Create your own business simulation lab to drill your teams in better decision-making

Ken Thompson, November 2010

About the Author

Ken Thompson is an expert practitioner and published author on teams, business networks, virtual technologies and social media. Ken helps major organizations to develop customized interactive Business Dashboards and What-if Simulators to support Strategy Development, Measurement Programmes and Team Learning. To find out more about Ken's work visit http://www.bioteams.com

Introduction

The huge interest in the "Serious Games" area, where gaming technology is used for serious or business purposes, has made it feasible for far-sighted organizations to gain enduring competitive advantage by creating their own unique *business simulation labs* where they can present their senior teams with all kinds of challenging business scenarios to improve decision making capabilities by allowing the big mistakes to be made in the simulator rather than in the business.

The first part of this article explores how people learn and explains why business simulation has become a vital tool for organizations who need their leaders and decision-makers to be "well drilled" in rehearsing the many highly challenging scenarios they could encounter in the business year. The second part of the article builds on this by proposing a systematic road-map which organizations can use to quickly and effectively define, design, calibrate, refine and experience the benefits of their own custom business simulation lab.

Part 1 - How people learn and why business simulation is so important

Developing new mental models

People act according to their "mental models" or "meaning structures." In the classic book that popularized the concept of the learning organization, *The Fifth Discipline,* [1] mental models are described as: "deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action. Very often, we are not consciously aware of our mental models or the effects they have on our behavior. ...Mental models of what can or cannot be done in different management settings are no less deeply

entrenched. The discipline of working with mental models starts with turning the mirror inward; learning to unearth our internal pictures of the world, to bring them to the surface and hold them rigorously to scrutiny."

"Espoused" versus "In-Use" Models

The Fifth Discipline, and other texts on individual and organizational learning [2], make the distinction between "Espoused" models and "In-Use" models. In simple terms, espoused models are what we *think* we believe or how we might explain our beliefs to others. In-use models are what an analysis of our real-world actions, by an independent observer, would suggest we actually believe. Espoused models and in-use models are often in sharp contradiction. These contradictions can only be generally exposed through some kind of action, real or simulated.

For example, in-use models for reacting as a competent car driver on unexpectedly hitting an icy patch would be to regain control by not deploying the brakes and turning into the skid (as recommended). However, practical experience often resulted in drivers doing exactly the opposite. This showed clearly (and shockingly), that the espoused model was different from the in-use model for this situation. Armed with this knowledge, drivers are better equipped to handle the situation next time, as they know what the natural automatic reaction will be. Indeed, they would be even better equipped if they were to go to a car skid track, or driving simulator, and practice such maneuvers in a risk free environment.

The value of computer-based simulation models

Senge, [1] describes the advantages of having a tool for accelerating learning that he calls a *microworld,* "One of the most important new tools for accelerating learning and fostering shared mental models of the large system among local decision makers is the 'microworld.' These are microcosms of real business settings where teams of managers learn by conducting experiments that are difficult or impossible to conduct in real business. The research and design of microworlds will come to be the primary task of central management in learning organizations of the future."

Dörner, [3] in his book, *The Logic of Failure,* amplifies on Senge and suggests how such a tool should be best used, "Thus, simulated scenarios are an excellent teaching device. But it probably profits no one if we simply turn our pupils loose on these scenarios. Action alone is of little value. What makes more sense is to assemble a battery of different scenarios, that expose our participants to a 'symphony of demands' posed by various systems. We should also have experts observe participants as they plan and act."

The Process of Individual Learning

There are a number of theoretical frameworks for individual learning, e.g., *Dreyfus* [4]. One very useful framework in this context is Kolb's experiential learning cycle, described in detail in *The Organizational Learning Cycle.* [2] *Kolb* proposes a cycle through which individual learning progresses, involving four stages:

1. *Concrete Experience:* We experience the world through our senses.
2. *Reflective Observation*: We consciously reflect on what has occurred.
3. *Abstract Conceptualization:* We make sense of what we have experienced, by relating the new information to existing meaning structures (mental models), and out of that relationship we create new meaning.
4. *Active Experimentation:* We test out the meaning that we have constructed by taking action in the world, which then leads to new experience (then back to stage 1 again).

Difficulty in anticipating time-delayed consequences of actions

Dörner reflects on common themes in human-induced catastrophes such as the Chernobyl disaster. [3] He observes, "One basic error accounts for all the catastrophes: none of the participants realized that they were dealing with a system in which, though not every element interacted with every other, many elements interacted with many others. They conceived of their task as dealing with a sequence of problems that had to be solved one at a time. They dealt with the entire system not as a 'system' but as a bundle of independent mini-systems."

One of the ways to deal with complex systems is, to work from "general principles" that are applied in different situations. However, *Dörner* also points out the major flaw in this approach: "In complex systems with many interlocking elements, deconditionalizing abstractions are dangerous. The effectiveness of a measure almost always depends on the context within which the measure is pursued. A measure that produces good effects in one situation may do damage in another, and contextual dependencies mean there are few general rules."

Professor Edward Wilson of Harvard, and one of the world's leading biologists and environmentalists, muses on the problems we seem to have as human beings in anticipating the long-term consequences of our behaviors [5]: "Why do they (we) think in this short-sighted way? The reason is simple: it is a hardwired part of our Palaeolithic heritage. For hundreds of millennia, those who worked for short-term gain within a small circle of relatives and friends lived longer and left more offspring. The long view that might have saved their distant descendants, required a vision and extended altruism, instinctively difficult to marshal."

The Limits of the predictive ability of Simulation Models

The quote, "All models are wrong but some are useful," has been attributed to *Albert Einstein*. We should never deceive ourselves that we are dealing with correctness in any model building activity. The only value of a model is its utility or usefulness, never its correctness or accuracy. The builders of simulators recognize that a good test of a model is for it to be able to retrospectively reproduce some previous historical behavior pattern. While this is, of course, true, it may only be partly achievable. However, even if it were fully achievable it would not make the particular model any more "correct," only more "useful." Thus retrospective behavior reproduction is more a necessity than a sufficiency for models and simulators.

Part 2 – How to setup your own Business Simulation Lab

Now that we have shown the importance of simulation in enhancing team decision-making skills we will look at what is involved practically in designing and developing your own uniquely tailored business simulations and propose a clear business-led road-map with ten key steps.

1. Establish a clear purpose for the simulation

First we need to establish the primary purpose of the business simulation. There are two main uses of business simulations – strategy testing and team learning. Both of these require a subtly different approach. For example, for a "strategy testing" business simulation it will be important to calibrate the model with accurate data and for the simulation results to be realistic in comparison with recent results. It will also be necessary to prove that the simulation can broadly reproduce historical performance before it is used to engage with the future. However for a "team learning" objective it may be much more important to make the consequences of both success and failure extreme (and thus less realistic) both in terms of the consequences and how quickly these consequences occur. Beware of the temptation to try to achieve both strategy testing and team learning from the same business simulation scenarios – it is likely that you will achieve neither!

2. Put the simulation into context

Learning Context. Simulations may be absolutely "necessary" as part of a learning objective but they are rarely "sufficient" in themselves to achieve this objective. They need to be placed in context. We have already described the "learning context" and the importance of a simulation to be framed within an overall learning framework. Simulations which are used as part of experiential learning events which are designed, managed and professionally facilitated produce many times more value than those where the focus is only on the simulation as an end in itself.

Social Context. It is also important to define the group or team context in which the simulation will be used. One of the most important aspects of this is understanding the different ways team members will use the simulator (e.g. single versus multi-user) and the extent to which we decide to make the simulation more "workplace realistic" by the use of distraction and social noise. Even more important is the way that the team will make decisions during the simulation. In addition to the ever-popular "Leader Decides" there are a number of alternative decision-making approaches such as the "Wisdom of crowds" where the team essentially vote on decisions and "Collective Wisdom" where the team select the most knowledgeable member to decide on the team's behalf depending on the decision required. For more on alternative team decision-making methods see my book "The Networked Enterprise" [6].

Technology Context. Finally it is important to decide on the Technology Context for the simulation which could be the desktop, internet/intranet or even embedded into another application such as a dedicated gaming platform. There a whole range of technologies available to build business simulations as summarized in the table in Figure 1. My advice is to start as

simply as possible and be prepared to move into the more sophisticated environments as your needs and skills evolve.

Simulation Technology	Examples	Price	Advantages	Disadvantages
Spreadsheets	*Excel 2010* and add-ons	$	Low cost and very familiar. Very fast to prototype.	Only suitable for very simple simulations.
Business Dashboards	*Xcelsius idashboards*	$$	Powerful dashboards, web deployment and ability to integrate with live data.	Limited business modeling capabilities.
Systems Dynamics Tools	*ithink vensim forio*	$$	Powerful business modeling and rapid prototyping especially for feedback loops and delays.	Learning curves – may need specialized help.
Serious Games Engines	Too many to list!	$$$	Powerful immersive user interfaces and multi-user support.	Significant Investment in time, money and resources.

Figure 1 - Different Types of Business Simulation Technologies

3. Identify the "essence" of the target simulation process

It is said that the sign that someone really understands a complex subject is that they can explain it simply. To make a good simulation you need to uncover the very essence of the process or organization you are seeking to simulate and isolate this from anything else which adds complexity. The objective is to model your process in *the least complex useful way*.

One of the best ways to do this is to identify the single core business object which the process manages. For example HR processes deal with EMPLOYEES, Sales Processes deal with CUSTOMERS, Innovation Processes deal with PRODUCTS, Operational Units deal with PROJECTS and Entrepreneurial Units deal with VENTURES.

This method might seem simplistic but from experience it will address 95% of all business simulations. As you develop your business simulation lab you will of course simulate different business processes each of which will have different central business objects which you may decide to link together. However the complexity of adding a second business object *within a single process* is seldom justified and can become unmanageably complex very rapidly. This "central business object" approach is reinforced by an excellent article in the Harvard Business Review [7] by *Mark Gottfredson* and *Keith Aspinall*, "Innovation Versus Complexity: What Is Too Much of a Good Thing?" which suggests:

"The first step is to ask, What would our company look like if it made and sold only a single product or service? For Starbucks, it might be a medium-size cup of coffee; for a bank, a simple checking account. Then determine the cost of producing that baseline offering. Next, add variety back into the business system, product by product, and carefully forecast the resulting impact on

sales as well as the cost implications across the value chain. When the analysis shows the costs beginning to overwhelm the added revenues, you've found your innovation fulcrum. By deconstructing their companies to a zero-complexity baseline, managers can break through organizational resistance and deeply entrenched ways of thinking to find the right balance between innovation and complexity."

Now that we have identified our Central Business Object we must establish the different "states" this object goes through in the life of the business process. We need to identify just 4 states – the initial state, the optimum state, the non-optimum state and the exit state (see Figure 2) . For example, in a customer management simulation these might be New Customer, Major Account, Minor Account and Ex-Customer respectively. Although it is easy to identify multiple non-optimum states (e.g. Medium Customer, Minor Customer and Inactive Customer) it is rare to need more than one non-optimum state in the vast majority of business simulation needs.

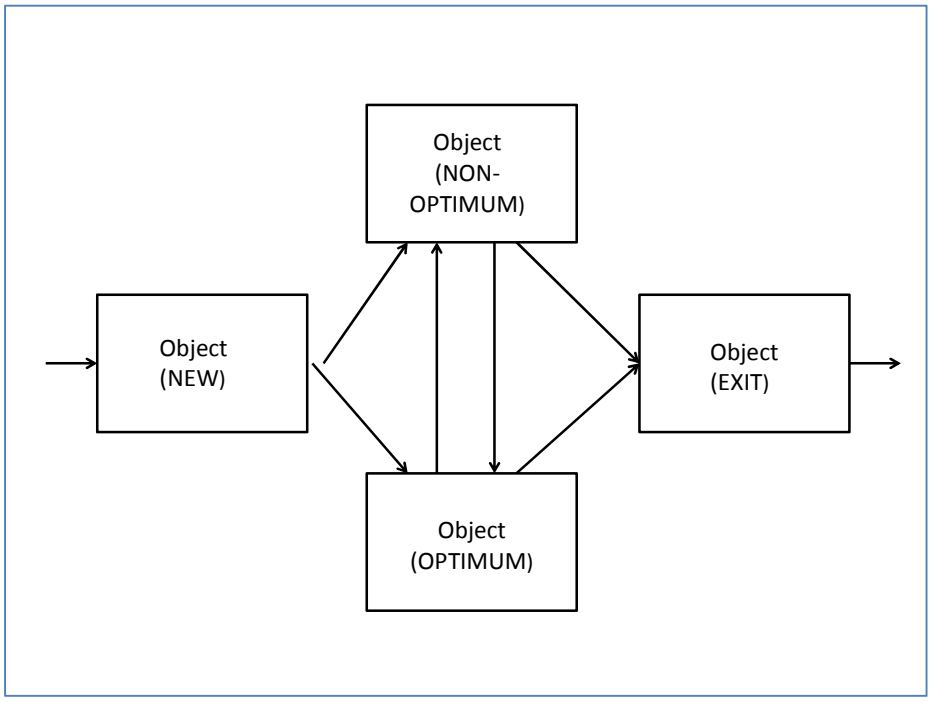

Figure 2 – Business Object Life History

4. Agree key business decisions to be simulated

Now we must identify the different business decisions to be explored using the simulation. Generally the best type of simulations use a set of *resource investment decisions* which must draw from a shared but limited pool of money, people and materials. Thus, as in the real-world, trade-off decisions and compromises are required.

Figure 3 shows 6 typical decisions which might be appropriate for a simulation whose central business object is Customers:

DECISION	MATURING DECISION TYPE?	RISK AVOIDANCE DECISION TYPE?
SALES & CRM	YES	NO
OPERATIONS	YES	NO
PRODUCT DEVELOPMENT	YES	NO
PEOPLE MANAGEMENT	YES	NO
ENVIRONMENTAL MGT	YES	YES
COMMUNITY ENGAGEMENT	YES	YES

Figure 3 – Typical Business Decisions and their Types

It is important to note that there are two important characteristics of business decisions – *Maturity* and *Risk Avoidance*.

Maturing Decision Types are those where the effect of decision has currency beyond the current cycle. Normally this is because the decision is creating cumulative capacity such as "Selling Effectiveness" which can grow (or decay) over time depending on the investment made. Most simulation decisions are in this category but some decisions, such as policy or strategy decisions, can have their full effect in the cycle in which they are made.

Risk Avoidance Decision Types are those which are primarily designed to avoid problems (often external) rather than directly adding value to the central business object. In the table in Figure 3 the top four decisions are primarily *Value-Chain* decisions and the bottom two decisions are primarily *Risk Management* decisions.

Decision Strategies. For each decision it will add richness to the simulation if you can identify different "strategies" by which the decisions can be implemented. These strategies can be explored and rewarded/penalized in the simulation. For example, in the case of a Product Development decision two alternative strategies could be "Breakthrough Innovation" or "Continuous Innovation" with one being more appropriate than the other in one scenario**,** with the reverse in a second scenario and neutral/neither in a third scenario.

5. Create a Decision-Impact Matrix

Now that we have defined our central business object and our key decisions we need to work with other members in our team who understand the business in depth to establish the impact of these business decisions on the different stages in the object's lifecycle. This is very easy to represent in a simple matrix like the one in Figure 4:

Decision-to-Results Impact Matrix (with Delays)						
	OPERATIONAL DECISIONS			RISK MGT DECISIONS		
Decision / Result	A: Sales & CRM DELAY=1	B: Operat-ions DELAY=0	C: Product Devel. DELAY=2	D: People DELAY=0	E: Environ-ment DELAY=0	F: Commun-ity DELAY=0
1: Customer Acquisition	+1	+2	+3	-1	-1	-1
2: Customer Development	+2	+2	+2	-1	0	0
3: Customer Management	+3	+2	+2	-2	0	0

Figure 4 – Decision Impact Matrix

The table shows the impact each decision has on the state of the main business object – in this example "Customers". For example it shows that Product Development has a major impact (+3) on new customer acquisition and a lesser impact (+2) on existing customer development but that these impacts are not immediate and are delayed by 2 business cycles. If deciding between 2 or 3 (or 2.5) causes too much debate then you can use a non-numeric scale of impacts such as "None", "Very Low", "Low", "Medium", "High" and "Very High" and have these labels converted to numbers on implementation.

6. Establish a Balanced Simulation Scorecard

Now that we know our central business object, our key decisions and their impacts we can then determine the result measures we wish to monitor on the simulator. The most respected approach in this area is *The Balanced Scorecard* [8] by *Kaplan and Norton* which stresses the importance of two different types of indicator which should appear on a good business scorecard:

Lagging Indicators – these are typically financial performance indicators and are ultimately what a business (or simulation) will be judged on. However they do not provide early warning of success or failure and managing exclusively by these indicators is like driving a car by only looking in the rear-view mirror!

Leading Indicators – these are typically non-financial performance indicators (e.g. bids made, customers contacted, defects reported) which give an early warning of the likely result of a key financial indictor. For example, if you are not making your target level of bids in quarter 1 it is a good bet that you will have sales revenue problems in quarter 2!

7. Develop a simulation dashboard based on good Information Design

The "engine room" of a business simulation is its management dashboard. This is where the simulation users make their decisions for each cycle and receive instant feedback on the results. Dashboard design is a constantly developing area which is being impacted by advances in a field known as *Information Design* led by pioneers such as *Edward Tufte* and *Stephen Few* who have

authored a number of books on this subject [9,10].

Tufte encourages the use of data-rich illustrations with all the available data presented but has also coined the term "chartjunk" to refer to useless, non-informative, or information-obscuring elements of quantitative information displays and argues against using excessive decoration in visual displays of quantitative information.

Figure 5 is a fragment of a typical business simulation dashboard showing the decision-making area on the left (using "Sliders" which run from 0-100% for investments and -1,0,+1 for strategies), the key financial results (*lagging indicators*) in the middle and the key performance indicators (leading indicators) on the right supported by traffic-light style (GREEN/AMBER/RED) warning lights.

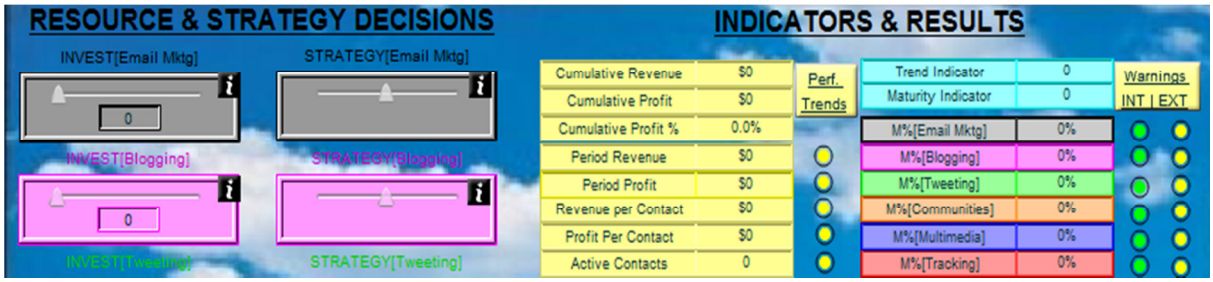

Figure 5 – Fragment of a typical simulation dashboard

8. Sanity-check the "Vanilla Sky" simulation

To make a business simulation valuable it needs to be calibrated so that it produces results that make sense to the intended users. The best way to do this is to develop a base case scenario which when operated according to plan should produce results which are in approximately in line with historical performance. I refer to this as the "Vanilla Sky" scenario (after the film starring *Tom Cruise* where by looking at the repeating patterns of the clouds the main character realized he was living in a computer simulation and not the real world). The aim here is to produce results which pass sanity check for a neutral starting scenario. This sanity check should test normal performance and also extreme performance (e.g. making 100% investment in a single decision area rather than balancing investments across multiple decisions as you would normally do).

9. Create increasingly challenging business simulation scenarios

There are two main elements in simulation scenario definition – setting start-up conditions and event scheduling.

Start-up Conditions allow us to set the opening scenario position in terms of, for example, the current number of customers, average revenue per customer and starting capability/maturity levels in each of our key business process decision areas. This allows us to commence a scenario with a problem or an advantage already present in a chosen area.

Event Scheduling allows us to schedule two types of unexpected event – those which the users bring on themselves through their own poor decision-making and those which just happen and to which the users must react .

Stephen Covey in his book *Principle Centred Leadership* [11] describes the difference between an individual's *sphere of influence* and *sphere of concern*. I have extended Stephen's approach from two spheres to three specifically for business simulation. Imagine three concentric spheres all businesses must operate within. The smallest sphere is the "Sphere of Control" – that is what the business can directly control. The next sphere is the "Sphere of Influence" where the business can affect things but are not in total control. Finally the largest sphere is the "Sphere of Concern" where the business can take action (and hope) but have little actual control over what ultimately happens. Figure 6 summarises the different types of simulation events appropriate to each of the three spheres which we should cater for in our simulation and identifies the technical mechanisms for scheduling them.

Sphere	Cause	Business Impact	Simulation Scheduling Mechanism
Control	Inside your control	Direct	*Decision Maturity Thresholds* Example: You neglect Product Development investment and your product is seen as no longer "leading edge" which impacts sales
Influence	Outside your control	Direct	*Internal Event Schedules* Example: A competitor releases a new product which directly impacts your sales
Concern	Outside your control	Indirect	*External Event Schedules* Example: A Global Recession makes it harder for everybody to win new customers

Figure 6 – Simulation Event Scheduling

Decision Maturity Thresholds work by assigning a value to a decision area below which problem events and corresponding penalties will occur; **Event Schedules** work by allowing us to specify "on" and "off" cycles for events to switch on and switch off at pre-defined severity levels.

10. Develop "off-sim" scripts, props and media

We have now specified, designed and calibrated our business simulation. We have built a number of scenarios starting with a base case and moving on to more challenging scenarios with different start-up conditions and various events scheduled to happen both inside and outside the direct control of our users.

The final important step is to develop "off-sim props" such as scripts, role-plays, human interventions, images, audios and videos to ensure that our simulation provides a true multi-dimensional experience to produce maximum benefit to its users. For more on this aspect see the excellent book "Story and Simulations for Serious Games" [12].

Conclusions

This article has explored how teams learn and has argued the importance of business simulation as a vital tool to improve organizational decision-making capabilities. We have then outlined a clear business-driven roadmap, for organizations and enterprises who wish to develop their own in-house business simulation capabilities, involving the following ten steps:

1. Establish a clear business purpose for the simulation
2. Put the simulation into context
3. Identify the "essence" of the target simulation process
4. Agree key business decisions to be simulated
5. Create a Decision-Impact Matrix
6. Establish a Balanced Simulation Scorecard
7. Develop a simulation dashboard based on good Information Design
8. Sanity-check the "Vanilla Sky" Simulation
9. Create increasingly challenging business simulation scenarios
10. Develop "off-sim" scripts, props and media

Finally to see some real examples of the type of business simulations which can be developed using this approach please visit **http://tinyurl.com/3xqz9qr**

References and Further Reading

1. Senge, P., *The Fifth Discipline – The Art and Practice of the Learning Organization*, Random House, 1990.
2. Dixon, N., *The Organizational Learning Cycle – How we can learn collectively*, McGraw-Hill, 1994.
3. Dörner, D., *The Logic of Failure – Recognizing and Avoiding Error in Complex Situations*, Perseus Books, 1996.
4. Dreyfus, H, *Mind over Machine – The Power of Human Intuition and Expertise in the Era of the Computer*, Free Press, 1988.
5. Wilson, E., "The Bottleneck", from *Scientific American* and reprinted in *The Best American Science and Nature Writings 2003,* Houghton Mifflin, 2003.
6. Thompson, K., *The Networked Enterprise*, MK Press, 2008
7 Gottfredson, M., "Innovation Versus Complexity: What Is Too Much of a Good Thing", *Harvard Business Review*, 2005
8. Kaplan, R., Norton, D., The *Balanced Scorecard, Translating Strategy into Action,* Harvard Business School Press, 1996
9. Tufte, E., *The Visual Display of Quantitative Information* , Graphics Press USA, 2001
10. Few, S., *Information Dashboard Design: The Effective Visual Communication of Data* , Pragma, 2006
11. Covey, S., *Principle-Centred Leadership*, Simon and Schuster, 1995
12. Iuppa, N., Borst, T., *Story and Simulations for Serious Games – Tales from the Trenches*, Focal Press, 2007

