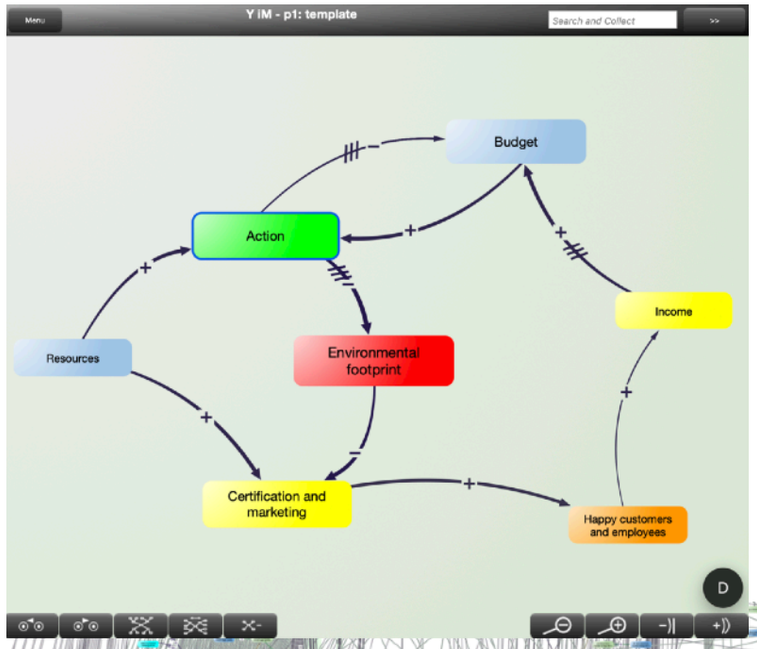
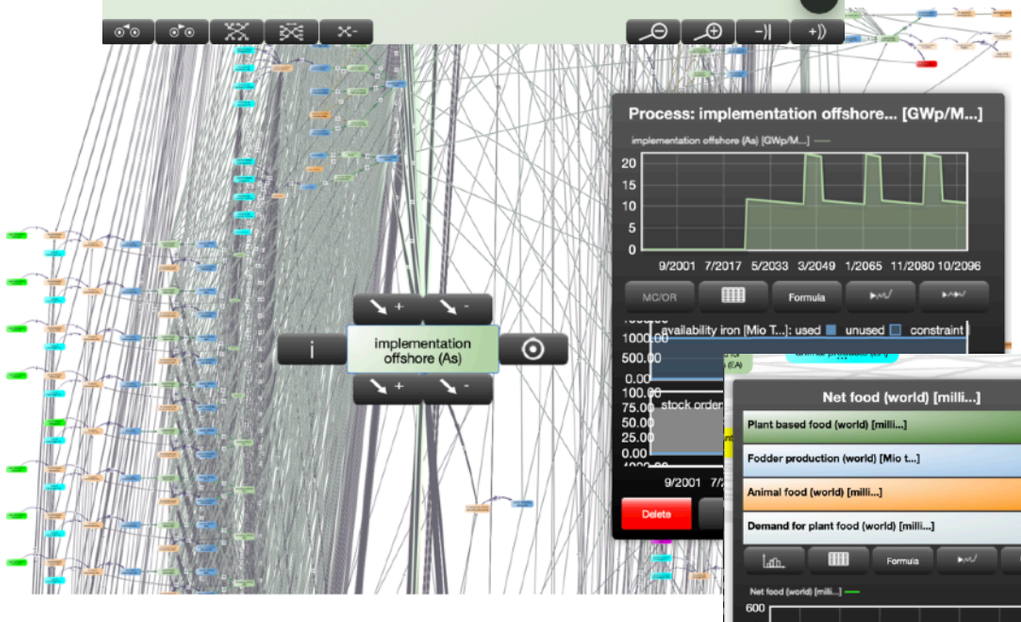
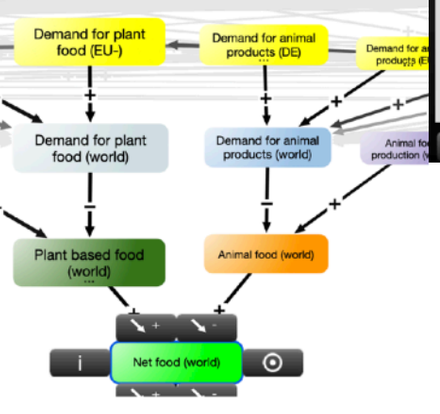
‘Why iMODELER?’ - more than a guide to its USPs

Consideo - Kai Neumann, Franc Grimm







CONSIDEO

Why iMODELER?

A GUIDE TO iMODELER's UNIQUE FEATURES TO TACKLE COMPLEX CHALLENGES

Summary The iMODELER is probably the leading software to visualise and analyse interconnections. We can collect arguments around our challenges and directly translate them into cause and effect relations. We can then decide whether to

- ***qualitatively*** weight their impacts to analyse with the Insight Matrix what the biggest obstacles and the most effective actions to reach our targets are

or

- ***quantitatively*** run scenarios an the potential developments of our challenge.

It is as easy as mind mapping or the use of a spreadsheet and it features and improves concepts like

- Fuzzy Cognitive Maps (FCM) or the Sensitivity Model (Vester)
- System Dynamics (SD)
- Theory of Constraint (ToC)
- Simulations Games
- Monte Carlo Simulation (MC)
- Operations Research (OR).

The iMODELER runs either web based on any device with features like collaborative modeling or as a stand-alone software on Win/Mac/Linux. It comes as a freeware or very inexpensive full version.

Applications (so far)

- Strategy development (dynamic balanced scorecard / dynamic strategy map)
- Project management
- Process optimisation (Operations research, Theory of Constraints …. using the iM Optimiser)
- Risc management (using Monte Carlo)
- Change management
- Quality management (Six Sigma, DRBFM/FMEA)
- Explorative, participatory stakeholder modeling (e.g. in a World Cafe format)
- Team development
- Product development (e.g. using Idealised System Design)
- Corporate foresight / Horizon scanning
- Knowledge management
- …

Users (only a selection)

- Banking, Automotive, Pharma, ….
- Science and research
- Governmental organisation
- Non-governmental organisations
- Schools and universities
- Coaches and trainer
- Individuals

Over the years our customers have come from all fields, whether a family organises their holiday, a fashion boutique organises its team, a car-manufacturer explores the right product strategy for India, the NATO seeks to develop a knowledge base for the organisation of infrastructure in Afghanistan, thousands of school children develop concepts for local sustainability, or a bank develops its asset allocation strategy…..

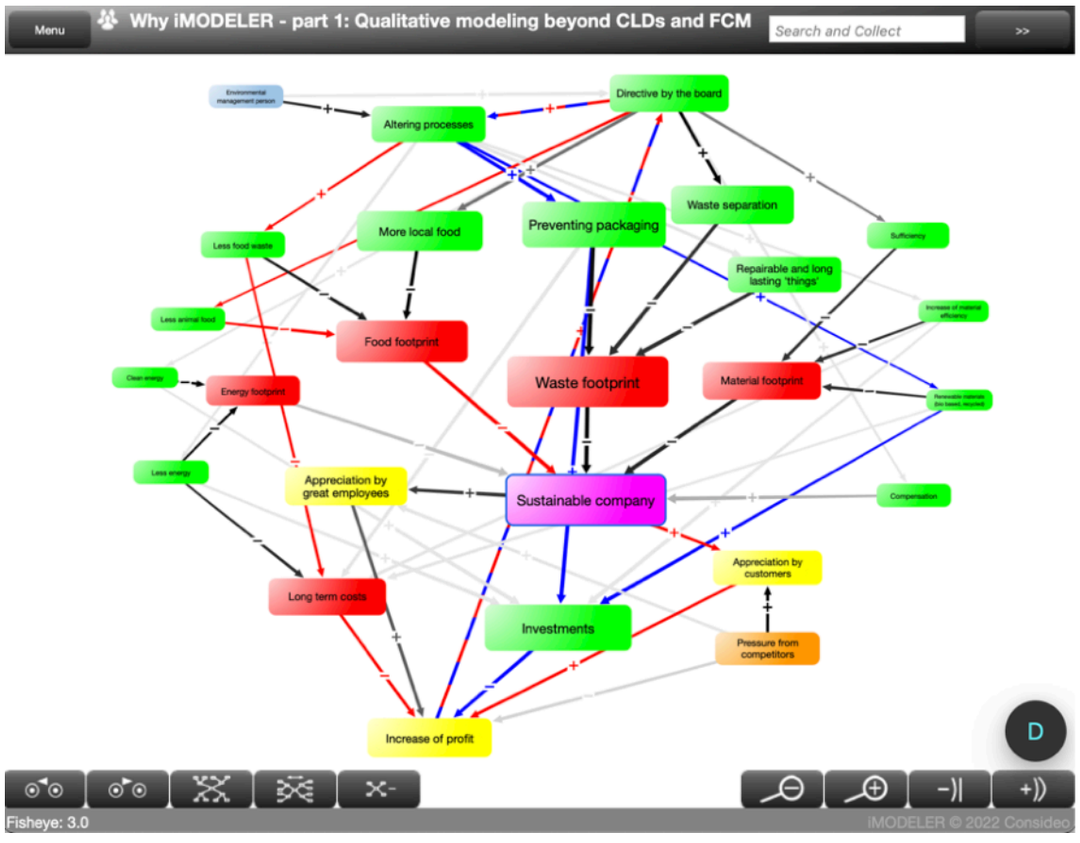
We as consultants and scientists ourselves have modeled the global food supply, the global energy transition, the development of artificial intelligence, the battery electric mobility, and a lot more. More at the end of this paper.

Features - table of content:

1. Explorative qualitative modeling - what are the levers and obstacles to reach our goals

The visualisation of interconnections knows many approaches. Some consider mind maps a thing (but they actually just structure content), some call it concept mapping and some causal loop diagrams (CLD), and some - actually quit a lot - are rather left brainers who prefer not to use visualisations at all.

Interestingly, most visualisations seem to be rather *descriptive* in order to use as few factors (elements, nodes, entities …. whatever you call what is connected by arrows) as possible. We are fine with that but the purpose of the iMODELER is to provide a tool for *explorative* modeling that allows e.g. in a meeting of 90 minutes to come up with crucial, new insights - not something the author has known before. Therefore, the iMODELER collects as many arguments as easy and quickly as possible. The sum of the many arguments, then, and the dynamic and overlapping reinforcing or balancing feedback loops cannot be analysed by just looking at it as it is tried with rather descriptive CLDs.



Qualitative model on the implementation of environmental management: https://www.know-why.net/model/C57a1tA9UDESYkronTTuj7g

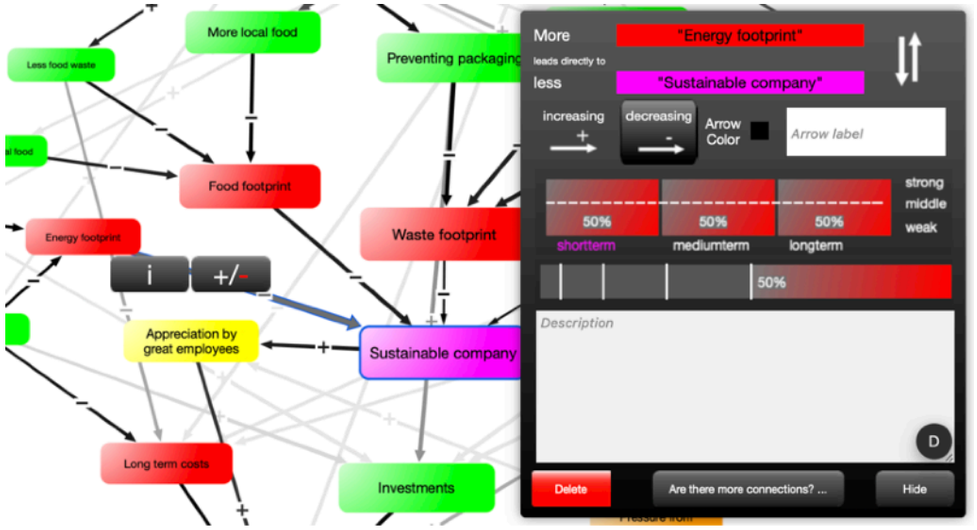
There are approaches like the fuzzy cognitive maps (FCM, which fail to describe the potentially exponential development of feedback loops) or the sensitivity model (or ‘Papiercomputer’ by Prof. Vester, which leads to devisions through zero unless one follows more then a dozen cybernetic rules) and there is the iMODELER.

First you translate arguments (from a meeting, an article, or just your thoughts) into cause and effect relations as a factor can either lead to more (+) or less (-) of the other factor.

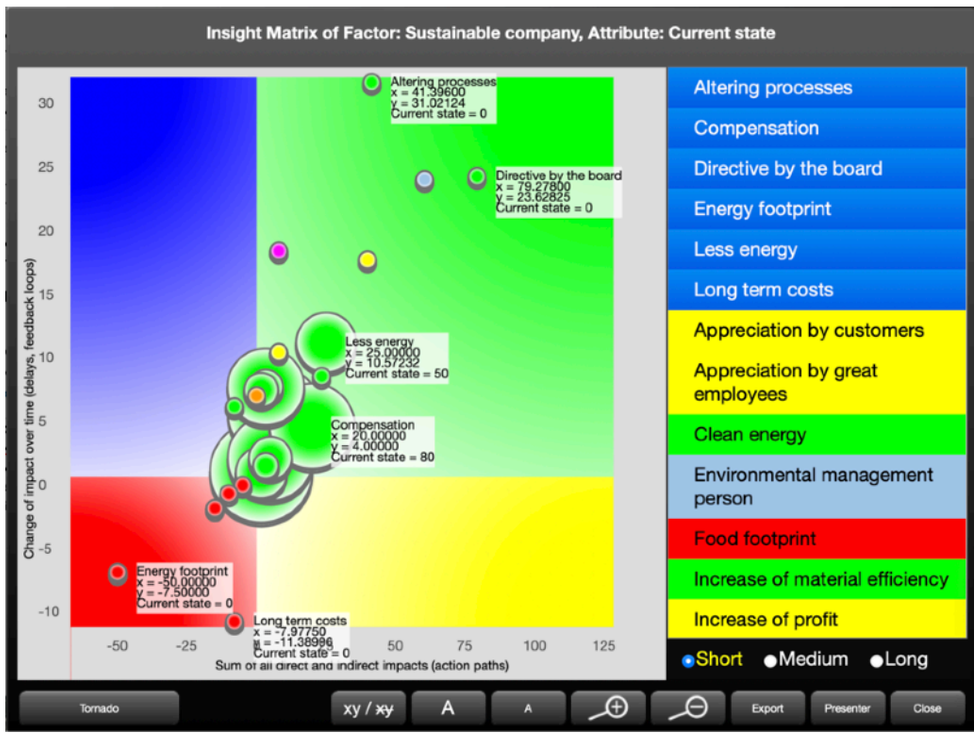
Qualitative weighting

Second, after you collected all your arguments you further define these influences by a rough weighting compared to the other influences distinguishing short-, medium- and long term impacts (you define what you mean throughout the model by short-, medium- and long-term).

An easy way is to refer to data though most often as you have also so called soft factors you just decide whether one factor has more or less impact than another factor. If you do this in a group it is part of a process that is called mental modeling. The process is quite fast and effective and yet robust a kind of crowd intelligence or educated guess - better than mere gut feeling or nor decision at all.



The qualitative weighting of impacts (not shown a weighting matrix where you also see the influences from the other factors)



The Insight Matrix of a factor. The diameter of the factors allows to depict a descriptive attribute in this case the current state of action.

Insight Matrix

To analyse the model you can choose not just the target of your model and look at the Insight Matrix that shows the short-, medium- and long-term impact the other factors have on this factor calculating the sum of effects through all cause trees and the loops.

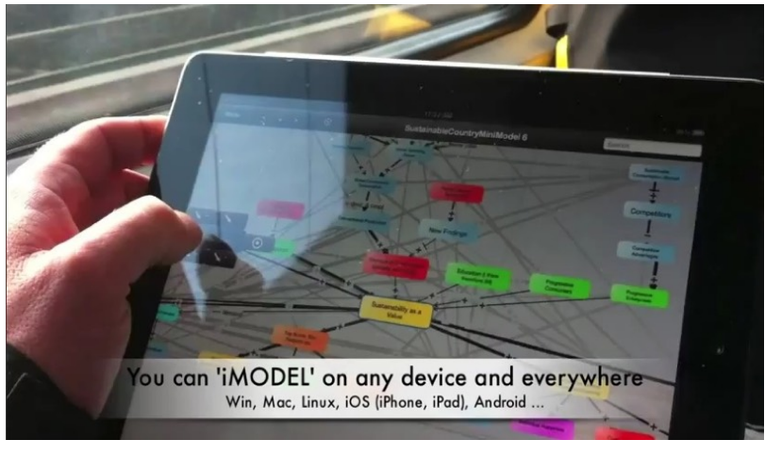
The Insight Matrix shows on the horizontal axis the impact of the measures, obstacles, resources, etc.. The vertical axis indicates there change of impact due to a change of weighting or the impact of feedback loops. An alternative way is to look at a tornado chart (not shown here) that provides a ranking of influences.

And it is freeware! Get your free account on www.imodeler.info :-)

2. Two-touch modeling on any device and the bionic concept of relative perspectives plus the use of filter ...

Ten years ago a classic CONSIDEO MODELER like other tools used connected sub-models to describe large contexts and you had to define views and cockpits and used a computer mouse to open a context menu to access all the features.

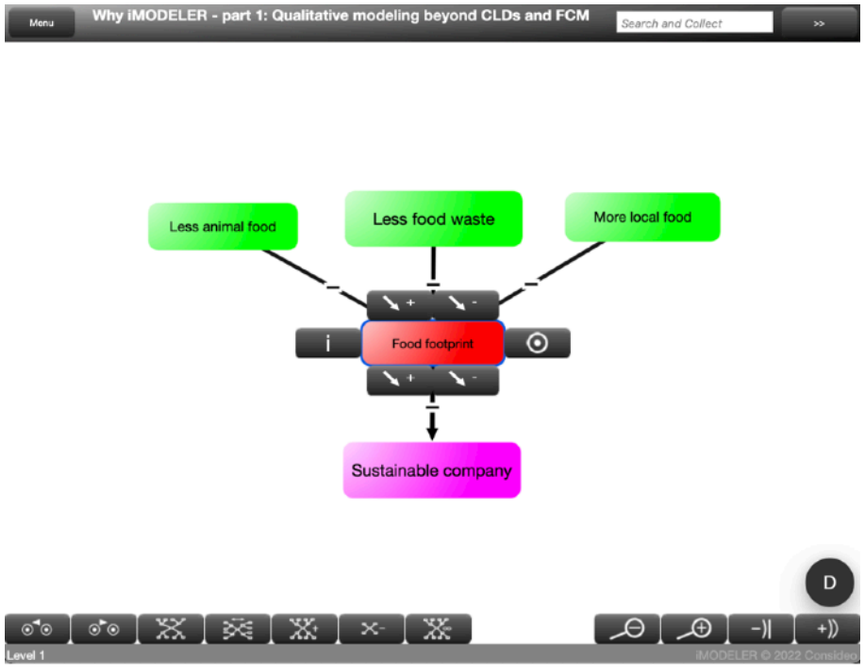
That concept, however, isn't working on touch screens like they were coming up with tablets and smartphones. Consideo then developed the iMODELER as a new concept applying the method of "Idealised System Design" as a part of the KNOW-WHY-Method by Kai Neumann. The result is a bionic concept that enhances our brain and works web-based on smartphones and tablets as well as on computers (Mac, PC, Linux).



Effectively modeling on touch screens with both hands

Although the iMODELER offers many features its menu has just a few entries and all buttons are large and easy to touch with you fingers. You can pick a factor or arrow and then alter its properties without the usual clicking of "yes", "no", and "cancel". Not just on a touch screen this is extremely effective.

Also, as if the iMODELER was part of our brain we start from an association (factor) to ask what leads to it or what does it lead to. That way we can have models with thousands of factors and we just pick a perspective (factor) by clicking on the button to the right of it and then we look at the cause chains that lead to it or the cause chains that it leads to.



The model from the perspective of the factor "Food footprint" showing just the first level of interconnections.

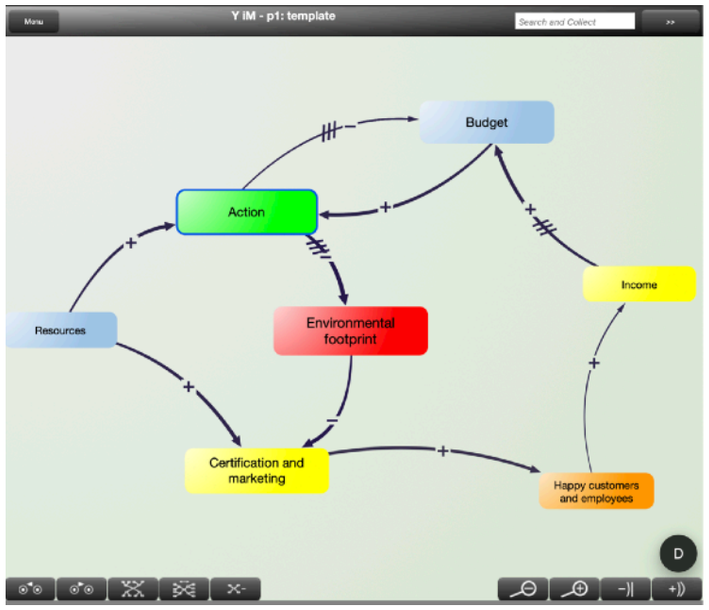
To concentrate on the effect on or of a factor we can reduce the levels of interconnections that are shown.

We may use categories to apply filter and cluster to manage large models in a very powerful way.

3. Directly quantifying (system dynamics based) causal loop diagrams (CLDs)

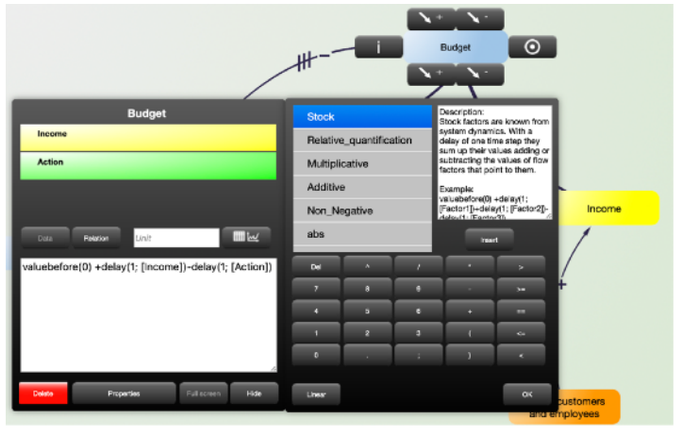
System Dynamics (SD) is one of the most powerful quantitative modeling approaches (others, less transparent approaches for example are agent based modeling (ABM), discrete event modeling, or even the use of neural networks (NN)). However, since a quantitative model requires a lot of efforts system dynamics modelers often use causal loop diagrams to just draw interconnections and descriptively emphasise feedback loops that they expect to exist. If they later decide to quantify these models they use a stock-and-flow-diagram (SF diagram) that looks very different from the CLD. Also SF diagrams follow a set of rules that are not necessarily intuitive to everyone (which many SD modelers do not understand ;-).

A CLD just defines that something leads to less (-) or more (+) of another factor or has onto another factor an impact into the same or the opposite direction.



A CLD (qualitative model) that is also quantified: https://www.know-why.net/model/CXGaaLDHvnNjVnu3BSqXHGA

A stock-and-flow diagram defines stocks with a factor that represents its inflows and a factor that represents its outflows. The outflows and the inflows are the further described by information factors so that after all the model looks completely different from the CLD. Also there are rules the prevent to connect stocks and wouldn't allow to use the same flow-factor to influence several stocks. BTW: those rules make sense if you have the time to learn system dynamics and if you are not starting from a CLD:



A formula for a stock

The iMODELER still offers stocks but the formula that describes the value of each factor for each time step is more flexible. Thus you can directly quantify a CLD without changing its intuitive depiction of cause-and-effect relations.

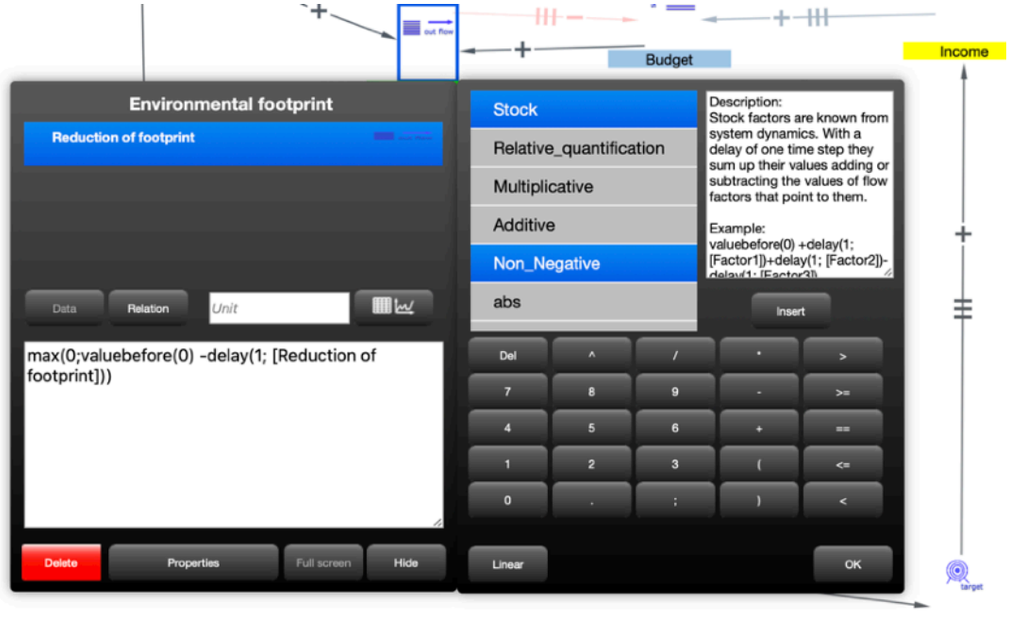
4. Using rather classic system dynamics and integration of data (the iM-Data-Manager)

Since the simulation approach of iMODELER is system dynamics you can of course also explicitly use stocks and flows and use symbols and colours to resemble classic stock and flow diagrams.

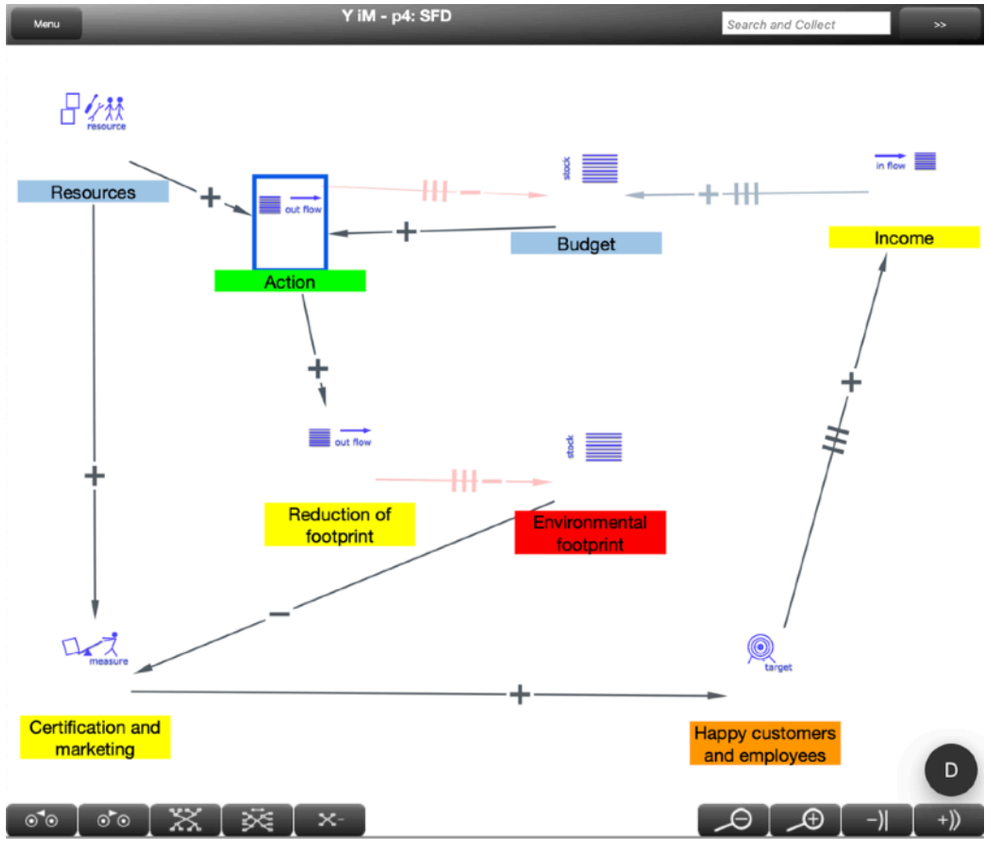
Instead of a central cockpit iMODELER allows you to define a cockpit for each factor adding a list of factors to compare and a list of parameters to alter.

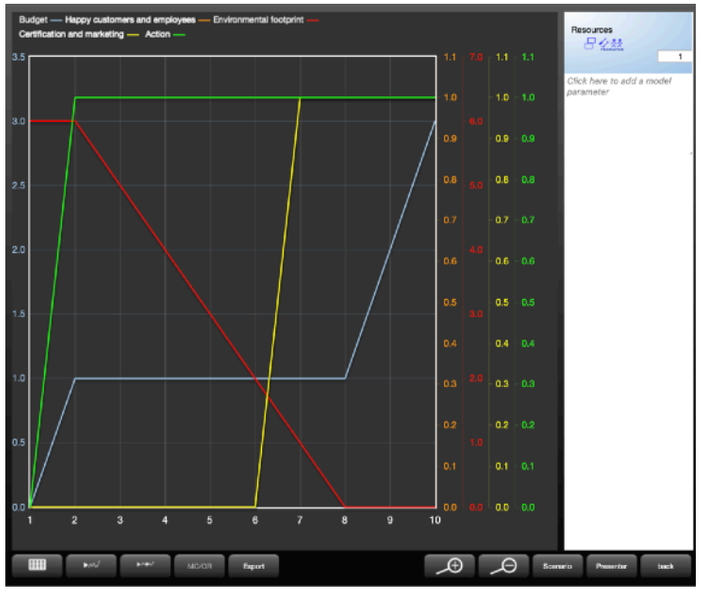
The scenarios can be saved within the scenario manager. You may import and export data factor by factor or use the iM Data Manager to define a source for input values and a target to export your simulation data, e.g. in an Excel file. Very powerful!

Next to simulation curves you will automatically get spaghetti charts or bar charts depicting likelihoods in case you have used a Monte Carlo simulations and, of course, you can also look at table values.



iMODELER knows the formula for a stock that you can then adapt. You may even combine some formula by just clicking them.

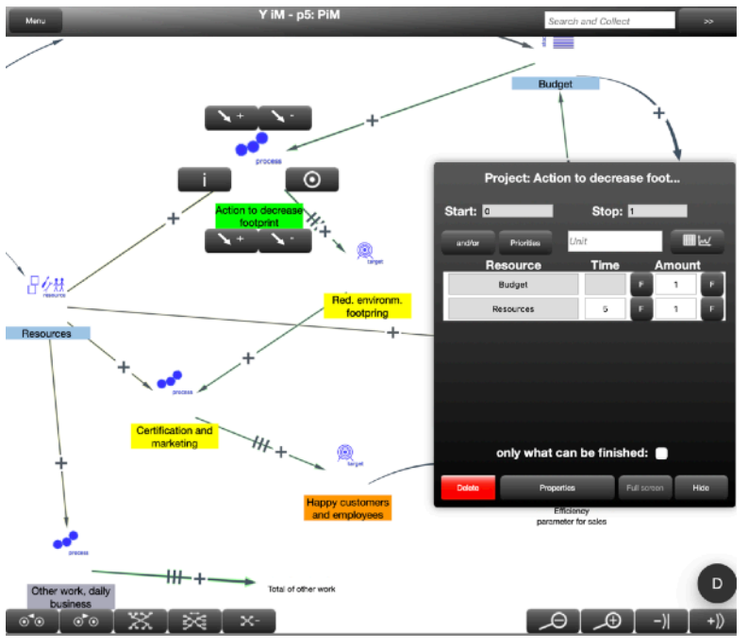




For each factor you can define a cockpit to alter parameters and save scenarios

Using stocks, inflows, and outflows explicitly: https://www.know-why.net/model/Cr0fl4G1R7aYL3S78htP_bw

5. Process and project modeling featuring the Theory of Constraints (ToC)

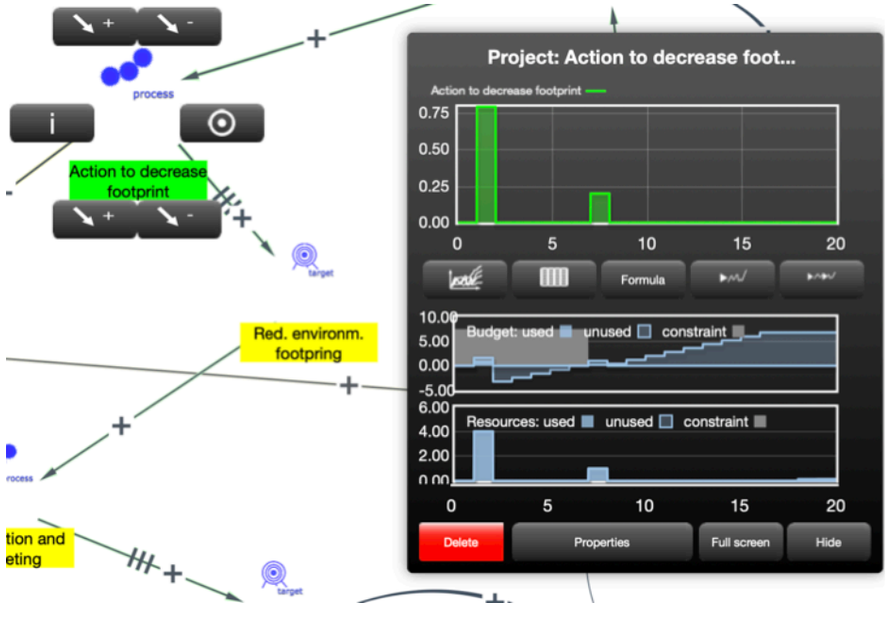


A process or project factor with the definition to what extent per unit it needs the connected resources.

In the previous chapter's example the factor resource was just there and the two processes for each time step simply saw that there is a resource. This is how many people use Excel or MS Project as well - they assume that there is a resource and they ignore that actually the processes are competing for the resources. This is not how we should simulate processes or projects.

So, in reality a process can only run if other processes with higher priority leave resources unused. To model this with classic system dynamics usually means that we define a lengthy if() formula (our record for a customer were about 70 if() terms in one formula).

That's why iMODELER now features special types of factors: process, project, resource, level resource and milestone factors. They allow to model projects and processes without the use of formula though you still can use additional factors to model dynamics of parameters in a way probably no other process modeling tool can.



The simulation of processes automatically shows the utilisation of resources and the grey background indicates the constraints (bottlenecks)

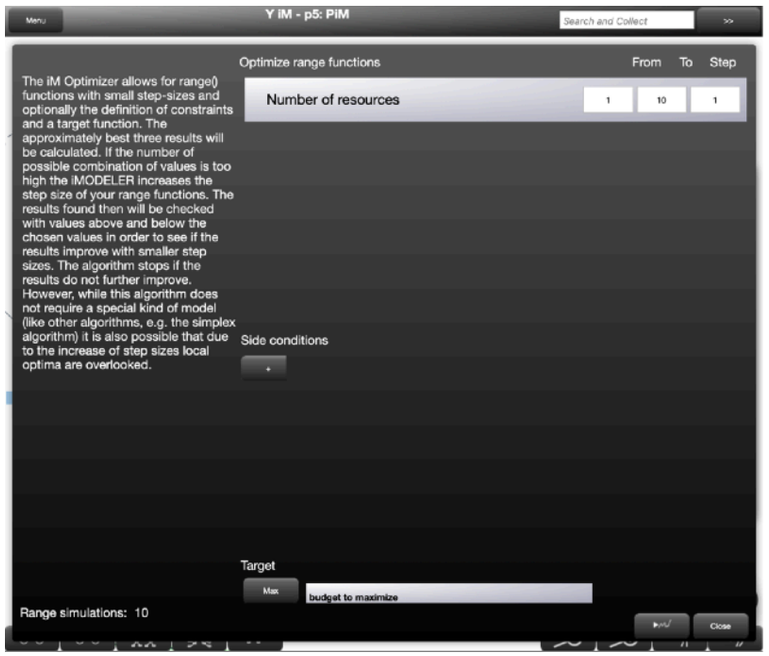
You need to define priorities for the processes though for the actual sequence will be defined by the availability of resources.

Without the use of formula though you still can use additional factors to model dynamics of parameters in a way probably no other process modeling tool can.

Really cool is the feature to automatically show the constraints (like known from the Theory of Constraints) for each process for each time step since only removing constraints improves the overall process.

6. The iM-Optimizer (Operations Research)

One way to improve a process or plan a project is to simply vary the number of resources and to see if

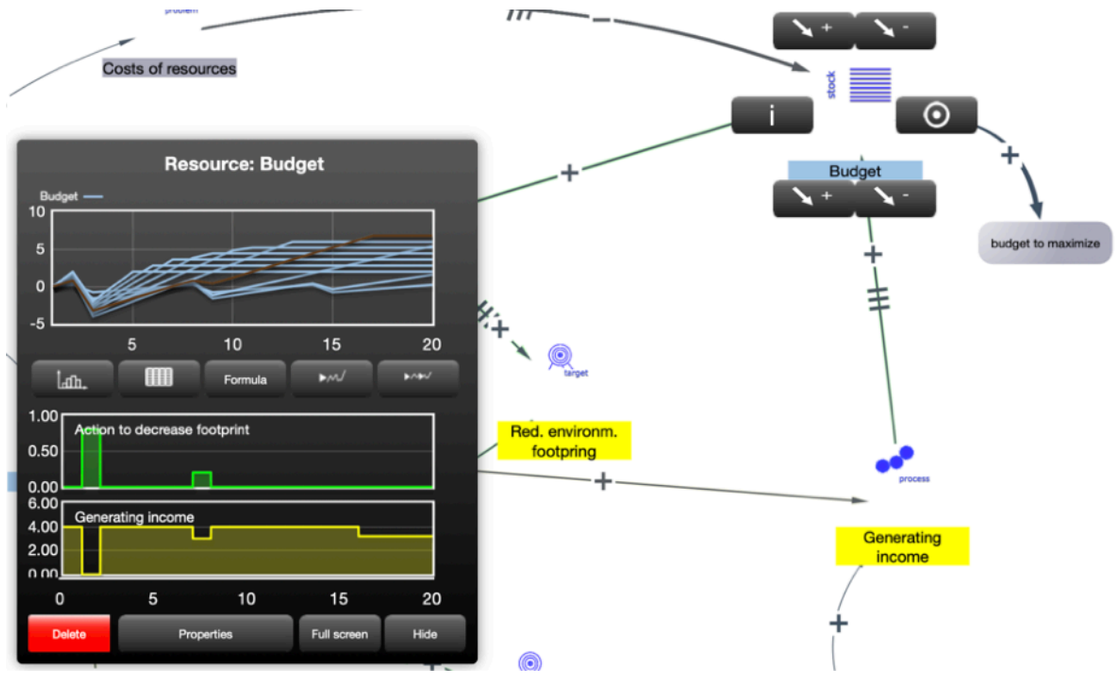


The iM-Optimiser shows all factors with a range, allows to define side conditions and set the factor that is to be minimised or maximised

that improves the overall result . that is called soft operations research. However, in most cases the number of different resources and the interplay of process steps is more sophisticated so you expect a computer could to do the optimisation with hard operations research.

For optimisation algorithms the objective and the side conditions must fit certain conditions and that could be quite complicated to apply. Therefore iMODELER with its iM-Optimiser offers an extremely simple way to look for the optimal set of parameters to maximise your goal. You just define the range that your parameters could be and you define which factor you want to maximise or minimise and then iMODELER automatically tries to run all possible combinations with a simple algorithm to narrow the optimal result in case there are too many possible combinations.

The result of the simulation is a series of results highlighting the scenario with the best outcome. By clicking on the other factors you now see the set of parameters that led to this outcome.



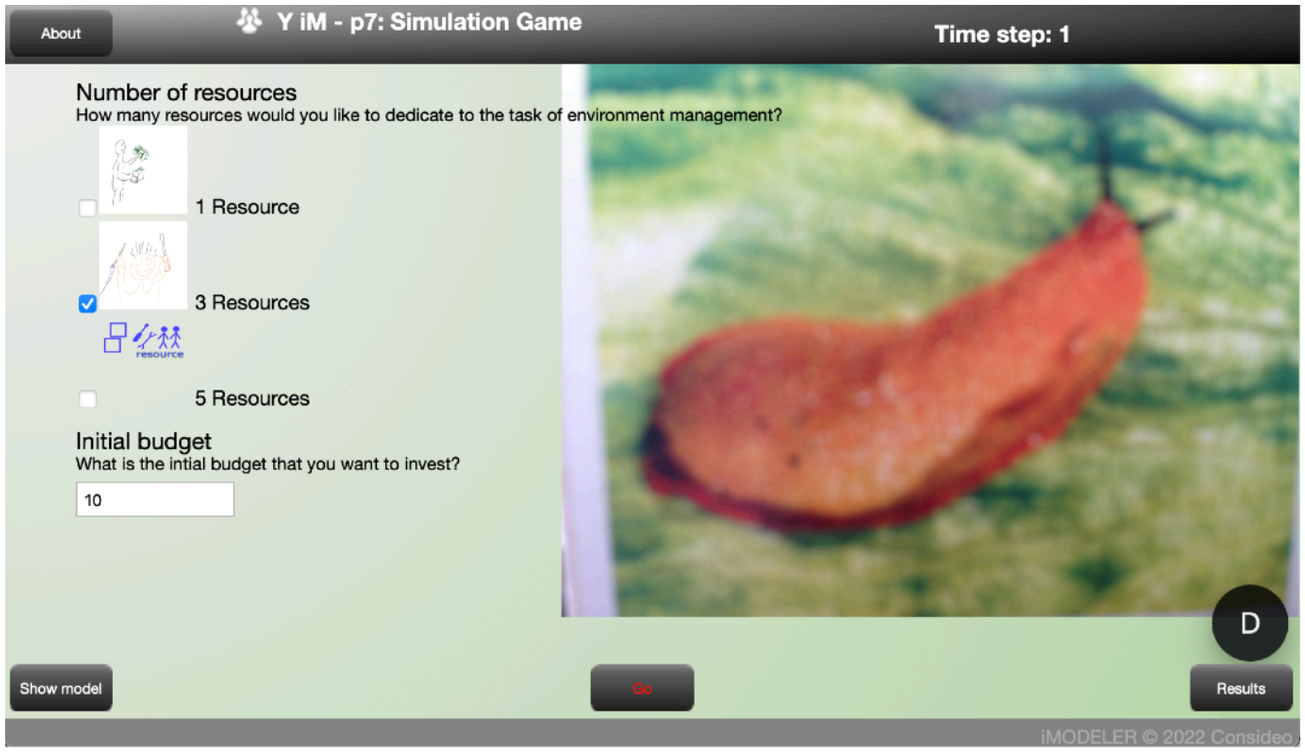
The iM-Optimiser shows all factors with a range, allows to define side conditions and set the factor that is to be minimised or maximised

7. Authoring tool for simulation games

Sometimes it makes a huge difference whether you show your target group 'just' the result of some quantitative scenarios or even the likelihood of different scenarios from a bandwidth of possible developments using a Monte Carlo simulation, or whether you offer them to literally play a role in these scenarios and let them decide for each time step of the model what they would like to do. That way they define the scenario.

For this purpose iMODELER features a Sim-Game Manager.

The Sim-Game Manager to define roles and the factors they can define values for.



For the cockpit of the players you can decide whether they define values for each time step or whether they just click on answers that are described by text while you have defined what values are behind these answers. This is a very powerful function if you translate actual behaviour into values of your simulation.

Without any programming (!) you can define roles and factors and the kind of input these roles can give at each time step.

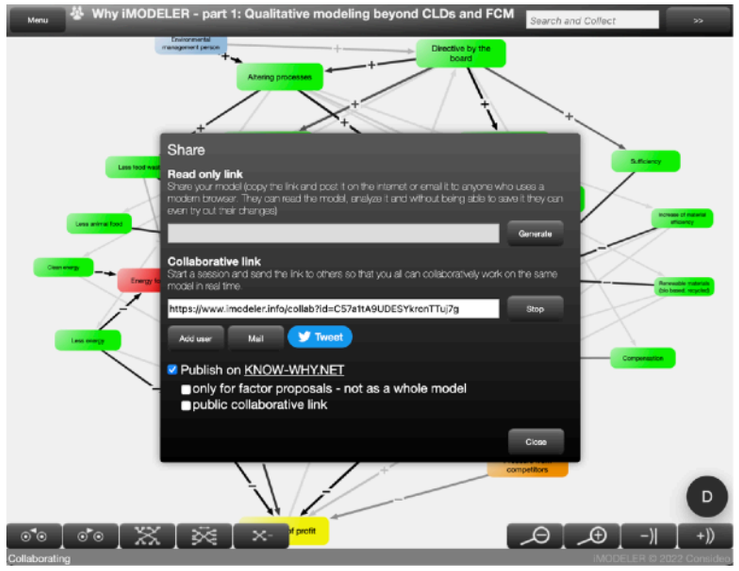
You then start the model and send a link to the roles so that they can play the game in their browser. As the game manager you start a step-wise simulation and each player can define their action for the time step and then give a go so that you can simulate the next step.

The players can switch to a model view or a view on the current results (their performance) or continue to play in their cockpit.

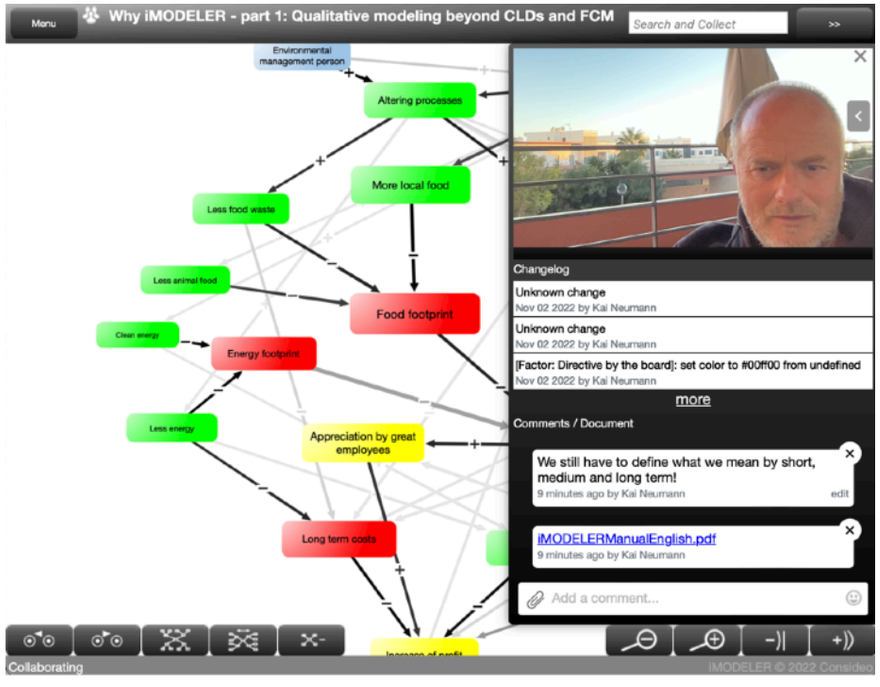
8. Collaborative modeling (featuring iM-Document-Manager, video-calls and a discussion tool)

As one of the first tools we managed to offer a real collaboration software. By simply sharing a collaborative modeling link people can work

- on a model at the same time, e.g. in a workshop so they don't have to wait for a facilitator to add their arguments to the model
- in a world cafe format, where each table can work on a different perspective of the common model
- by themselves opening multiple views (perspectives) on the same model in different windows, on different screens or even using different devices.
- or as an ongoing project via internal or public (see chapter 10) link whenever someone has time to add something to the collaborative model.



Simply choose from the share menu the way you want to share your model



Via the "D" or the ">>" button you can access video, chat, discussion and the iM document manager.

This is a very powerful function that can lead to a true culture of reflexion.

Well, not so good for Consideo but perfect for many teams: you need just one license to share multiple models while others can work on them without any further license.

iMODELER also features a video function, a chat function, a discussion tool and the possibility to add documents or links to either connections or factors or the whole model. That way you can evolve your model and make it an effective tool e.g. for knowledge management.

With appendix 2 we will link several public collaborative models, e.g. on climate change or horizon scanning of upcoming technologies.

9. Sharing models, using the iM-Presenter

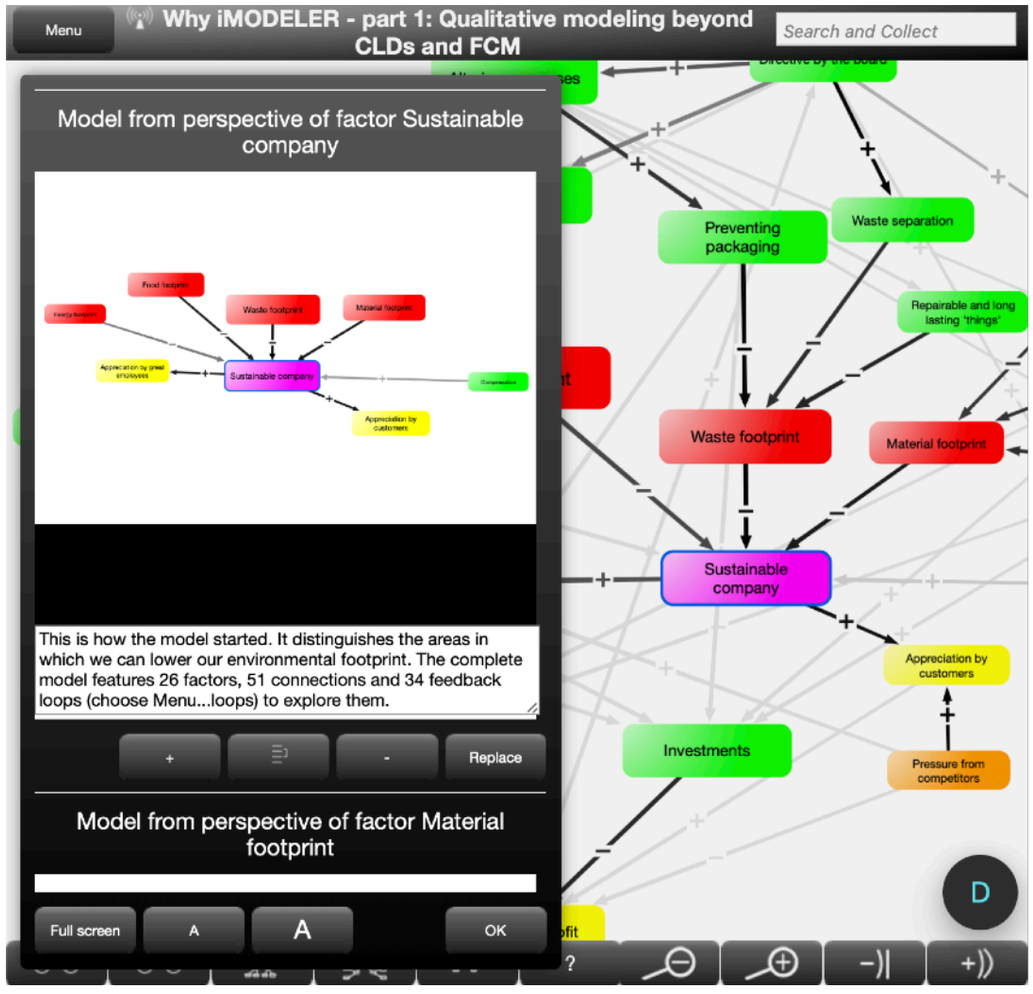
Often you want others to look at your model and explore it, even run analyses with different assumptions, but you do not want that they change the model (like through a collaborative link). For that purpose you can choose a read-only link from the share menu.

The iMODELER-Presenter is a tool to collect and present screenshots from your model, from different perspectives, matrices, or simulation results. That way you can tell the story behind your model, how to read it and what insights it provides.

We highly recommend to present a model not just as a big picture with hundreds of connections. Instead, show readable excerpts how you have started your model (usually with an overall target), what categories/ colours (e.g. for targets, measures, obstacles, etc.) you have used and how you have modeled some selected details by showing just the first or the first two perspectives.

The iM-Presenter automatically pops-up if you open the read-only link so your target group gets an introduction to your model.

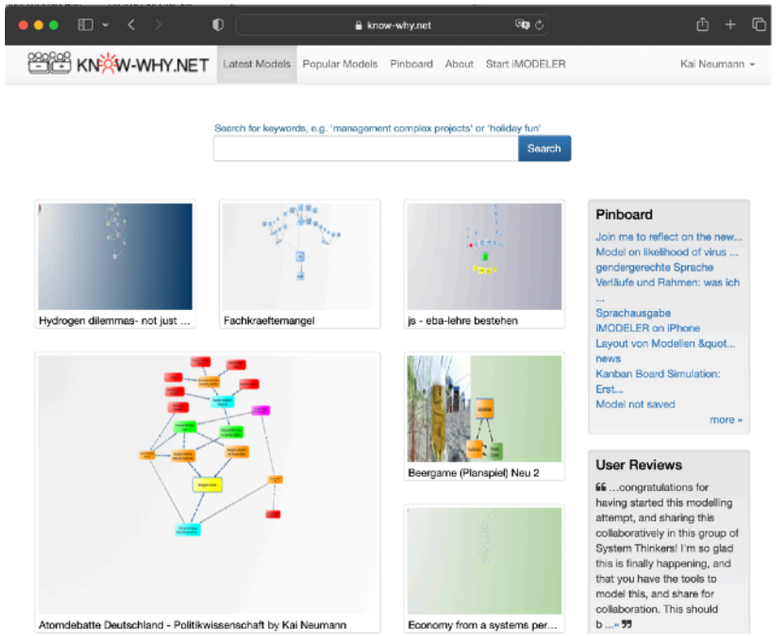
By the way - the iMODELER automatically arranges the factors but at the end of the modeling you should consider to arrange them in a neat way. You can do this for each perspective via the properties of the central factor.



Opening the read-only link you see the iM-Presenter with descriptions you have defined for each view on the model and its results.

10. The use of KNOW-WHY.NET

KNOW-WHY.net as a platform to share models is in many ways unique. You can choose to share your models either as a read-only-link, a collaborative link or even just as a proposal for factors - which we will explain in a moment.

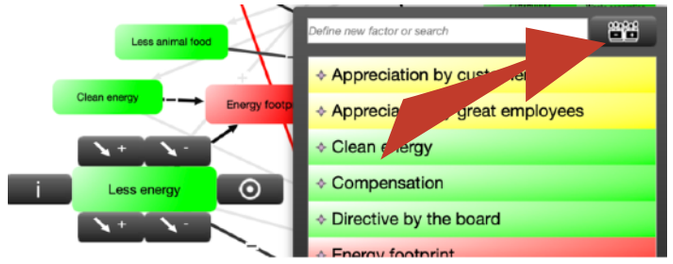


www.know-why.net

Visitors can then explore models without a license, installation, registration, name grabbing, or any restrictions. They can discuss the models or use the pinboard to ask for example models for their specific tasks.

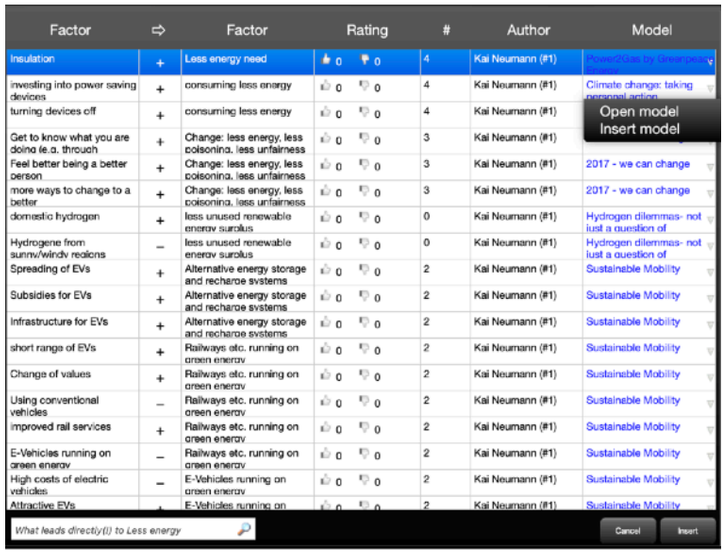
There are already hundreds of models on a wide range of topics featured on KNOW-WHY.NET, from political topics like the Brexit, the election of Trump, the war in the Ukraine to topics like the SDGs, climate change, or the spread of the Corona virus.

The real game changer is the possibility to ask for proposals for influence factors right within your model. When the dialog to define new or use existing factors pops up you can click on the KNOW-WHY.NET button on the right and iMODELER searches from the open access models from KNOW-WHY.NET factors that are connected to factors with similar names. Sometimes they suit, sometimes they are just an inspiration. The system is



Click on the button to the right …

learning from more models and it ranks the proposals on the basis of their use and the thumbs up or down given by the users.



… to get proposals from similar contexts

BTW: the name “KNOW-WHY” originates from the KNOW-WHY-Thinking and the KNOW-WHY-Method.

Models

1. The qualitative Integrated Assessment Model (IAM) using participatory stakeholder modeling explored what a transformation needs.

2. The D3 model with more than 4,500 factors simulated the transformation differentiating the German society into social milieus looking at the effects on the economy, welfare, the environment, resources, and happiness. We will all gain since we increase the domestic value creation and shift our values.

3. The GEE(R) as well as the ICARE model as a process model based on WEO data quantitatively explored the global energy transition and its need for resources. It is doable but we will face constraints in the capacities to build the installations and we need to use hydrogen just for the industry and re-electrification but not for mobility or heating.

4. The global LULUCF model as a process model based on FAO data explored the potential for biotic resources. We will soon not be able to feed the world anymore unless we change diet (less animal products) and farming practices (legumes, permaculture, agroforestry, etc.)

5. The qualitative collaborative Horizon Scanning Model on KNOW-WHY.NET collects the latest technology developments and puts them into perspective. Over the years with more sources on similar developments they become more likely and the model shows their importance and side-effects.

6. A qualitative collaborative climate change model on KNOW-WHY.NET that collects the latest science to show all the reinforcing and balancing feedback loops.

7. A simulation model on the development of global battery electric mobility. Lithium even for planes and trucks would be there unless we decide to grow from 1 billion to 1,5 billion cars with way to high battery capacities.

8. Qualitative models on the development of information and communication technology (ICT) figuring out that utopian developments driven by reinforcing feedback loops is way more likely than any utopian developments the industries are promising.

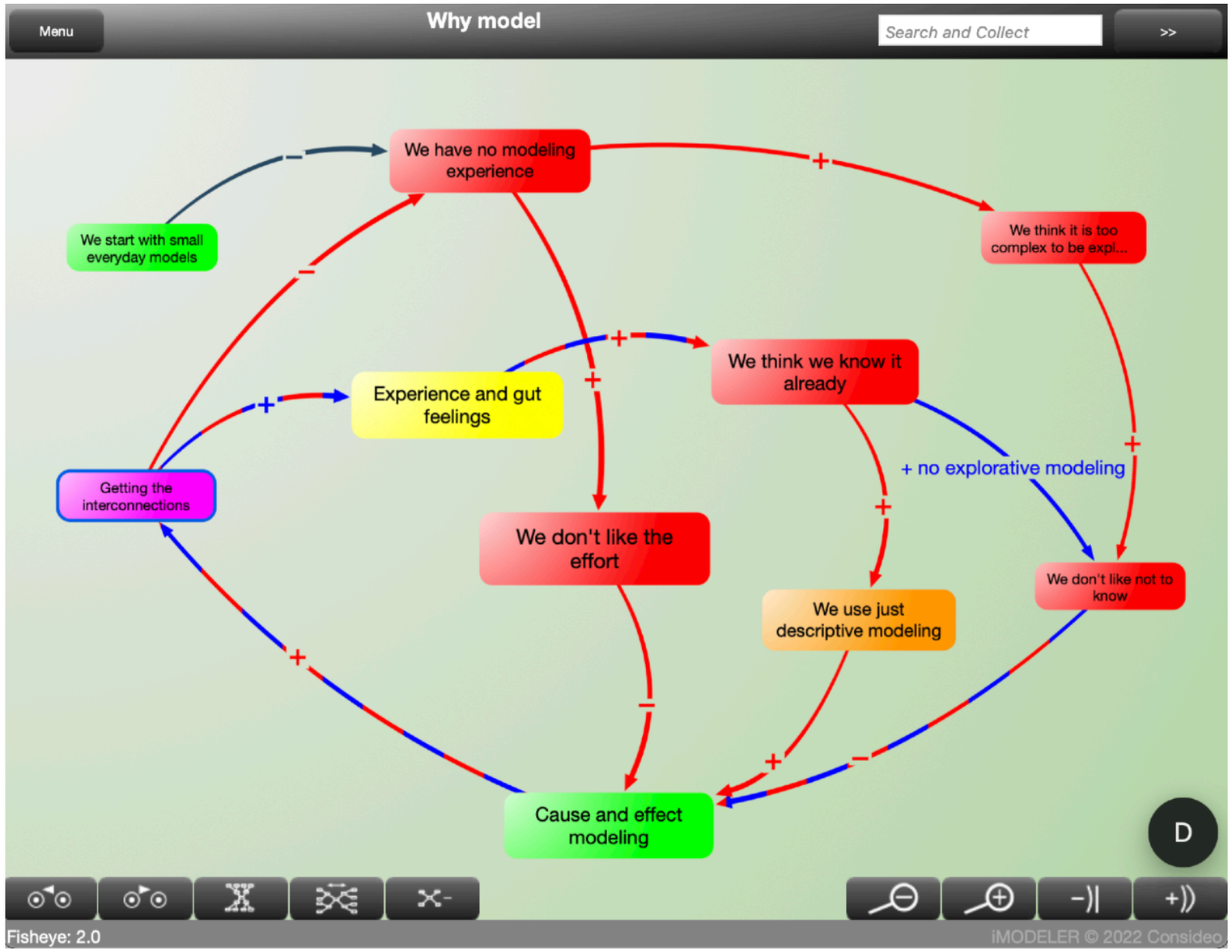
Why should we model?

The easy way to translate any argument from a meeting, an article, or our thoughts into cause and effect relations works as powerful lingua franca that even - or in particular - school children can apply. The iMODELER more than any other tool (at least those we are aware of) lets us draw these interconnections as quick as possible without complicated rules to be applied.

Most models are qualitative models, most even do not use the weighting and the matrix analyses and already get important insights.

So, actually any organisation, team, enterprise, individual, or family should model any challenge that requires to consider several factors. But mostly for psychological reasons few do.

Just give it a try and enjoy the reinforcing virtuous cycles:



Reinforcing feedback-loops (red) and balancing feedback loops (blue). Unless we start with small models we face vicious cycles and not virtuous cycles. Many modelers only develop descriptive models for the same reason why others do not model at all.

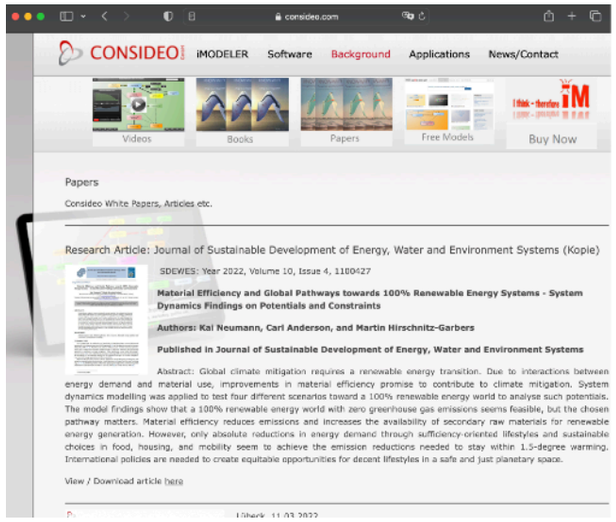
References and links

On our website you will find further information on fields of application, videos, papers, e-books and books e.g. on the KNOW WHY Method.

We recommend our grey paper series that present our research projects in a nut shell as well as our “A business culture of reflection” series.

And here is a list of videos on the “how to model”:

https://www.consideo.com/software-imodeler.html



On https://www.consideo.com/papers-33.html you find a whole list of papers, e-books and articles.

How to get iMODELER

The web version of iMODELER comes as a freeware for qualitative modeling - simply register at www.imodeler.info .

For quantitative and collaborative modeling you need a full version, starting as a private/ education version for 113 EUR/6 months or 470 EUR/year for the professional version.

The desktop version is available for 1,065 EUR unlimited, or 708 EUR/year with all upgrades.

https://www.consideo-shop.de/software.html

You may also ask for an intranet server solution.

About Consideo

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Consideo has the vision of a better world. The mission is to help people understand how things are interconnected. We work with the award winning software iMODELER for business, research, politics and private individuals.

With the platform KNOW-WHY.NET we offer collective interconnections.

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