



THE LEGO GROUP

ERM and Monte
Carlo Simulations

From Project Risks to
Corporate Risk Appetite



Baldwin
RISK STRATEGIES



Monte Carlo simulations are one of the best tools available to make informed, value-based decisions about risk management. Thanks to companies like Palisade Corporation and their @RISK™ software, they have become increasingly user-friendly and business-oriented. I am pleased to present you this case study in the remarkable application of Monte Carlo simulations by The LEGO® Group for the purposes of strategic risk management and the establishment of risk appetite by the board of directors. I hope it will encourage other companies to have another look at this powerful method.

Ghislain Giroux Dufort
President of
Baldwin Risk Strategies Inc.

Cover Artwork by Dingo Design Inc.





The LEGO Group

Enterprise Risk Management

The LEGO Group is one of the most advanced corporations we know of in the use of Monte Carlo simulations for strategic risk management purposes and the establishment of risk appetite by the board of directors.

Monte Carlo Simulations

The following pages will explain how The LEGO Group is using sophisticated methods to quantify specific risks such as project and credit risks, as well as to consolidate its risk portfolio at the highest level.

A case study in strategic risk management

The LEGO Group

Founded in 1932 by Ole Kirk Kristiansen, a master carpenter, the multinational LEGO Group remains a private and family-owned company based in Billund, Denmark.

The name LEGO comes from the Danish words 'leg godt', meaning 'play well'. In 1958 the founder's son, Godtfred, filed a patent application for the LEGO brick. Since then, all the bricks ever produced by the company have been compatible with one another. Today, the company is the world's third largest toy manufacturer by revenue (after Mattel and Hasbro) and keeps growing.

Through the family holding KIRKBI, The LEGO Group is part owner of the LEGOLAND theme parks, which are located in Denmark, the UK, Germany and the US (California and Florida). At the end of 2011, The LEGO Group had 10,000 employees (1,000 more than the year before) who helped generate 18.7 billion DKK in revenue and 5.7 billion DKK in operating profit, with an operating margin of 30.2% (1 DKK = 0.1821 USD).

Each year, new product launches account for more than 60% of The LEGO Group's sales. The average life of a LEGO product is 20 months. It is therefore not surprising to learn that the company is very much future-oriented, as can be attested by its **Mission**:

- "Inspire and develop the builders of tomorrow"

and **Vision**:

- “Invent the future of play”.

It has established a LEGO Brand Framework articulated around four Promises:

1. Play - cultivate the joy of building and the pride of creation
2. Planet - have a positive impact on it
3. Partner - mutually create value with them
4. People - succeed together.

The company’s ***Spirit*** is that “Only the best is good enough” and it operates based on six key corporate ***Values***:

1. Imagination
2. Creativity
3. Fun
4. Learning
5. Caring and
6. Quality.

The company focuses on, promotes and tracks not only product quality but employee commitment and diversity, health and safety, business integrity, customer satisfaction and resource utilization.

The LEGO brick is one of the best-known – if not iconic – products of the planet. At the start of the new millennium, Fortune Magazine declared it the ‘Toy of the Century’. A few fun facts can illustrate its reach:

- LEGO products are sold in more than 130 countries.
- On average, every person on earth owns 80 LEGO bricks.
- The company sold 4 billion figurines over the years – which, if they were real people, would represent the world’s largest population group!
- The LEGO Group is one of the largest tire manufacturers, with 300 millions tires sold in 2011.
- Since its foundation, the company has produced 600 billion elements.
- A column of 40 billion of its bricks would reach the moon!
- The bricks produced in 2011 alone would circle the earth 16 times.
- The company’s moulds produce the bricks with an accuracy of 0.005 mm and their product defect rate is 18 bricks per million.

Risk Management

Despite its longevity and current success, The LEGO Group is acutely aware of risk.

Not so long ago, up until the early 1990s, the company enjoyed solid double-digit growth year after year. Then, in 1993-95, their growth rate tumbled from 10-12% to 2-5%. The CEO wondered how the company could go back to previous growth rates and encouraged initiatives. LEGO went in many directions, launching figurines and a number of innovative products – but forgot about the bricks.

Their customers and consumers could not figure out what they were doing anymore. In 2004, the Kristiansen family almost lost control of the company and in 2005 had to sell a majority shareholding of the LEGOLAND theme parks to Merlin Entertainment/Blackstone.

Referring to the Harvard Business Review article 'The Coherence Premium' (published in June 2010), Hans Læssøe, Senior Director of Strategic Risk Management at the LEGO Group, says: "Companies that do well focus on what they're good at. Given that the toy market is a fashion industry and that more than 60% of our annual sales come from new product launches, we obviously have to reinvent ourselves every year. But The LEGO Group is fundamentally a multibillion plastic brick maker. We had made the mistake of forgetting that."

With their set of values, future-orientation and focus on quality, it is not surprising to learn that the company has not only adopted Enterprise Risk Management (ERM) but also earned much deserved kudos for its accomplishments. Its leader, Hans Læssøe, has won multiple European commendations and awards for The LEGO Group's risk management framework. He earned LEGO a 'Corporate of the Year' title at the Operational Risk & Regulation Innovation Awards 2011. His approach to ERM and Strategic Risk Management have been mentioned and commented upon in many articles, including most recently in Business Insurance (May 10, 2012), Strategic Risk's Risk Report 2012 (May 2012), Strategic Finance (February 2012), CFO Magazine (November 1, 2011) and The Conference Board of Canada's Risk Watch (September 2011).

The Strategic Level

The LEGO Group systematically considers both risks and opportunities. At the highest level they look at the macro-picture, at mega-trends, and generate potential strategic scenarios that might affect the company.

As a concrete example, The LEGO Group might consider the future of their Chinese market presence. At the moment, China is a relatively small market for The LEGO Group, maybe the size of the Swedish market. The company might look, for instance, at two possible future scenarios:

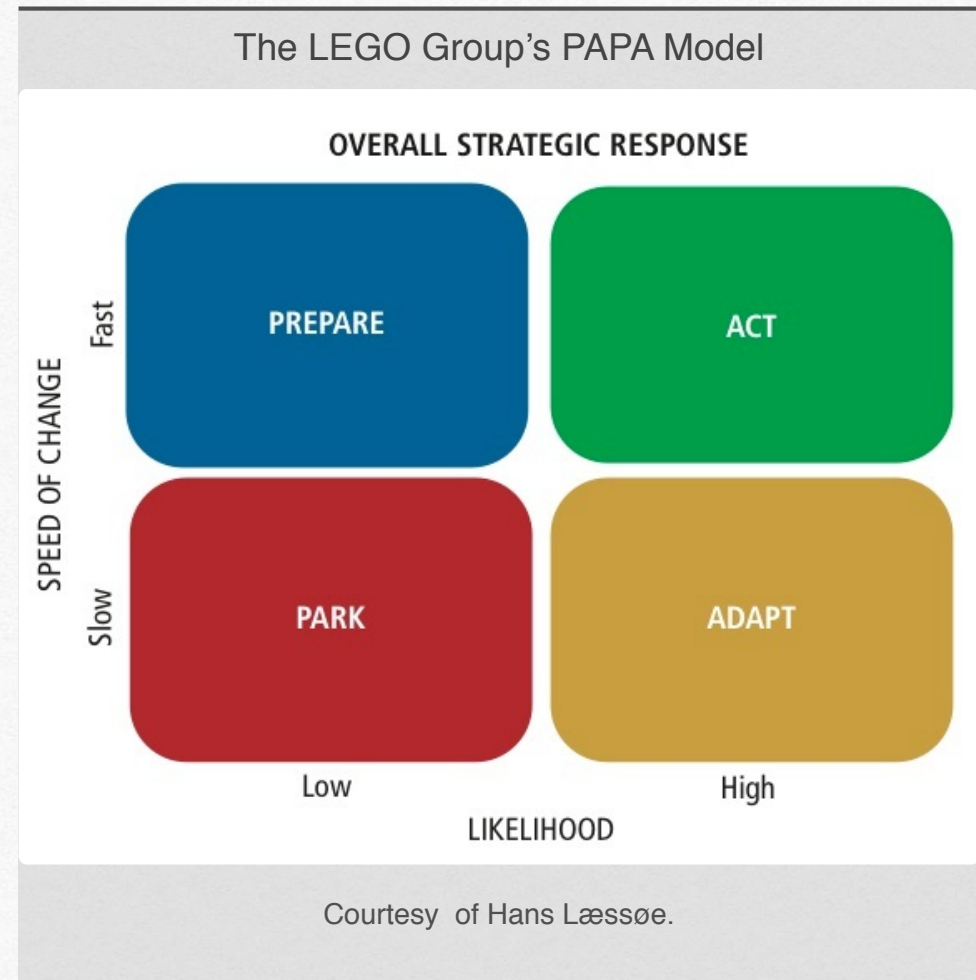
1. Continue to concentrate on Europe and the USA, benefit from some price increases and 5% growth or less over the next 10 years; or or
2. Decide to increase their market presence in China.

In 3 to 4 years, China's economy is expected to surpass that of the USA. There may exist a \$5bn toy market in that country – possibly the largest in the world. What infrastructure would The LEGO Group need to serve such a market adequately? These are the kind of issues being discussed by the company in the strategic-scenario generation phase.

The PAPA Model

To prepare The LEGO Group's overall strategic response to those scenarios, in addition to the traditional risk map of Likelihood Vs. Consequence, the company uses another dimension: Speed of Change. They use what they call The PAPA Model (Park, Adapt, Prepare, Act), defining four basic types of actions based on the quadrant the scenario find itself in (as illustrated in the next column): Park the issue, Adapt to the trend, Prepare for it, or Act immediately. Hence a prioritization is established for the needed actions to ensure a robust strategic approach.

These processes and discussions are, however, so high-level and qualitative that numbers are not truly relevant, and hence this process does not use computer-based tools.



The Project Level

Given the importance of new product launches to global sales, The LEGO Group uses a sophisticated risk management system for its portfolio of projects – both for product launches and for other business changing projects.

There are significant uncertainties associated with new launches. As a concrete example, let's consider the simultaneous development of two movie-related new products: one based on Indiana Jones (timed to match the release of the Episode 4 movie - "Kingdom of the Crystal Skull"), and the other one on "Speed Racer". Which one will lead to the better LEGO product launch? Which one will sell best?

At the time, the company analyzed the question thoroughly. An example of important issues being considered in the analysis was the impact on the potential LEGO customer's purchasing behavior of: 1) the age of actor Harrison Ford on one side Vs. 2) the fact that Speed Racer is a CGI (computer-generated image) movie on the other side. To reduce the level of uncertainty associated with planning production for that purchasing behavior, the company used focus groups and surveys. For instance, they asked the opinion of retailers and they obtained confirmation that the same key issues were at play. Then, The LEGO group tested the concept in a controlled experiment.

The company surveyed 5,000 children selected randomly in shopping malls of various countries, including Germany, the UK, France and the US. They asked them which product they preferred – the price being equal. According to survey results, 60% of the children preferred the Speed Racer product and 40% the Indiana Jones product. The LEGO Group established production budgets in line with those surveys and launched both products simultaneously. And guess what? Speed Racer sold 85% of its budget while Indiana Jones sold 300% of its budget!

This example illustrates why The LEGO Group needs flexibility: they use monthly sales forecast, analysis of the actual results, and ‘What If’ scenarios. ‘What if sales are 5%, 10%, 20% more than budgeted?’ What kind of investment plans do they need ready to go in case they would have to react in time. And what is very interesting is that their board of directors and senior management team are not discouraged by the fact that sometimes reality is very different from anticipation. They ask: ‘What can we do better?’

The AROP Process

At the project level, The LEGO Group uses what they call The Active Risk and Opportunity Planning (AROP) Process, supported by a tool within Excel. Depending on the project’s Business Impact Vs. Newness & Complexity, they prioritize the methodology either 1) Fully, 2) Lightly or 3) Not at all.

Enterprise Risk Management

The Full approach includes the application of a best practice ERM framework to each project, taking into account the ‘portfolio’ effect: the impact the project might have on existing business and, conversely, the impact the existing business might have on the project’s potential success. Risks have to be identified and prioritized,

treatments anticipated and selected based on their cost/benefit, and the projects’ risks monitored and updated regularly throughout the project’s life.

Risk Appetite

Interestingly, probability and impact scales are given careful consideration to make sure that they are comparable, even between quantitative and qualitative risk types. The prioritization of risks is automated within Excel through an algorithm that takes into account each risk’s probability and impact on the risk map relative to The LEGO Group’s established risk appetite. Project risks are reassessed (‘refreshed’) periodically to take into account potential changes in the risks themselves or their treatment, including the fact that risks may have been terminated over time or that unexpected risks may have materialized. In the latter case, those unexpected events are documented to help improve risk anticipation in future projects.

Reports and pivot tables are generated automatically within Excel. They show both risks and opportunities on a gross and net basis, highlighting the improvement (‘net – gross’) narratively and visually on the risk map. They also include priority overviews of risks and opportunities by type of risk or by person responsible for managing them.

An important point made by Hans Læssøe is that if you don’t assign clear responsibilities, risks and opportunities will not be managed actively. As he says: “Experience shows that it is important to have a named owner/driver to ensure action. When two persons share a responsibility, they tend to assume 1% each.”

The Operational Level

A third process relates to the management of current risks in the **Going Concern**.

Here The LEGO Group also uses an Excel-based tool to capture and update risks on operational, financial, hazard, IT security as well as strategic risks, all of which are systematically updated by the risk owners (i.e. line of business) based on a pre-defined frequency.

The risk portfolio is consolidated and reported upon every half year to Corporate Management and the Board of Directors.

Monte Carlo Simulations

Studies have shown that Monte Carlo simulations improve decision-making in complex situations.

As Hans Læssøe explained: "I was introduced to Palisade Corporation's @RISK at a training program some years ago and, being a mathematician by education, I found it was simply great fun. I downloaded the trial edition and was 'sold'. We use the @RISK Professional edition."

The LEGO Group mainly uses Monte Carlo simulations in three areas: Budget Making, Credit Risk Portfolio Analysis and Consolidation of Risk Exposure.

Budget Making Purposes

For budget-making purposes, the ERM team analyses historical deviations on both sales and cost elements.

Using the @RISK analytical tool, they identify a best-fit distribution for those uncertainties. For some costs this is done based on the actual fiscal budget, while for other, more variable costs, this is done based on a cost/sales ratio.

The full P&L (profit and loss) statement at the Business Area level is embedded in the simulation, and relevant data are consolidated: for instance, sales between regions, sales and marketing spending, distribution costs and raw material costs (as both are related to the price of oil).

The result is a simulation of potential outcomes and key uncertainty drivers, which are included in the budget packet presented to the board of directors. This analysis is not done just once a year (The LEGO Group's financial year-end is December 31). The process is re-done based on the March and September full-year estimates, which are seen as important to The LEGO Group's management.

In a highly volatile industry such as toys, it has proven valuable insight for management to know in advance what the potential range of earnings are, as well as which levers are the most important.

Credit Risk Portfolio

A model covering the top 700 customers has been established to enable the Monte Carlo simulation of credit risk.

The model is based on internal as well as external assessments of the probability of default for each customer – as well as data on days of sales outstanding, peak credit and other key metrics. Due to the heavy seasonality of the toy industry, the average exposure is not truly relevant.

The @RISK model uses a binomial distribution of each customer – because they will either default or won't – and a simulation is run to determine the 5% and 1% worst-case exposures. The model also includes credit-risk insurance coverage - and hence allows the assessment of The LEGO Group's credit risk *and* credit insurance coverage value.

The Excel-based model is seen as a Treasury tool and has been built in close collaboration between Strategic Risk Management and Treasury. It enables the calculation of portfolios with a level of self-containment, as well as stress-testing of poorer payment performance, increased probabilities of default and other potential scenarios.

The Monte Carlo simulation of credit risk is regarded as a valuable tool for professional and informed discussions with credit-insurance providers, as well as with The LEGO Group's market-regions management on what to accrue for on the balance sheet for credit risk at the financial year-end.

Consolidation of Risks

Consolidation of a risk portfolio is too often seen done by multiplying the likelihood with the impact for each risk – and adding up the total for the portfolio. Hans Læssøe sees this as dangerous and essentially a systemic error in risk management, as the outcome of this calculation is the expected loss.

“Risk management is not about averages. If it was, no one would ever take out insurance on anything - because on average it does not pay”.

Risk management is about handling the extremes. This is where the Monte Carlo simulation approach proves valuable – allowing to generate the probability of unexpected and extreme ranges.

At The LEGO Group – both in the AROP process for business projects and in the ERM database for the current risk exposure – Monte Carlo simulation is applied to define the consolidated exposure.

For each risk, a binomial distribution is applied using the likelihood defined for the risk. When they think a risk could materialize more than once in a year, they use

a Poisson distribution. But that is rare in a very seasonal industry and for a company like The LEGO Group, where about 50% of sales occur in the 4th quarter.

Based on this probabilistic analysis and the defined impact they estimated, Palisade's @RISK is used to simulate and define the consolidated risk exposure both on a gross basis (before mitigation) and on a net basis (after mitigation).

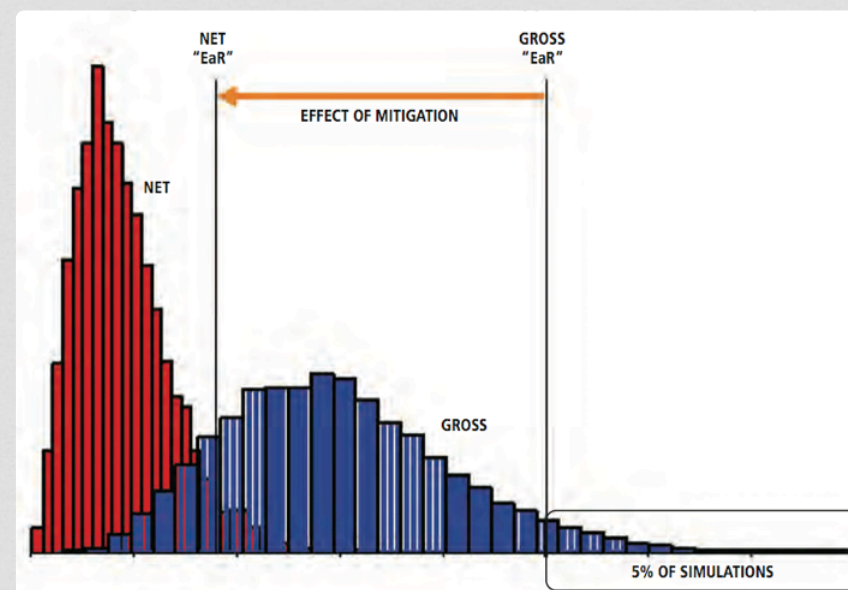
The LEGO Group then focuses on the 5% worst-case loss compared to its budget. The difference between gross and net shows the impact of the risk mitigation and the net exposure is reported relative to a defined LEGO Group risk appetite.

This analysis allows The LEGO Group's management and board of directors to monitor the company's risk exposure and then have informed discussions about risk-taking decisions in terms of:

- What are the key risks
- Do they need further mitigation of these key risks
- Can they "afford" to take-on more risk and potentially raise the level of ambition on performance even further.

For business projects, the risk appetite is based on the projects' key performance indicators (KPIs), whereas the overall risk appetite is based on a defined minimum earnings requirement.

Sample Consolidated "Earnings At Risk" Gross and Net Graphs Output from Palisade's @RISK



Courtesy of Hans Læssøe.

Risk Interdependencies

The LEGO Group does not use correlations in the risk consolidation process, but it does use them in budgeting.

For instance, they look at sales correlations between the US, EU and Asia. They usually are positively correlated market-wise, in the sense that a strong product does well everywhere.

Marketing spending and sales are correlated. There is 60% positive correlation between distribution costs and raw material prices owing to the fact that oil is a major input in both transportation and plastic making.

There is a negative correlation between sales and discounts.

The company tracks 6 or 7 important correlations, including currencies, and embed these in the budget models.

In the future, they would like to look at interdependencies in a wider sense. They are currently testing their use in the ERM model whereby they could describe

that if risk A occurs (e.g. a factory burning down) then risk B (loss of sales due to competition) becomes irrelevant.

Conclusion



The LEGO Group has one of the most advanced Enterprise Risk Management frameworks in the business. It is one of the rare companies to use Monte Carlo simulations to quantify risk and present key risk information to their board of directors for decision-making and oversight purposes against risk appetite.

As Hans Læssøe says, “the board of directors does not have to understand the underlying technicalities – the ERM team does. But we have to make the analysis mean something to them business-wise.”

Such a sophisticated approach allows the company to react quickly to both risks and opportunities – sometimes allowing it to take more risks than it otherwise would have thought affordable.



Thank you very much to Hans Læssøe,
Senior Director of Strategic Risk Management at
The LEGO Group, for his kind and generous contribution.

Other Titles Available on the iBookstore



An interview with risk-taking zoo owner Benjamin Mee, who
was played by Matt Damon in “We Bought a Zoo”.

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