Business modelling and simulation

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1 The Powersim® suite of business simulation tools

Powersim provides a range of tools for business modelling and simulation. The tools are designed to cope with real-world business situations, addressing complexity as well as dynamic and risk related issues.

1.1 Dealing with complexity

Different System Dynamics tools provide various mechanisms for dealing with large models. Powersim Constructor version 2.51 is the current version of Powersim’s simulation builder application. Its main features for dealing with model complexity, include the following:

- Visual Diagramming
- Array Variables
- Co-models

Visual diagramming means that the model structure can be built graphically. Array variables make it possible to let one variable (symbol) represent multiple values. As an example, if products are arrayed, we can use one Inventory variable to keep track of the inventory level for all products (instead of having one variable per product). Co-model support means that multiple models can concurrently run and exchange information. As an example, each competitor can be run as a separate co-model instead of putting everything into one giant main model. Future releases of Powersim Constructor will include two important enhancements to the above list:

- Multiple Diagrams per Model
- Hierarchical Models

The provision for multiple diagrams on a model makes it possible to focus on different sectors in each diagram. A product company model, for example, can have diagrams showing suppliers, production, sales channels, administration, finance, etc. Finally, hierarchical models add object orientation to System Dynamics. This approach allows a model to be assembled from pre-built parts. Components can be nested to any level, and the tools provide a mechanism for abstraction as well as model re-use. Another major benefit of components is that less experienced modellers can work with concrete building blocks (components) instead of the abstract symbols of system dynamics (states and flows).

1.2 Dealing with Dynamics

Powersim’s technology builds on System Dynamics and is therefore capable of describing feedback, which is the driving force behind the development of a business over time. Feedback is different from circularity, in that feedback involves a time delay between cause and effect. A static modelling tool does not have a time dimension and will see feedback as an (invalid) circular definition (picture 1).

A dynamic modelling package, like Powersim, views the feedback as a spiral over time, where actions in one moment will have effects later (picture 2). Over time the influence chain can return to its origin. (A price decision today can have implications that affect future price decisions)

1.3 Dealing with risk and uncertainty

Powersim Solver 2.0 contains several tools for analysing and improving the behaviour of dynamic models.

The sensitivity analysis task is used to determine how the results of a model are affected by uncertainties in model assumptions such as external factors or relationships between model variables. The analysis is carried out through a Monte Carlo or a Latin Hypercube (the latter is ten times more efficient) process. The output is in the form of probability distributions for simulation results (picture 3).

Optimisation is important for getting the most out of industrial processes. Does this also have potential for business processes? Before attempting to give an answer to this question, let us assume that you want to participate in a lottery.

The “optimal” solution for you is to win the first prize. The “best” solution is probably that you don’t participate at all.

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When the odds of reaching the optimum are low, you should consider investing in something with a more likely return.

When optimising systems that contain intelligent control functions (strategies and policies), traditional optimisation algorithms can produce totally wrong results [Wall00]. Solver contains a function for performing optimisation under uncertainty, which is the typical situation we face in the business world. (Solver is also capable of performing regular optimisation using Evolutionary (genetic) algorithms.)

Using the risk-management task of Solver, the user can ask the system to find the best solution given a certain level of confidence [MySa99]. For example: “Find a solution that in 95% of the cases will grow profits by at least 5% over a three year period.”

1.4 Available simulation tools from Powersim

Powersim provides software for building and analysing models as well as for building and running simulators in a Microsoft Windows environment or over the Internet.

1.4.1 Building and Running Models using Powersim Constructor

Powersim Constructor is a Windows application for building models and running simulations. The product allows the user to draw models graphically using variable symbols and links and to define relationships using expressions very similar to spreadsheet syntax. Constructor makes it very easy even for a non-technical person to create a graphical user interface on a model. Graphical controls can be picked from a toolbar and placed in diagram windows to define navigation, input and output. Connectivity to external applications and data is an important part of Constructor. It is easy to set up import and export of data to a file or to a spreadsheet for example.

1.4.2 Analysing Models using Powersim Solver

The tuning task of Powersim Solver compares the results of a simulation to historical data and changes model parameters to match the target behaviour as closely as possible. Tuning is an important part of model validation as it provides a measure of how closely a model matches reality. Solver can also perform Optimisation of a model to achieve one or more objectives. If multiple objectives are specified, they can be weighted according to importance. Solver can also assess the sensitivity of a model to changes in certain parameters. The user can specify uncertainties relating to parameters, and Solver finds out how this will be reflected in the result of the simulation. Finally, Solver contains a risk management task for performing optimisations under uncertainty. This task is highly relevant for business models where trade-offs between risk and opportunity have to be made.

1.4.3 Creating Simulators using Powersim Engine

All Powersim products rely on Powersim Engine to perform core operations on models. Powersim supplies an Engine API (Application Program Interface) that allows programmers to include simulations in their applications. The Engine API is used together with standard programming languages like C++ or Visual Basic (VB). Using VB or C++ a programmer can create custom user interfaces and access databases, networks, multimedia, or any other software resources. Applications based on Engine run fast and are easy to distribute on disk or CD.

1.4.4 Creating Internet Simulators using Powersim Metro

Powersim Metro is a simulation server application prepared for the Internet. The client applications are written in Java and launched from a standard web browser. It is also possible to use Powersim Look to

Kernpunkte für das Management

Powersim bietet eine Produktfamilie für Geschäftsmodellierung und Simulation an. Die Werkzeuge sind entwickelt worden, um reale Geschäftssituationen und daraus resultierende Entscheidungen zu bewältigen, indem die Komplexität, ihre Dynamik und das unternehmerische Risiko systemseitig beurteilt werden.

Das Werkzeug vergleicht die aus der Simulation gewonnenen Ergebnisse mit Vergangenheitsdaten und passt auf diese Weise dynamisch das Modell an die realen Gegebenheiten an.

Es ist möglich, Data Warehouses an die Simulation zu koppeln, sodass sowohl Geschäftsmodelle als auch -abläufe nachgebildet werden können.

Die Fallstudie beschreibt den Einsatz bei einem Automobilhersteller. Dort konnte u. a. der strategische Planungsprozess durch die Simulation entscheidend verbessert werden.

Stichworte: Powersim, Simulation, Geschäftsmodellierung, System Dynamics, SAP Strategic Enterprise Management (SAP SEM®)