



# ADVANCED DATA ANALYSIS TECHNIQUES

Modelling, Simulation, Optimisation and Predictive Analytics using Microsoft Excel Training Workshop



**EKHAYA  
LUXURY RESORT**  
Mangochi - Malawi

**10-13  
JUNE  
2025**

**REGISTRATIONS FEES**  
**K1,950,000**  
VAT EXCLUSIVE

**FROM  
8:30  
TILL 4PM**

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## INTRODUCTION

The statistical analysis of numerical information is proven to be a powerful tool, providing businesses with everyday insight into matters like corporate finance, manufacturing processes, service provision and product quality control.

However, the advent of the Internet of Things, the consequential growth in Big Data, and the ever-increasing business requirements to model and predict, mean that many of the analytical opportunities and needs of a modern, high performing company cannot be met using conventional data analysis methods alone.

More and more companies are wrestling with complex modelling and simulation problems, addressing matters like trying to optimize production systems, to maximize performance efficiency, to minimize operating costs, to combat risk, to detect fraud and to predict future behavior and outcomes.

This Advanced Data Analysis Techniques training course is 100% computer-based and shows by example how to use Microsoft Excel to solve a series of complex and realistic business problems. The problems are drawn from the widest possible range of applications – from robotics to refining, from supply chain logistics to production optimization and from financial risk management to the efficient provision of healthcare. All the problems are different and all convey carefully designed learning objectives.

Delegates will learn how to code and simulate realistic problems and then how to use these simulations to understand system operation, to optimize performance, and to predict future behavior. The training course is intended for people who are experienced in conventional data analysis techniques, and who now want to become specialist in the modelling and simulation of complex business activities.

## OBJECTIVES

This training course aims to provide those involved in monitoring, managing and controlling complex business processes with the understanding and practical capabilities needed to convert data into meaningful information via a range of very powerful modelling, simulation and predictive analytical methods.

- To show delegates precisely how to implement a range of modelling, simulation and predictive analytical methods using Microsoft Excel 2016 (or 365)
- To provide delegates with both a conceptual understanding and practical experience of advanced data analysis methods including: Bayesian models, conventional and genetic optimization methods, Monte Carlo models, Markov models, What If analysis, Time Series models, Linear Programming, and more
- To provide a clear understanding of why the best companies in the world see modelling, simulation and predictive analytics as being essential to delivering the right quality products and optimized services at the lowest possible costs
- To engage delegates for the entire 3 days in the exploration and use of modelling and simulation methods within Microsoft Excel, to develop complete solutions to the 8 totally realistic business problems that are presented
- To enable delegates to make the shift from intuition-based to information-based decision making in complex situations, hence enabling them to enhance their forecasting and future behavior predictions, increase their proficiency in risk assessment and risk-informed decision making, and to exploit to a much greater extent the wealth of information contained in Big Data
- To teach delegates how to solve a wide range of complex business problems which require modelling, simulation and predictive analytical approaches



## TRAINING METHODOLOGY

This training course on Advanced Data Analysis Techniques adopts a problem-based learning approach, in which delegates are presented with a series of real problems drawn from the widest possible range of applications – they range from insurance to supply chain logistics, from chemistry to engineering, and from production optimization to financial risk assessment. Each problem presents and exemplifies the need for a different modelling or analytical approach.

This training course is entirely applications-oriented, minimizing the time spent on the theory and mathematics of analysis and maximizing the time spent on the use of practical methods from within Excel, along with the understanding of how and why such methods work.

Delegates will spend almost all of their time exploring the use of modelling and simulation methods using Microsoft Excel, to develop solutions to the totally realistic problems that are presented.



## ORGANISATIONAL IMPACT

Organizations which are able to make optimum decisions, and which can reliably predict future trends and behaviors, are able to enhance substantially their ability to compete on the global stage; as a result of sending their employees on this training course, organizations can expect to benefit from:

- A shift from intuition-based to information-based decision making
- The provision of accurate solutions to complex problems
- Enhanced forecasting and future behavior prediction
- Advanced modelling and simulation of business processes
- More capable risk assessment and risk-informed decision making
- Improved capitalization on the wealth of information contained in Big Data

## PERSONAL IMPACT

Participants of this Advanced Data Analysis Techniques training course will each gain extensive understanding and lots of practical experience of a wide range of the more common modelling, simulation and predictive analytical techniques, all of which will have direct relevance to a wide range of business issues; specifically delegates will acquire:

- New insights into the use of optimization, modelling and prediction using Microsoft Excel
- Experience of Linear Programming
- An understanding of how and when to use Newtonian and Genetic Optimization Methods
- Knowledge of Scenario Analysis, Markov Modelling and Monte Carlo Simulation
- The ability to recognize which types of analysis are relevant to particular types of issues
- Sufficient situational knowledge to judge when a technique will lead to incorrect conclusions

## WHO SHOULD ATTEND?

The Advanced Data Analysis Techniques course has been designed for professionals whose jobs involve the manipulation, representation, interpretation and/or analysis of data. This training course involves extensive modelling and analysis using Excel 2010 [or higher] and therefore delegates must not only be numerate, but must enjoy detailed working with numerical data to solve complex problems.

Full familiarity with Microsoft Excel [version 2007 or higher], and the ability to analyze data using common statistical methods, are fundamental prerequisites for attendance on this course.

## COURSE OUTLINE

### Monte Carlo Simulation

- Introduction to Monte Carlo Simulation; Monte Carlo building blocks in Excel; Using the RAND() function; Learning to model the problem; Building worksheet-based simulations; Simple problems; How many iterations are enough?; Defining complex problems; Modelling the variables; Analysing the data; Freezing the model; Manual recalculation; "Paste Values" function; Basic statistical functions; PERCENTILE() function
- Monte Carlo Simulation solutions to problems of traffic flow in a city, dealing with uncertainty in the sale of product, predicting market growth and assessing risk in currency exchange rates

### Linear Programming

- Introduction to Optimisation; Multi-variate Optimisation Problems; Determining the Objective Function; Constraints to Problems; Sign Restrictions; The 'feasibility region'; Graphical Representation; Implementation using Solver in Excel
- Using Linear Programming to Solve Production and Supply Chain / Logistics Problems, such as optimising the products from a refinery, and minimising the manufacturing and delivery costs for a complex supply chain (with and without batch manufacturing, and with and without warehousing)

### Scenario Analysis

- Introduction to Scenario Analysis; A What-If example in Excel; Types of What-If analysis; Performing manual what-if analysis in Excel; One Variable Data Tables; Two-variable data tables
- Using Scenario Manager in Excel; Using scenario analysis to predict business expenses and revenues for an uncertain future

### Newtonian and Genetic Optimisation Methods

- Linear and Non-linear Optimisation Problems; Stochastic Search Strategies; Introduction to Genetic Algorithms; Biological Origins; Shortcomings of Newton-type optimisers; How to Apply Genetic Algorithms; Encoding; Selection; Recombination; Mutation; How to Parallelise; Implementation using Solver in Excel
- How to Solve a range of Optimisation Problems, Culminating in the classic 'travelling salesman problem' by optimising the motion trajectory of a large manufacturing robot, both with and without forced constraints

### Markov Models

- Understanding Risk; Introduction to Markov Models; 5 Steps for Developing Markov Models; Manipulating Arrays and Matrices inside Excel; Constructing the Markov Model; Analysing the Model; Roll Back and Sensitivity Analysis; First-order Monte Carlo; Second-order Monte Carlo
- Decision Trees and Markov Models; Simplifying Tree Structures; Explicitly Accounting for Timing of Events
- Using Markov Chains to simulate an insurance no claims discount scheme, and Modelling the Outcomes of a Healthcare System

## CERTIFICATES

On completion of the training a PALGNET Certificate of Attendance will be awarded to delegates.