Business Analytics and Intelligence

3rd Batch

(Classes conducted on-campus as well as off-campus)

Course Starting: 23 July 2012

Last date to apply: 25 May 2012

Certificate Programme on Business Analytics and Intelligence

Business Analytics is a set of techniques and processes that can be used to analyse data to improve business performance through fact-based decision-making (Figure 1). Business Analytics is the subset of Business Intelligence, which creates capabilities for companies to compete in the market effectively. Business Analytics is likely to become one of the main functional areas in most companies. Analytics companies develop the ability to support their decisions through analytic reasoning.

Thomas Devonport in his book titled, "*Competing on analytics: The new science of winning*", claims that a significant proportion of high-performance companies have high analytical skills among their personnel. On the other hand, a recent study has also revealed that more than 59% of the organizations do not have information required for decision-making.
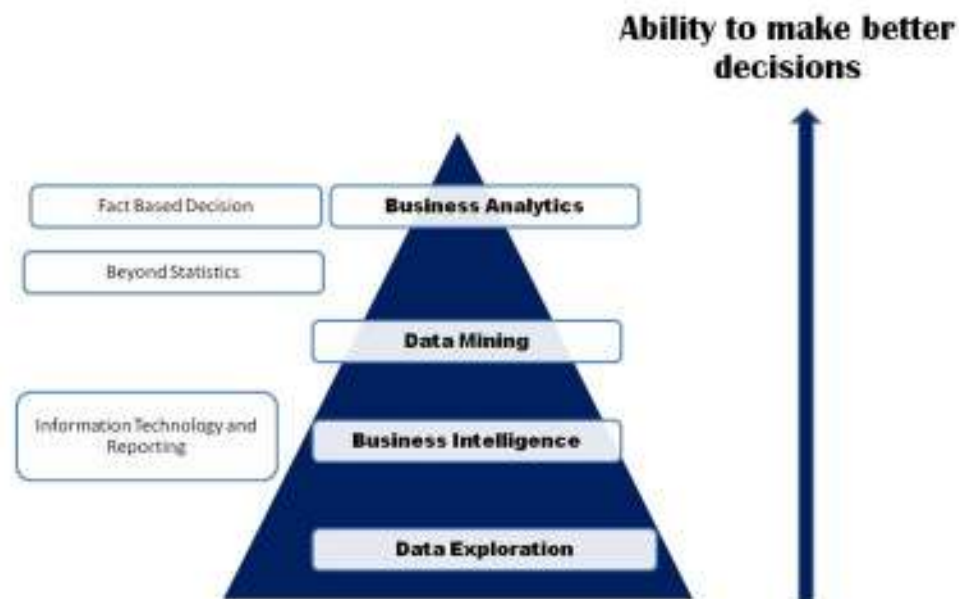

Figure 1. Business Analytics and Intelligence
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In a recent article[1] based on a survey of nearly 3000 executives, *MIT Sloan Management Review* reported that there is striking correlation between an organization's analytics sophistication and its competitive performance. The biggest obstacle to adopting analytics is the lack of knowhow about using it to improve business performance. Business Analytics uses statistical, operations research and management tools to drive business performance.

Many companies offer similar kind of products and services to customers based on similar design and technology and find it difficult to differentiate their product/service from their competitors. Business Analytics helps companies to find the most profitable customer and allows them to justify their marketing effort, especially when the competition is very high.

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[1] M S Hopkins, S LaValle, F Balboni, N Kruschwitz and R Shockley, "10 Insights: A First look at The New Intelligence Enterprise Survey on Winning with Data", *MIT Sloan Management Review*, Vol. 52, No. 1, 21–31.

Companies such as
- CAPITAL ONE has managed a profit of close to $1 billion in their credit card business in the recent past, whereas many of their competitors have shown a loss of several millions in credit card business. The success of Capital One is attributed to its analytical strength.

- STAPLES invented the office super store concept and became the world's largest office products company. Staples over years discovered that the best way to grow its business and build loyalty was to analyze the purchasing patterns of its core customers and target them with relevant, profit-generating offers. To do that, Staples is using Business Analytics for predictive modeling and customer insight to fine tune its marketing campaigns

There is significant evidence from the corporate world that the ability to make better decisions improves with analytical skills. According to new research, relevance of effective data management and business analytics is growing and being considered strategic and discussed at board-room level.

This course is designed to provide in-depth knowledge of business analytic techniques and their applications in improving business processes and decision-making.

Course objectives

The course is designed to provide in-depth knowledge of handling data and Business Analytics' tools that can be used for fact-based decision-making. At the end of the course, the participants will be able to:

1. Understand the role of business analytics within an organization.
2. Analyse data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. Use decision-making tools/Operations Research techniques.
4. Use advanced analytical tools to analyse complex problems under uncertainty.
5. Manage business processes using analytical and management tools.
6. Use analytics in customer requirement analysis, general management, marketing, finance, operations and supply chain management.
7. Analyse and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

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Course Design

The course consists of six modules and a project. The duration of each module is 5 days. In addition there is an optional module on, "Applied Analytics using SAS Enterprise Miner" which shall be carried out by SAS Institute's analytical consultants and is mapped on to the international predictive modeling certification using SAS enterprise miner. The modules and their contents are discussed in the following paragraphs. Case-based teaching methodology will be used for all the modules.

Module 1: Business Statistics

The process of fact-based decision-making requires managers to know how to summarize, analyse and interpret data to facilitate his/her decision-making. Statistical analysis is a fundamental method of quantitative reasoning that is extensively used for decision-making. This module is aimed at providing participants with the most often used methods of statistical analysis along with appropriate statistical tests. The module is oriented towards application rather than the theoretical aspects.

Business Statistics Module Contents

Different types of data; Data summarization methods; Tables, Graphs, Charts, Histograms, Frequency distributions, Relative frequency measures of central tendency and dispersion; Box Plot; Chebychev's Inequality

Basic probability concepts, Conditional probability, Bayes Theorem, Probability distributions, Continuous and discrete distributions, Sequential decision-making

Sampling and estimation: Estimation problems, Point and interval estimates

Hypothesis testing: Null and alternate hypotheses; Types of errors, Level of significance, Power of a test, ANOVA

Test for goodness of fit, Non-parametric tests.

Module 2: Predictive Analytics

Predictive analytics search for patterns found in historical and transactional data to understand a business problem. In many business problems, we try to deal with data on several variables. Regression models help us understand the relationships among these variables. Forecasting models are tools for predicting future values of variables such as sales from past data. Primary objective of this module is to understand how regression and forecasting models can be used to analyse real-life business problems. The focus will be case-based practical problem-solving using predictive analytics techniques to interpret model outputs. The participants will be exposed to software tools such as MS Excel, SPSS and SAS and how to use these software tools to perform regression, logistic regression and forecasting.

Predictive Analytics Module Contents

Simple linear regression: Coefficient of determination, Significance tests, Residual analysis, Confidence and Prediction intervals

Multiple linear regression: Coefficient of multiple coefficient of determination, Interpretation of regression coefficients, Categorical variables, heteroscedasticity, Multi-collinearity, outliers, Autoregression and Transformation of variables

Logistic and Multinomial Regression: Logistic function, Estimation of probability using logistic regression, Deviance, Wald Test, Hosmer Lemshow Test

Forecasting: Moving average, Exponential smoothing, Trend, Cyclical and seasonality components, ARIMA (autoregressive integrated moving average).

Application of predictive analytics in retail, direct marketing, health care, financial services, insurance, supply chain, etc.

Module 3: Optimization Analytics

Optimization models are methods of arriving at optimal or near optimal decisions for a given set of managerial objectives under various constraints. The objective of the module is to acquaint participants with the construction of mathematical models for managerial decision situations and use freely available Excel Solver to obtain solutions and interpret the results.

Optimization Analytics Module Contents

Introduction to Operations Research (OR), linear programming (LP), formulating decision problems using linear programming, interpreting the results and sensitivity analysis.

Multi-period LP models. Applications of linear programming in product mix, blending, cutting stock, transportation, transshipment, assignment, scheduling, planning and revenue management problems. Network models and project planning.

Integer Programming (IP) problems, mixed-integer and zero-one programming. Applications of IP in capital budgeting, location decisions, contracts.

Multi-criteria decision making (MCDM) techniques: Goal Programming (GP) and analytic hierarchy process (AHP) and applications of GP and AHP in solving problems with multiple objectives.

Non-linear programming, portfolio theory.

Module 4: Stochastic Models

Stochastic models offer a powerful analytical approach to model and examine complex problems in the domains of finance, marketing, operations and economics. In management as well as in business, many measurements change with time and are inherently random in nature. Stochastic models can be used to model and measure changes in metrics used for finance, marketing, operations, supply chain, etc. over a period of time. The objective of this module is to provide an introduction to stochastic processes and their applications to business and management. Our approach will be non-measure theoretic, with an emphasis on the applications of stochastic process models.

Stochastic Models Module Contents

Introduction to stochastic models, Markov models, Classification of states, Steady-state probability estimation, Brand switching and loyalty modeling, Market share estimation

Poisson process, Cumulative Poisson process, Applications of Poisson and cumulative Poisson in operations, marketing and insurance

Renewal theory, Applications of renewal theory in operations and supply chain management

Markov decision process, Applications of Markov decision process in sequential decision-making

Advanced Analytics Modules

Advanced analytical tools will be taught in two modules. The participants will be exposed to a complex decision-making scenario under uncertainty and how to deal with such problems using advanced tools. Discussion problems will be drawn from many sectors such as finance, banking, insurance, IT, ITeS, retail, service, manufacturing, pharmaceuticals, etc.

Module 5: Advanced Analytics 1

Principal component analysis, Factor analysis, Conjoint analysis, Discriminant analysis, ARCH (autoregressive conditional heteroscedasticity) and GARCH (autoregressive conditional heteroscedasticity), Monte Carlo simulation

Survival analysis and its applications: Life tables, KapMeier estimates, Proportional hazards, Predictive hazard modeling using customer history data

Six Sigma as a problem solving methodology, DMAIC and DMADV methodology, Six Sigma Tool Box: Seven quality tools, Quality function deployment (QFD), SIPOC, Statistical process control, Value stream mapping, TRIZ

Classification and regression trees (CART), Chi-squared automatic interaction detector (CHAID)

Lean thinking: Lean manufacturing, Value stream mapping

Module 6: Advanced Analytics 2

Dynamic pricing and revenue management, high dimensional data analysis, financial data analysis and prediction.

Supply chain analytics

Analytics in finance, Discounted cash flows (DCF), Profitability analysis. Asset performance: Sharpe ratio, Calmar ratio, Value at risk (VaR), Brownian motion process, Pricing options and Black–Scholes formula

Game theory

Insurance loss models: Aggregate loss models, Discrete time ruin models, Continuous time ruin models

SAS Module:

SAS Module is available as an optional and is recommended. The details of SAS module is given below.

Who should attend?

The business analytics and intelligence certificate programme will equip the participants with analytical tools and prepare them for corporate roles in analytics bases consulting in marketing, operations, supply chain management, finance, insurance and general management in various industries.   The course is suitable for those who are already working in analytics to enhance their knowledge as well as for those with analytical aptitude and would like to start new career in analytics.

Eligibility Criteria:

The participants should have a Bachelors degree in engineering/science/commerce or arts with mathematics as one of the subjects during their Bachelor's programme. The participants of Executive Education are expected to have at least 5 years of work experience. For profiles with exceptional qualifications, the experience criteria may be waived.

Evaluation:

The participants will be evaluated through take-home assignments and a project work. At the end of each module, the participants will be given a take-home assignment that should be completed and submitted within 3 weeks.

Each participant should carry out an individual project for 3 months based on a real-life problem/data.

Tentative Course schedule:

The course schedule is as follows. Modules 3, 4 and 5 are also available in the distance mode:

Programme Schedule		
Module	**Dates**	**Venue**
1 Business Analytics	23–27 July 2012	IIM Bangalore
2 Predictive Analytics	2–6 September 2012	IIM Bangalore
SAS Module (Optional)	6–9 September 2012	6-7th IIM Bangalore 8–9 SAS locations
3 Optimization Analytics	6, 20, October; 3,10 November, 1 December 2012	IIM Bangalore and distance mode (Reliance Web World)
SAS Predictive Modeler Preparation	29 September 2012	SAS distance mode
4 Stochastic Models	8, 15 & 29 December 2012, 5 & 12 January 2013	IIM Bangalore and distance mode (Reliance Web World)
5 Advanced Analytics I	19 January, 2, 9, 16 & 23 February 2013	IIM Bangalore and distance mode (Reliance Web World)
SAS session on Business Cases	26th January 2013	SAS distance mode
6 Advanced Analytics II	11–15 March 2013	IIM Bangalore

Class timings: 9 am to 5.15 pm

Project:

Students are expected to do a live project as part of this course. The project report should be submitted by 28 June 2013. The participants have to submit the project proposal by 28 February 2013. The projects will be supervised by an IIMB faculty member.

Program Directors:

Professors U Dinesh Kumar, Ishwar Murthy, Rajluxmi V Murthy and Pulak Ghosh.
For any queries contact. Professor U Dinesh Kumar (Email: dineshk@iimb.ernet.in)
For queries on SAS Module contact Biju Panicker (Email: biju.panicker@sas.com)

Program Delivery:

The programme will be conducted live in the classroom at IIMB. The sessions will be beamed instantaneously across selected cities in India through Reliance Web World outlets using video conferencing facilities that allows a large number of geographically dispersed participants to participate in highly interactive sessions with the faculty. The system incorporates two-way data and audio–video interactivity.

Those interested in participation may indicate a convenient location (IIMB Campus/RWW locations) as indicated in the nomination form. Participants travelling during the programme days can attend the programme at any one of the convenient classrooms, subject to availability of seats. **IIMB selects Reliance Web World locations provided a minimum of five participants opt for the location**.

Program fee:

Rs. 3,70,000/- + service tax (as applicable) per participant for the core Program. The fee is payable in three installments as per indicated schedule. The payment schedule is as follows:

Rs. 1,25,000/- + service tax   I installment on admission (DD in favour of IIM Bangalore)
Rs. 1,25,000/- + service tax   II installment (DD in favour of IIM Bangalore)
Rs. 1,20,000/- + service tax   III installment (DD in favour of IIM Bangalore)

Rs. 30,000/- + service tax for SAS Module **(Optional Program)** (DD in favour of SAS)

Award of Certificate:

A certificate of completion will be awarded by IIMB to the participants at the end of the programme upon successful completion of the programme satisfying the programme requirements.

SAS participation certificate will be awarded by SAS to those participants who have opted for SAS.

Alumni:

On successful completion of the programme, the participants are eligible to be admitted to IIM Bangalore Alumni Association on a one-time payment of Rs. 3000/-.

Important Dates:

Registration closure: 25 May 25 2012
Announcement of 1st shortlist; Payment due: 13 June ; 20 June , 2012 at 4.30 pm
Release of 1st waitlist, Payment due: 21 June ; 27 June , 2012 at 4.30 pm
Release of 2nd waitlist, Payment due: 28 June ; 4 July , 2012
Course commencement: 23 July 2012

SAS Module: Applied Analytics Using SAS Enterprise Miner

To pursue a successful career in the field of data mining, along with theoretical clarity of data mining concepts, knowledge and skill set to handle data mining software is a must. SAS is used in over 127 countries, including 93 of the top 100 companies on the 2011 Fortune Global 500® list.

One of the widely used products for data mining is the SAS Enterprise Miner. It provides a flexible, accurate and easy-to-use graphic user interface to create predictive and descriptive models based on large volumes of data. It offers a rich, easy-to-use set of integrated capabilities for creating and sharing insights that can be used to drive better outcomes in business analytics.

With the increase in usage of SAS software worldwide, there is a growing demand for SAS-certified professionals, especially, in the area of predictive modeling.

The objective of the module is to enable the participants to develop skills required to assemble analysis flow diagrams, using the rich tool set of the SAS Enterprise Miner, for both:

- Pattern discovery (segmentation, association and sequence analyses)
- Predictive modeling (decision tree, regression and neural network models).

The module is delivered in a workshop mode with prime focus on hands-on training. The module would help participants intending to take up SAS Predictive Modeling Certification. Refer to the SAS annexure below for more details about additional features and

SAS Module Contents (SAS Annexure)

As a part of this initiative, SAS shall be providing:

3 days training per year for group of 50 students on the mutually agreed training programme. (Details in Annexure 1)

1 day Webinar session on presenting case studies from industry

Joint participation certificate to each participant with SAS and IIM logo

One free attempt of predictive modeling exam for each participant (worth INR 12,000/-)

Each participant will get an extended learning session on the above course absolutely free. Extended learning session is internet-based, which provides the following:

- ✓ Frequently asked questions
- ✓ White paper
- ✓ Course datasets
- ✓ Recommended reading, extra practice sessions and examples

SAS will provide official course notes to each participant

Applied Analytics Using SAS Enterprise Miner

Duration: 3 days

This training is appropriate for SAS Enterprise Miner 5.3, 6.1, and 6.2.

This course covers the skills required to assemble analysis flow diagrams using the rich tool set of SAS Enterprise Miner for both pattern discovery (segmentation, association, and sequence analyses) and predictive modeling (decision tree, regression and neural network models).

Learn how to:

Define a SAS Enterprise Miner project and explore data graphically

Modify data for better analysis results

Build and understand predictive models such as decision trees and regression models

Compare and explain complex models

Generate and use score code

Apply association and sequence discovery to transaction data

Use other modeling tools such as rule induction, gradient boosting and support vector machines.

Who should attend: Data analysts, qualitative experts, and others who want an introduction to SAS Enterprise Miner.

Prerequisites:

Before attending this course, you should be acquainted with Microsoft Windows and Windows-based software. In addition, you should have at least an introductory-level familiarity with basic statistics and regression modeling. Previous SAS software experience is helpful, but not required.

SAS Course Contents

Introduction
        Introduction to SAS Enterprise Miner
Accessing and Assaying Prepared Data
        Creating a SAS Enterprise Miner project, library and diagram
        Defining a data source
        Exploring a data source
Introduction to Predictive Modeling with Decision Trees
        Cultivating decision trees
        Optimizing the complexity of decision trees
        Understanding additional diagnostic tools (self-study)
Introduction to Predictive Modeling with Neural Networks and Other Modeling Tools
        Introduction to neural network models
        Input selection
        Stopped training
        Other modeling tools (self-study)
Model Assessment
        Model fit statistics
        Statistical graphics
        Adjusting for separate sampling
        Profit matrices
Model Implementation
        Internally scored dataset
        Score code modules
Introduction to Pattern Discovery
        Cluster analysis
        Market basket analysis (self-study)
Special Topics
        Ensemble models
        Variable selection
        Categorical input consolidation
        Surrogate models
Case Studies
        Segmenting bank customer transaction histories
        Association analysis of Web services data
        Creating a simple credit risk model from consumer loan data
        Predicting university enrollment management

Software Addressed in SAS Module

This course addresses the following software product(s): SAS Enterprise Miner.

Access to SAS eLearning – Extended Learning Pages

Extended Learning Pages is the latest innovation in SAS education. Education's Extended Learning Pages provide students in SAS' most popular courses, a resource page that combines access to all the course content that they received in class (including course datasets and practice exercises) with learning tools from a variety of other SAS and user resources. The result is a richer learning experience, one that extends well beyond the last day of class.

Another very valuable component of the Extended Learning Pages is a link into the broader community around the software. It would facilitate users communicating with each other, building excitement about our software, sharing code with each other or helping each other become more proficient SAS users."

Extended Learning Pages help accomplish this, by providing a list of recommended readings, blog sites, technical papers, SAS Press books and documentation around the content, as well as links to appropriate SAS-sponsored online discussion forums where users can share experiences, questions and ideas with other users.

On the Extended Learning Pages, participants can:
> Download course data.
> Learn more on course topics through recommended reading, extra practice and examples, frequently asked questions and more.
> Identify recommended next steps.
> Find additional resources

REGISTRATION

The organizations interested in nominating their candidates and interested individuals for the programme may send the completed nomination form, their CV and a photograph to the email ID bai@iimb.ernet.in or to the following address on or **before 5.00 pm on the closing date**. All registrations will get an acknowledgement with reference number within one week on receipt of application through email.

The Administrative Officer
Executive Education Programs
Indian Institute of Management Bangalore
Bannerghatta Road, Bangalore 560 076
Phone: +91 - 80 - 2699 3660, 2699 3264, 2699 3475
Fax: +91 - 80 - 2658 4004, 2658 4050
Email: bai@iimb.ernet.inWeb: www.iimb.ernet.in/eep   http://www.facebook.com/IIMB.EEP

Participants interested in the programme may contact IIMB at the above-mentioned address for clarifications, if any. Once registration is accepted, cancellation/refund queries and requests will not be entertained.