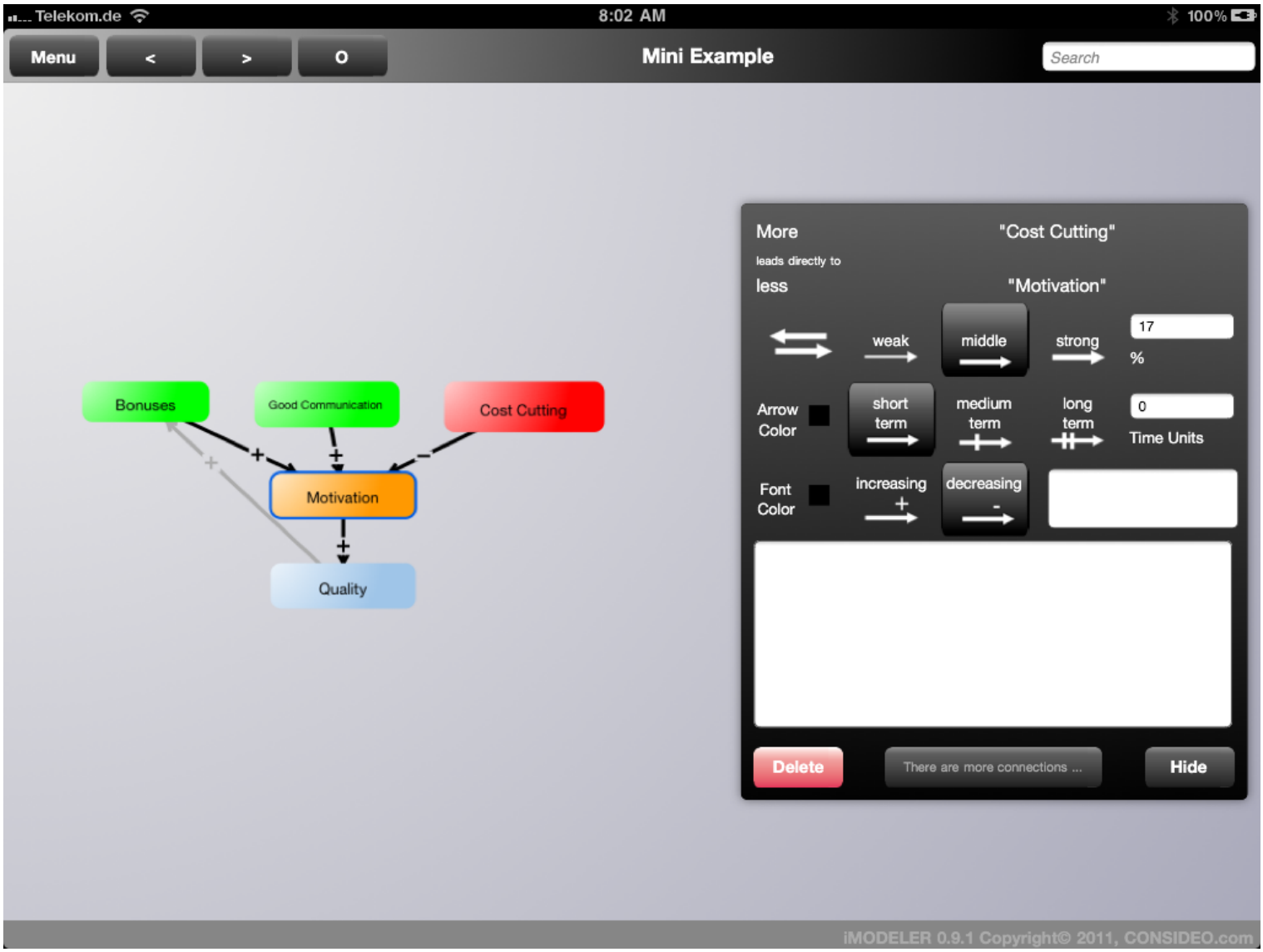
The range of topics that can be analyzed is diverse. The software facilitates daily discussions and also serves to help you to focus on business methods, strategies, and tools, such as the balanced scorecard (BSC), knowledge management, SWOT analysis, change management, quality management, Six Sigma, corporate forecasting, risk analysis, project management, product development and much more. Simply put: Whenever you are required to contemplate anything that features more than 4 factors, you should model it!

However, simply having the tool is not enough. Other important elements are needed as well in order to model cause and impact interconnections. Transparency must be the goal, time is needed and easy-to-use methods help to structure models and to include the crucial factors.

With the new iMODELER, we enhance the MODELER and allow for even simpler use and faster modeling. We have also finally integrated the KNOW WHY Method into the iMODELER.

Modeling

Modeling makes it possible for us to see cause and effect relationships between so-called factors. For example, Motivation leads to more Quality, which leads to more Benefits, which leads to more Motivation. Cost Cutting then may lead to less Motivation in the same way that Good Communication may lead to more Motivation.



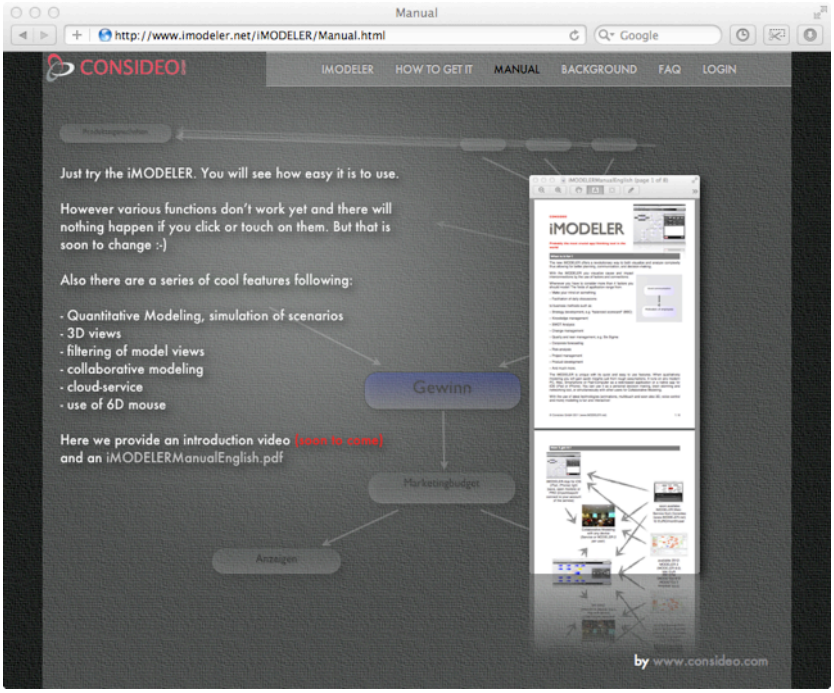
The + and the - signs indicate whether a specific factor has an increasing or decreasing effect on another factor. This mini example also has a so-called reinforcing feedback loop, which can become a vicious circle if Cost Cutting lowers Motivation leading to less Quality leading to less Benefits leading to less Motivation leading to less Quality and so on and so forth …

Although it seems fairly simple to connect factors to form arguments, in reality there are only a few experts who are actually capable of doing this. These experts often brainstorm factors first and then try to connect them afterwards, or they start by modeling loops that they already know of, gaining few if any new insights, or they structure so-called stocks and flows according to the rather complicated method of system dynamics and then insert the missing factors. These three approaches all become extremely arduous for people

who are not experts at modeling. They will usually end up with strange models that look like spaghetti because they mixed redundant direct and indirect connections. In fact, even experts very often fail to include the crucial factors as they tend only to model that which they already know.

The following sections of this guide show you how easy it is to structure a model, prevent redundant connections, and include the crucial factors.

You can weight connections qualitatively by defining whether an impact is weak, middle or strong; by using quantitative impact scores, you can ascertain whether an impact is weaker than weak or stronger than strong. You can also define whether the impact is short, middle or long term. Afterwards, you will gain insights from the analysis of the Insight Matrix. How you can do this is described in the manuals and videos that come with the MODELER and the iMODELER.



An alternative to qualitative modeling is quantitative modeling, where data and formulas are used to run scenarios. However, this topic will not be addressed here.

I will now explain what it means to model qualitatively. Qualitative modeling is much faster than quantitative modeling. You don't need to include data or develop sophisticated formulas to define the exact behavior of a system in scenarios by employing technical terms for the factors. Instead, you can choose factor names that are identical to the words you use when you think or speak about something.

The interconnections then are also defined using the very same language you would use when speaking about them. You speak of weak and strong impacts, and of something that has a stronger or weaker impact than something else does. In many cases, you use your gut feeling to predict the impact between two factors that would otherwise be very difficult to describe using a mathematical formula.

Interestingly enough, the less exact and rather fuzzy way we describe things is actually easier for people to understand. In most of our arguments we use the strengths of the human language: we connote a great deal with our words and the person we are talking to has no trouble understanding what we mean.

Using tools such as the iMODELER will in fact allow you to model almost as fast as arguments are made in a meeting.

Although, qualitatively, we are only modeling rough assumptions, the analysis that results from this is surprisingly exact. With the Insight Matrix we can analyze the overall effects that impact factors have on different paths of influence on a chosen factor. This is shown on the horizontal x-axis.

On the vertical y-axis, we see whether this short term impact that a factor has will change over time due to feedback loops, which in the case of a dominance of reinforcing feedback loops will lead to an increase in the positive or negative impact of a factor. Balancing feedback loops in turn lead to a decrease in a factor's impact over time:

The iMODELER and the MODELER calculate these results in a unique way by making use of the background simulation of impulses that are sent through the cause and impact model. They present the potential impact that a factor can have, expressed with values without dimension, on the chosen factor and indicate how this will develop due to feedback loops a few steps later (mid term) and ultimately a few more steps later (long term).

Only if you have to have a deeper understanding of the calculation of the insight matrix, e.g. for academical purposes: If factor A has a weak impact on factor B, that has a weak impact on factor C, than the calculation goes 1 * 0.1 * 0.1 = 0.01, the effect A has on C. A weak value of 10 for example with a mid term effect has a short term effect of 5, a mid term effect of 10 and a long term effect of 10. A weak value of 10 with a long term effect has a short term effect of 2.5, a mid term effect of 5 and a long term effect of 10. To calculate the effect of loops the impulse runs through the loops one time for the short term effect, two additional times for the mid term effect and two further times for the long term effect. In principle you can transfer the qualitative model into a quantitative model and run a simulation that results in the values of the in-

sight matrix in time step 1, 3 and 5. For example, if factor D has also a weak impact on factor B the formula for factor B would be: 0.1 * factor A + 0.1 * factor B.

Note: potential impacts that depend on many further details can only be modeled quantitatively. The real benefit of this is not obtaining the absolute value of a factor's impact that is shown in the Insight Matrix, but rather the possibility of comparing the potential impacts of factors on a chosen factor in order to identify, for example, more or less important risks, measures, resources, etc.

By the way, a number of models were later quantified in a sophisticated way and, surprisingly enough, brought no additional insights. Qualitative modeling is a powerful tool and the insights reach far beyond our intuition.

KNOW-WHY-Thinking: what are the crucial factors

Before I describe the KNOW-WHY-Method and how it is used to structure a model and to include the decisive factors, I need to introduce you to KNOW-WHY-Thinking. I developed KNOW-WHY-Thinking as an alternative to other approaches to systems thinking and systems theory, e.g. Talcott Parson's AGIL scheme or Stafford Bear's VSM because as fascinating as these may be, there are too many things that they simply cannot explain.

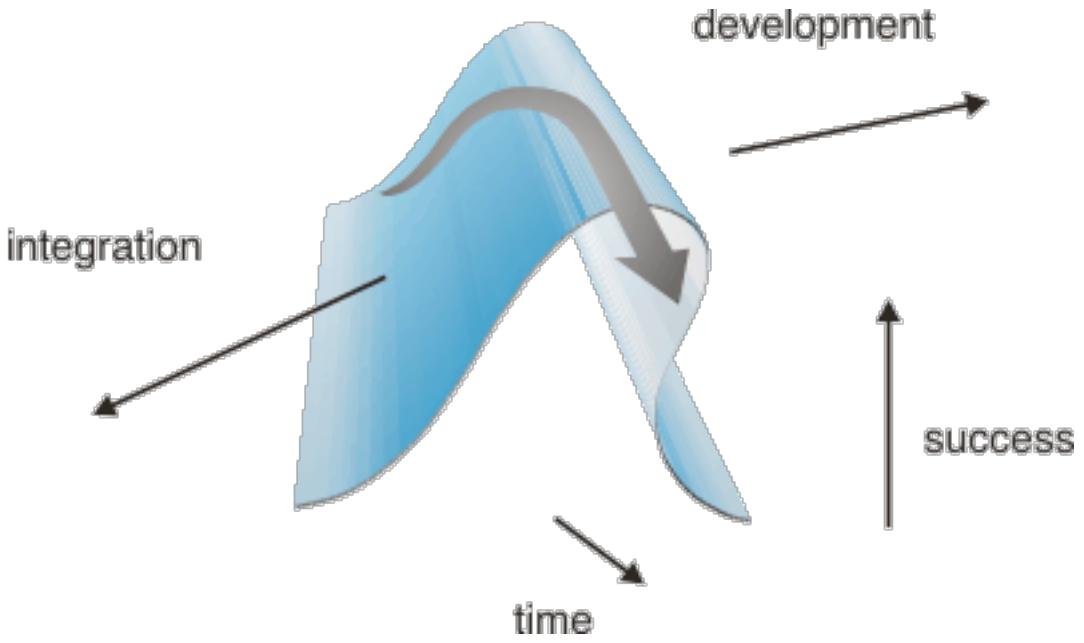
As a side note: there are a number of experts who say that they are systems thinkers or claim that they engage in holistic thinking just because they look at more than a few factors at a time. Regular people and software vendors, too, speak of analysis and optimization, although they just visualize something in a helpful way to analyze it by looking at it. This is a strange notion once you know that the MODELER and iMODELER have been developed to analyze your model an come up with results that reach beyond our mental boundaries.

A systems theory should lead to a better understanding of a system, i.e. a part of the world as we see it with all of its constituents and the interaction(s) and behavior between them, e.g. a market, a culture, the success of a product, human behavior, etc. While most systems theories just describe how systems work they lack an explanation as to WHY systems behave the way they do and also WHY some systems behave differently than other systems do.

If we continuously ask WHY something is the way it is, we will at some point find the answer—in order to be successful, any given thing needs to adapt (integration) to its circumstances and to its environment, but also to change (development) with its environment and in competition with others. In other words, any given thing will only be successful in the long run if it does both—integrate and develop. If either integration or development is missing for a longer period time, you will not only know the reason for the many problems that crop up, but also get some useful hints on how to handle these challenges.

For better understanding and communication, you can use a picture of this cybernetic pattern of success with the KNOW-WHY-Wave. It shows an iconographic representation of an event horizon. When it is on top of the wave, a given thing has maximum success. To get there it must develop. If it only remains integrated but does not develop the wave will continue moving and the given thing will become less successful. If a given thing develops too much, however, without becoming integrated it will develop beyond the crest of the wave and slide off of it with no success at all.

There are many examples that can be easily explained using this picture, e.g., the UN is an entity that develops too slowly. The financial markets lack integration into the real economy. The idea of a united Europe isn't integrated into the hearts of the people. Renewable energy lacks integration through a smart grid. Some major energy companies lack development, hindering them to become competitive when faced with a change in integration—to a decentralized energy supply.



Give it a try: Take a topic from a newspaper or any challenge that is on your mind and think about where it would be positioned on the wave. Then try to think of what it needs to integrate and what it needs to develop. Sometimes it may appear trivial, but in most cases it is easy and mind-blowing. Things will get more complex, however, once a topic has been modeled and the KNOW WHY Method has been applied.

Before we do this, I would like to mention a very important facet of KNOW WHY Thinking: human behavior. In most systems, human beings are a crucial factor. Their behavior is either purely rational or motivated by feelings. Neurotransmitters and hormones make us feel. Interestingly enough, there are no feelings that do not either make us feel integrated or feel that there is a lack of integration; that there is development or that there is a lack of development. When you buy something new that you want or when you do something new that you've always wanted to try, you do so to attain a feeling of development—and in both cases you have the very same flow of neurotransmitters. Whether you are on a sports team or just sitting in front of your computer surfing social networks—in both cases you have the same feeling of development and even more so of integration. If you fear something, it is a threat to your integration.

Evolution enables us to feel integration and development so that we can cooperate in teams and develop ahead of our competitors, and also in response to changes in our environment. The criteria that let us feel integration or development today are exchangeable. If you want to motivate employees, your children, a new partner, or your customers, etc. you should explicitly observe them and then determine what it is exactly that will make them feel that they are integrating or developing. If you urge on too much development, you will fail. What must be done to get people to drive slow electric vehicles with less mileage, for example, becomes much clearer if we first reflect on the feelings of people who drive cars.

The KNOW-WHY-Method: how to build a model with ease

Modeling with KNOW WHY Thinking is called the KNOW WHY Method. It is fairly easy to use: just take a central factor, a central goal or a factor that consists of several goals. Ask yourself what might cause or threaten the integration of this goal or factor, then ask yourself what might cause to hinder the development of it. Some more practical questions to ask yourself are the following:

- What does this factor need that will directly (!) lead to there being more of it?

- What hinders a factor; what leads directly (!) to there being less of it?

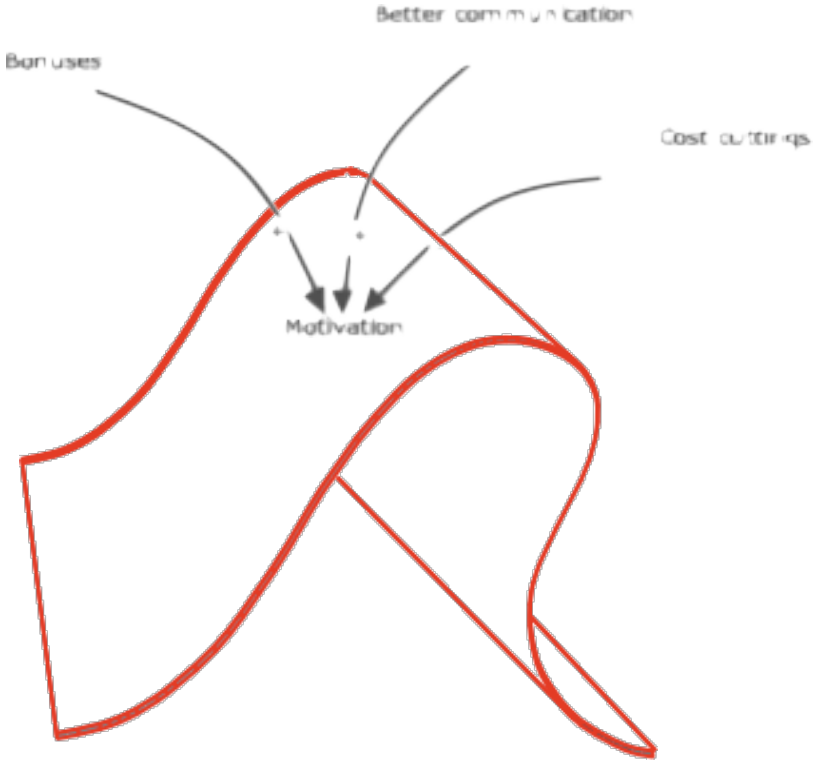
- What will be needed in the future; what may lead to it directly (!) in the future?

- What may hinder a factor in the future; what may later lead directly (!) to less of it?

You may alter these questions so that they better suit your topic. These questions will help you find the crucial factors for your model in both a creative and analytical way. No crucial factors exist that are not integrating or being the reason for not integrating, developing or being the reason for not developing.

The method involves simply posing these questions for every factor in your model until you think that the effects they have on your central goal can be neglected. If you have limited time for modeling, always begin by modeling those factors that are closest to your central goal first and then go into more depth afterwards.

Always express a newly made connection in the following terms: “more of X leads directly (!) to more/less of X”



The answers you obtain are factors that indicate how to get on top of the wave or what is hindering something from getting there.

If you continue to ask what leads to benefits, quality will be one answer. If you continue to ask what it takes to get quality then motivation will be an answer and the feedback loop will be well visible.

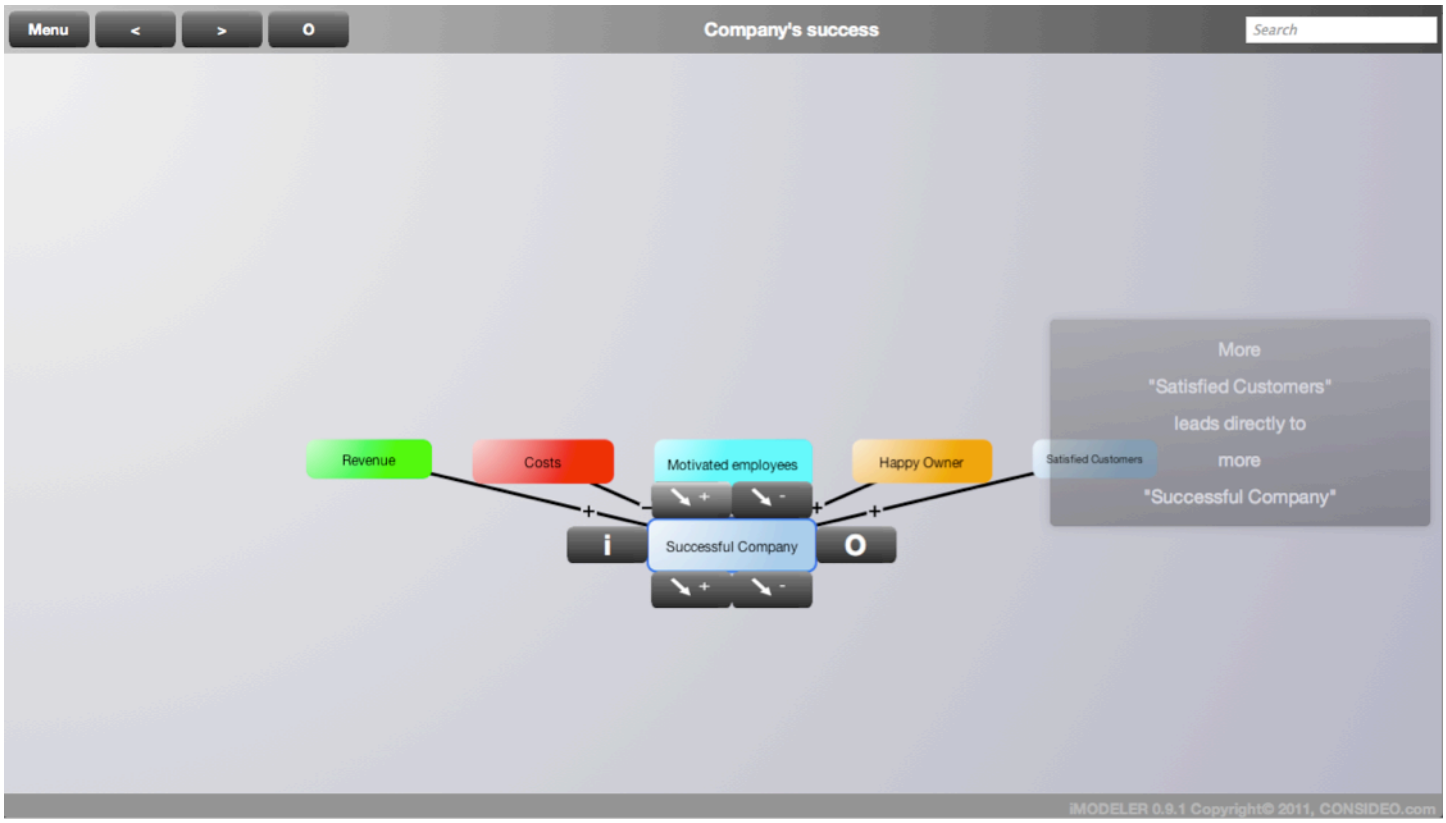
Tips and tricks for modeling

- Be very specific on the goal of your model. What do you want to get from your model? Do you want to identify activities, risks? Do you want to compare products, solutions? Do you want to identify what is most important for a change?

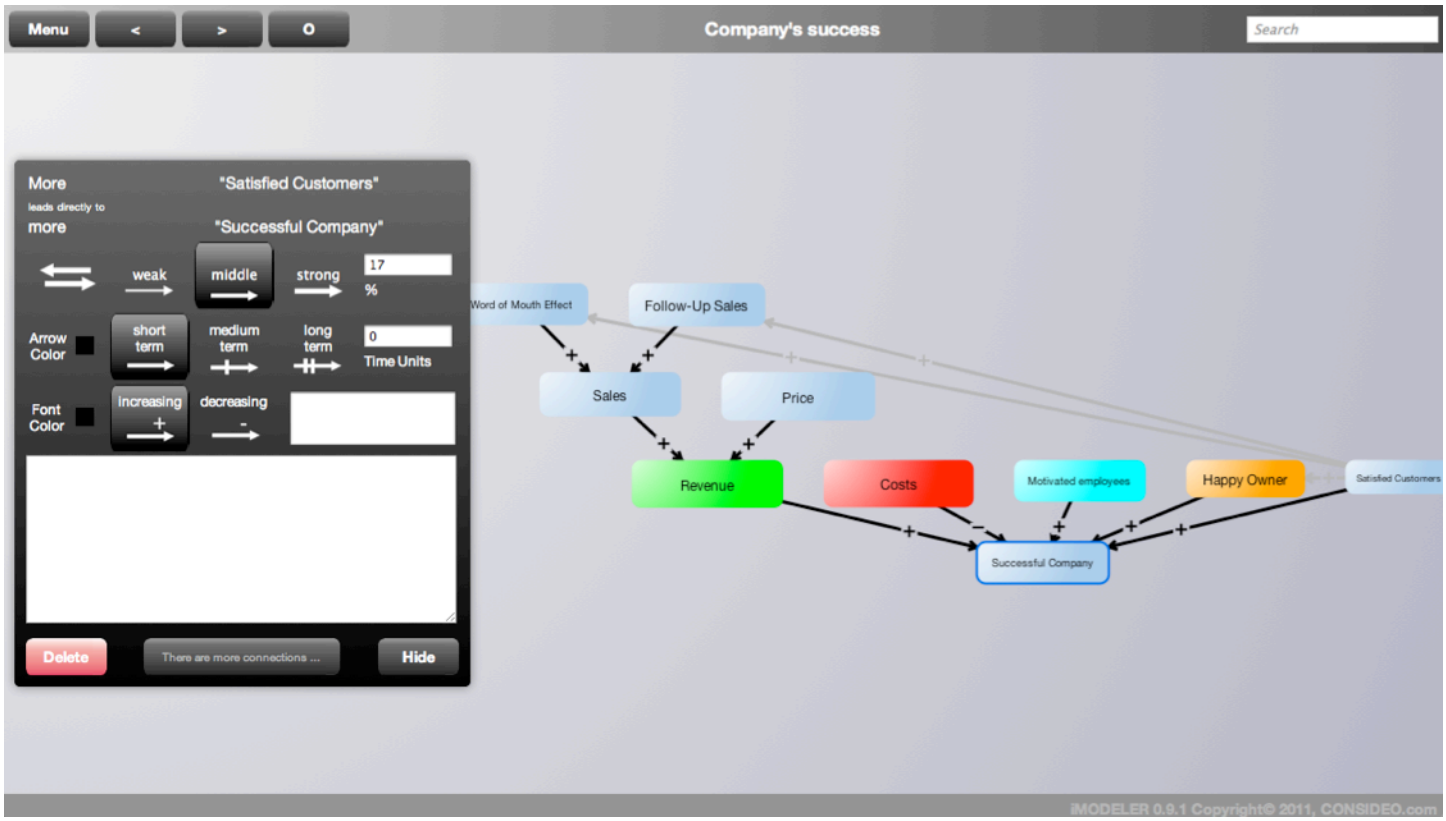
- If you have a complete new task think of a structure for the model in advance. This means you integrate the development of a model. For example you may have a goal that is divided into subgoals and influenced by processes that influence each other. The processes are dependent on resources and both, the resources and the processes might be influenced by incidents. For the incidents you may want to look for activities to handle them. Put this structure into a mini-model or even on a whiteboard. You may use it as a basis for your color coding as well.
- Think carefully with whom you start modeling. If it is a new challenge for everybody it might be good to have the full creative potential of a large, interdisciplinary group. If the most important factors of a topic are well know start to model with only the experts of a certain topic within the model so the others don't get bored. If you fear that there will be an unproductive discussion on details you may even decide to model with generalists, only. However, your first draft of a model should be shared with a large number of people and be refined by their input.
- If you have prepared lists of possible factors within other approaches, e.g. brainstorming, metaplan etc., don't use them directly! Of course, everybody will moan that it looks like doubling the workload. But very likely you will need other expressions for the factors if you put them into cause and effect relation. Also concentrating on how to connect existing factors somehow keeps you from thinking freely about the actually important factors. However, being prepared by previous workshops you may crosscheck the factors you have added to your model with the list of factors you have gathered before.
- Always make sure to only ask what influences a factor and not what a factor influences. At least for beginners this is a good way of ensuring that one does not get lost. Almost for sure a group of modelers get lost if one of them jumps back and forth. Many less experienced users, however, try modeling without this scheme and fail. Experienced users who ignore these scheme sometimes get surprised by the results beginners get with it.
- Express the connection using a sentence that is like the one mentioned in the previous section: "more of X leads directly (!) to more/less of X". Of course, sometimes you have to exchange more/less to expressions like better/worse, beautiful/ugly, conform/non-conform etc..
- Use natural language—I realize that this is hard for old school and rather technical quantitative modelers. But this is integration ;-) as we need to get the actual decision-makers to look at the models. After 50 years of highly sophisticated quantitative modeling, still nearly no decision-maker is using it personally. While old school modeling would take a factor "Communication" to get the possibility of expressing more or less communication, the natural language way allows us to use "Better communication" if the people in the organization call it that. Of course, later there might be something in the model that leads to less "Better communication" but this is perfectly alright.
- If you have the feeling that a factor is arbitrarily in its meaning than ask how it could possibly be measured. That helps to formulate it more precisely.
- Whenever you discuss a factor or a connection add a description text to it because later you or others should have a chance to understand why it is modeled that way.
- As already mentioned earlier, it is best to start modeling level by level with regard to your central goal factor. Factors that are far away from the central factor might only have a minor impact and too often models become much too detailed for one aspect, while the modelers are running out of time to model other aspects.
- First connect the factors, then color code them, and then weight their connections. Color coding means making factors that you want to compare with each other in the Insight Matrix the same color.

When you later weight the connections, the color coding allows you to compare these with other existing connections.

- Optional: with color coding you may add another dimension to your model, using darker or lighter tones of one color to express e.g. a state of a task in a project or the likelihood of an incident to happen. Then you see in the insight-matrix that a risk is very dangerous because of its impact, but very unlikely because of its color. Or a task is very important but done while another task might be unfinished but not that important.
- Though you are asked to look for only direct impacting factors you may start with less direct influences. In the mini example from this paper, more cost cutting leads to less employee motivation. This is a result that everyone can easily agree on. If you ask whether cost cuttings lead directly to less motivation, however, some people might note that it is the layoffs or lower wages that are influenced by cost cuttings. Well, if you have the time for this level of detail and if more crucial factors need to be connected to layoffs and lower wages then you can go ahead and add these details. You may, however, possibly get a smaller model and be able to model quicker if you add such details in the form of a description text for the connections and/or factors.
- If you get frustrated - because you have limited time - by the level of detail that workshops participants add to the model try to ask for general terms, for factors that stand for a series of other detailed factors. For example it there are 8 ways industry does pollute the environment and you see no need to look at the detailed factors, like air, water, soil, radiation etc., then ask when they name the first factor whether it is possible the put it with a number of others factors into a factor named pollution of environment. Generalize - and when the model is quickly completed you can still work it over and add details. This is way better than having to stop a project with unfinished models with a high lever of detail.
- In many cases you or the people you are modeling with will opt to start at the first level with, e.g., 5 directly influencing factors. I love the following example taken from a workshop:

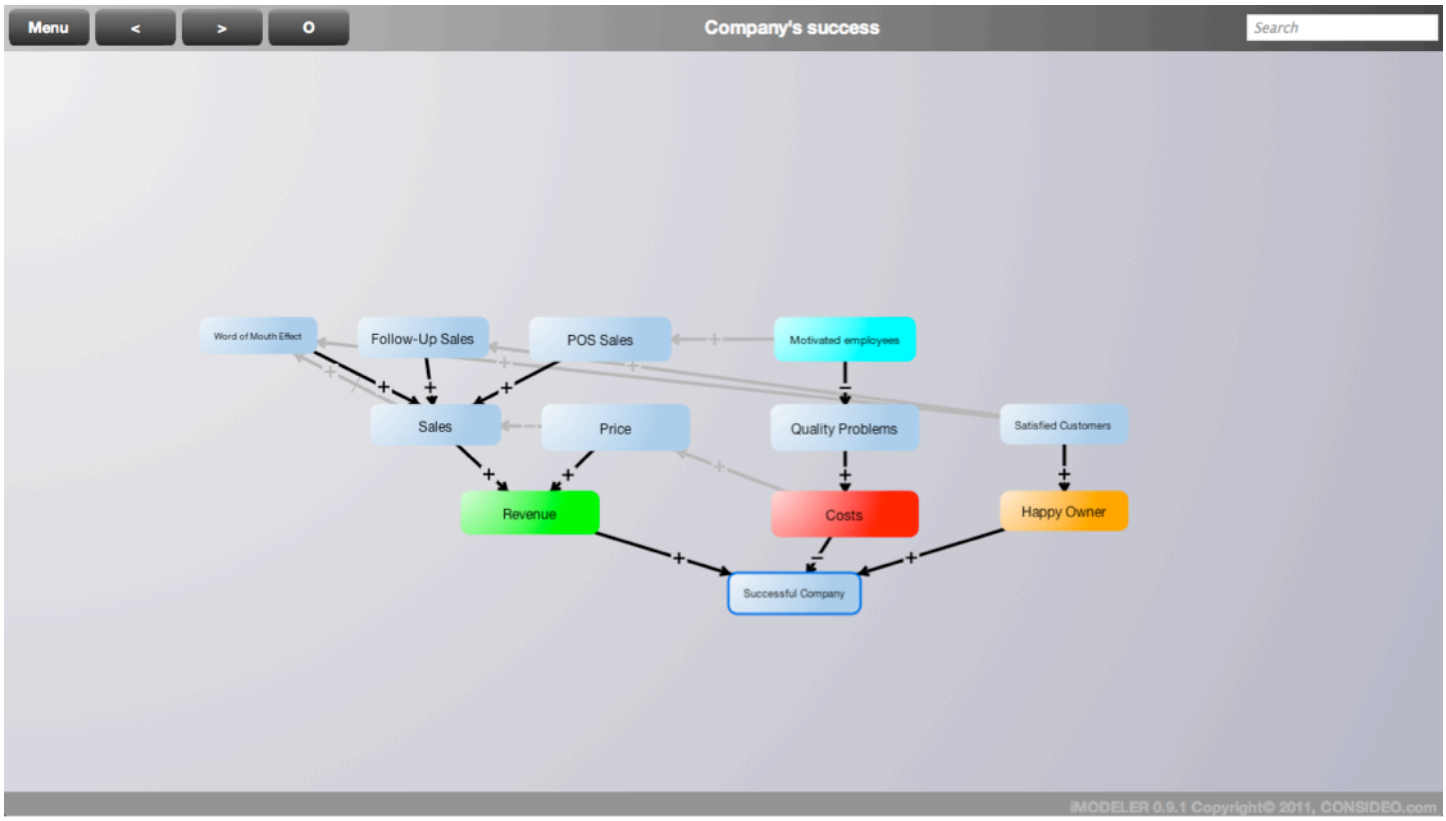


Of course, you won't agree that more satisfied customers directly lead to a more successful company, but if the others insist on this connection then let them. Later, when you ask what leads to a happy owner and what leads to more follow-up sales and word of mouth effects that lead to sales then they will again name satisfied customers and then you will have four ways for which satisfied customers lead to a successful company. The direct connection then will be redundant—although it is not always necessarily the case. Here there is no direct impact, only an indirect one.



- A model, especially a qualitative model with the use of natural language, is like a text you write. There are days your first draft is a perfect one, and there are days you need to work it over and over. Some say garbage in, garbage out. So, like any text you should have a look at the model from a distance of at least two days or by other people. You know what you are thinking of, it is your mental model. But whether it can be understood by others including yourself after a while is not guaranteed.
- A model easily becomes very large as it can display all the thoughts you and your team can have on a topic and the world around. If you later present this large model to others it would be literally too much development without integration for them. So for a presentation you should decide to show only parts of your model in detail while the complete model should only be seen as a picture that shows how much you have done. Especially for the insight-matrix you should select only a few factors you want to compare. As for any project presentation, of course, you should build a story that integrates the audience or the reader: What was your goal? What is the result? What did you do? Why is it so? What is the result again? What should be done next by whom? ….
- The history of modeling is full of examples where experts have build sophisticated models with astonishing results while the actual decision makers made completely independent decisions. Their decision is made up by gut feeling or based on best practice from the past. The actual analysis of the present challenge is something they were not part of. So if the result fits their gut feeling, it is taken. If not, it is too much development without integration. Thus you should try to integrate the actual decision maker. Let them join the modeling session. Ask them at least on some chosen details whether

they can agree on the relations and the weightings. Ask them, don't tell them. The iMODELER with its use of natural language is easy enough to be used and understood by everybody.



This is just an excerpt of such a model to demonstrate the development of redundant connections and the dominance of indirect connections.