



## **MSc Business Analysis and Consulting**

### **Management Science Department, Strathclyde Business School**

Website - <http://www.strath.ac.uk/mansci/>

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### **Class Descriptions - Core Classes**

#### **(1) Foundations of Operational Research & Business Analysis**

##### **Rationale**

Students who commence the MSc in Operational Research and MSc in Business Analysis & Consulting come from a variety of backgrounds. Some may have already studied Operational Research or Business Analysis and are thus familiar with some, or all, of the problem solving processes that will be studied and with the methods, or techniques and tools associated with them. However, many of the students on the degrees will be new to the subject area. This class therefore provides an introduction to and overview of the fields of Operational Research and Business Analysis. For full-time and part-time students it will be taught early in the first semester. For distance learning students it will be the first class which they will take.

##### **Class description/introduction**

The class will explore the generic problem solving process which underpins the provision of decision support. In particular, it will consider the role of modelling in that process. The activities of problem structuring, data collection and analysis, identification and evaluation of options, communication and implementation of learning, findings and recommendations will each be discussed along with the issues pertaining to each of them. In addition, the links between each of these activities will be explored. Basic methodological issues will be considered and debated. Relevant and up-to-date case studies will be used to illustrate key points and to initiate debate. Time will be spent appreciating the role of problem structuring methods and a variety of other approaches to modelling will be briefly discussed in order to introduce students to key techniques and tools in the field. Links will be made to other classes in the degree where these techniques will be taught in more detail.

## **Class aims**

To introduce, and provide an overview of, the fields of Operational Research and Business Analysis. This will involve gaining an appreciation of the generic problem solving process, an exploration of basic methodological issues, plus an introduction to and overview of key modelling tools and techniques. The class will provide a framework for understanding how these modelling techniques, which will be explored in greater depth in other classes, fit together.

## **Learning outcomes**

1. subject specific knowledge and skills
  - To develop an understanding of the problem solving process required when supporting management decision-making
  - To gain an understanding of the different elements involved in the problem-solving process
  - To appreciate the role of modelling in supporting each element of the problem-solving process
  - To develop an understanding of problem structuring methods
  - To gain an appreciation of a variety of key modelling tools and techniques and how each can support the management decision-making process
  
2. cognitive abilities and non-subject specific skills
  - Critical thinking
  - Team working skills through group work
  - Communication skills, both verbal and written

## **(2) Quantitative Business Analysis**

### **Rationale**

The analysis of data and development of empirical models plays a vital role in business analysis and operational research. This module will provide a basis for students to learn a range of widely used methods ranging from effective presentation of data to development of sophisticated statistical models.

### **Class description/introduction**

Quantitative Business Analysis runs over one semester but in two parts. The first part provides an introduction to the basic theory and application of statistical modelling. Topics covered included data analysis, probability theory, distributions and moments, estimation and hypothesis testing. The second part focuses mainly on two areas - regression modelling and multivariate analysis. While key background theory will be presented, the emphasis is on the generation and interpretation of

output from commercially available software. Throughout, there is an emphasis on the use of statistical analysis to help support decision-making and the management of business and industrial problems. Cases are used to illustrate topical issues.

### **Class aims**

The aim of the course is to introduce statistical modelling to support business and management decisions.

### **Learning outcomes**

#### 1. subject specific knowledge and skills

- To display and interpret data using appropriate visual displays.
- Select, construct and interpret summary statistics.
- Understand probabilistic reasoning and compute probabilities for simple problems.
- Use graphical methods to identify appropriate models and estimate parameters.
- Apply and interpret formal statistical estimation procedures and goodness-of-fit tests.
- To develop and validate appropriate simple and multiple linear regression models
- Understand the basic principles of classification methods
- Understand the basic principles of ANalysis Of VAriance (ANOVA).

#### 2. cognitive abilities and non-subject specific skills

- Develop students ability to construct numerical argument
- Critical thinking with respect to quantitative analysis
- An ability to express problems in forms conducive for the software support available

## **(3) Managing Business Operations**

### **Rationale**

Knowledge and practical understanding of the principles, tools and techniques required for the effective management of business operations is indispensable for Operational Research practitioners and business consultants.

## **Class description/introduction**

This class teaches essential principles, tools and techniques of Operations Management – both in general and as applied to specific manufacturing or service businesses. A section of the class focuses on service operations, where specific subjects and operational issues surrounding services will be discussed. This class is a core class for both the MSc in Operational Research and the MSc in Business Analysis & Consulting.

## **Class aims**

- Students should understand the principles of Operations Management as a management function and as a set of management decisions concerning the design, planning and control, and improvement of operating systems in both manufacturing and service organisations.
- Students should understand the key concepts of Operations Management and be able to apply relevant analytical tools, models and quantitative methods.
- Students should understand the differences between manufacturing and service operations, and also specific managerial challenges and decisions related to the former and the latter.

## **Learning outcomes**

### **1. Subject specific knowledge and skills**

- Describe the design, planning and control, and improvement decisions to be taken in the Operations Management function, and explain the link between operations strategy and business strategy.
- Analyse and explain the interrelationships between the performance objectives in Operations Management and the design of an operating system, for any given manufacturing or service organisation.
- Identify the main aspects of process and layout design, and evaluate the trade-offs between these aspects, and use relevant quantitative methods in support of layout design.
- Explain key concepts in supply chain planning and control, and evaluate the trade-offs between performance objectives in this area, and apply independent-demand inventory control systems to minimise inventory
- Explain key concepts in Enterprise Resource Planning.
- Use appropriate network planning methods for effective project planning and control.
- Explain key concepts in quality planning and control, and statistical process control and acceptance sampling to effectively manage quality costs.
- Understand specific characteristics of a typical service operation and the use of service classification models.
- Appreciate the concept of service package and its relationship with service encounter.

- Identify the most suitable approach to design in different service operations.
- Understand the concept of Yield Management in services.
- Appreciate the challenges surrounding the traditional concept of 'productivity' in services and its relationship with quality.
- Understand the links between employee, customer and profit in services.
- Explain potential effects of organisational culture on service employees and service consumers.
- Be aware of some of the new developments in services (such as Service Science ).

## 2. Cognitive abilities and non-subject specific skills

- Present a reasoned argument in writing based on a thorough knowledge and understanding of the relevant academic literature and supported, where required, by analytical discussion and/or appropriate quantitative analysis.
- Being able to use conceptual modelling techniques to study and analyse factors affecting business operations.

## **(4) Spreadsheet Modelling & Demand Forecasting**

### **Rationale**

Spreadsheets provide an easily accessible tool to support business modelling and analysis. Spreadsheets are a popular modelling support tool because they facilitate easy manipulation of data and thus greatly reduce the time necessary to set-up and modify models. Analysis carried out in a spreadsheet is easily transferred into other software packages or presented visually, so that it provides a good platform for report writing.

### **Class description/introduction**

This module will demonstrate how spreadsheets can be used to support the analytical techniques whose theory is taught on other modules, for example, forecasting, simulation, optimisation, data analysis, as well as being used to support technical report writing. Most prominence is given to demand forecasting and students will be introduced to different types of forecasting technique for short term smoothing through to decompositional analysis. These methods will be implemented using spreadsheet models. This module also extends the basics of using a spreadsheet to explore the principles of effective computer programming through the development of macros to automate the functionality available within spreadsheets.

### **Class aims**

The aim of this module is to develop an understanding of how spreadsheets can be used to effectively support business modelling, particularly in relation to the development of demand forecasting systems for which students will be introduced to the toolbox of commonly used techniques.

### **Learning outcomes**

#### 1. subject specific knowledge and skills:

- Create simple but appropriately organised spreadsheet models for complex problems;
- Use the spreadsheet to support traditional operational research techniques such as forecasting, optimisation and simulation;
- Describe the main categories of forecasting technique, their data requirements and applicability to different operational situations;
- Construct and interpret forecasts using smoothing methods and decompositional analysis;
- Compute forecast errors to track accuracy of forecasts;
- Understand the nature of effective forecasting systems;
- Understand basic principles of computer programming;
- Understand the basic elements of VBA for developing macros within Excel.

#### 2. cognitive abilities and non-subject specific skills:

- Further develop ability to see patterns in numerical data;
- Develop students ability to express modelling process algorithmically;
- Develop student's ability to express problems in forms conducive for the software support available.

## **(5) Strategy Modelling & Management**

### **Rationale**

It is highly likely that students completing a Business Analysis and Consulting degree once in organizations will be exposed to strategic problems and be expected to be able to work competently with such problems. As such this class provides a range of modelling techniques and tools for strategic management – in many cases building on skills learnt in other classes. These techniques and tools will enable graduates to be able to undertake an external examination of the environment and appreciate market forces along with being competent to investigate the internal resources and competences along with recognising that organizations are socially construed.

## **Class description/introduction**

As noted above, this class builds on a number of earlier taught skills, in particular the problem structuring element covered in Foundations of Operational Research and Business Analysis as this provides a basis to qualitative modelling for managing uncertainty and multiple perspectives.

The class aims to provide a broad coverage of strategy modelling ranging from theories and techniques underpinning the rational/analytical school to those espoused by the emergent and 'processual' schools. The class therefore concentrates on covering two main thrusts of strategy making – undertaking analysis and negotiating direction. The class will also set the scene for the Performance Measurement and Management class as this will look at means for monitoring and measuring strategic progress.

The 'rational analysis' thrust of the class will include coverage of tools and techniques developed to help in examining the environment (including considering market forces, competitors, and product mixes etc), appreciation of the theories underpinning tools for assessing internal strengths and determining resources (tapping into both SWOT and the Resource Based View) and monitoring threats and opportunities through forecasting and scenario modelling. Through understanding these analysis students should be able to produce a strategy model that is robust and coherent. The 'negotiating direction' element of the class will introduce concepts of procedural rationality and procedural justice, and will touch on political feasibility. It will also pay attention to stakeholder identification and management both within the strategy making group and those affected by the resultant strategy. This second part of the class will mesh closely with the facilitation skills taught in 'Becoming an effective business analyst'.

## **Class aims**

- To provide students with an appreciation of a number of analytical tools (as noted above)
- To enable students to select appropriate tools depending on context, client, and resources
- To give them skills to manage the processual elements of strategy making and increase the likelihood of successful implementation

## **Learning outcomes**

1. subject specific knowledge and skills
  - The ability to conduct a range of business/organisational analyses
  - The ability to identify and utilise alternative frameworks to categorise the position of organisation's and their products / services in their appropriate market and competitive space

- The ability to analyse an organisation's resource base to reveal competencies within existing organisational routines and activities that provide competitive advantage
- The ability to determine who are the organization's stakeholders and which ones matter
- The ability to recognise the political and social considerations necessary when making strategy
- The ability to understand the language of strategy and strategic management that is rooted in economic theory;

## 2. cognitive abilities and non-subject specific skills

- The ability to understand the processes that influence the way in which individuals and groups approach strategic problem identification and decision making in ambiguous and complex environments; and
- The ability to present and communicate strategy to varying audiences

## (6) Becoming an effective Business Analyst

The other taught modules on the programme introduce a variety of techniques, methods, models and approaches to the student. However, the practical reality of applying analytical methods in business is often far removed from the classroom. Working with decision-makers on real issues presents a variety of challenges. For example, data may well be ambiguous and hard to come by, it may be far from obvious which business analysis methods can be applied and managers will need to be convinced of the business merits of any suggested solutions. While traditional teaching can alert students to such issues, understanding needs to be reinforced by experience.

Becoming an effective Business Analyst runs through both semesters of the degree, in parallel with the other classes. It introduces students, mostly through **experiential learning**, to as much as possible of the practical reality of becoming an effective business analyst and the key skills required to function as an effective consultant in this area.

The class will consist of:

- A series of semi- or unstructured business problems, typically introduced by a manager from an outside organisation. The business problems will typically relate to a topic/technique recently covered in one of the other modules. Students spend time tackling unstructured problems, usually in groups, and present and compare their findings. These sessions include "workshops" in which students analyse real problems presented by managers as guests of the Department (in addition, practitioners give more general talks to the class on business analysis/consulting within their own organisations). Following these case studies reflective sessions will be held which focuses on the development of reflective practitioner skills
- Experience is augmented, and integrated with, the rest of the course by a series of workshops on directly related topics that will provide guidance on key skills development.

## **Class Descriptions - Elective Classes**

**Students choose three of the four electives.**

### **(1) Business Simulation Methods**

#### **Rationale**

This class will form part of the MSc in Operational Research and MSc in Business Analysis and Consulting. Both of these courses are focussed on introducing students to modelling techniques that can be used to help support decision-makers. Business simulations are one such important modelling technique. This class focuses on two specific business simulation techniques; discrete-event simulation and system dynamics.

The Operational Research technique of discrete-event simulation provides a decision maker/client with the equivalent of a flight simulator of their factory or service operation. This is done by modelling every significant resource and event in the operation and displaying them on a computer screen as icons which move/work with simulated time. This enables the decision maker/client to try out different ways of operating the system without experimenting with the real system.

System dynamics has been around for over 50 years. It was originally created to help decision-makers to design improved management policies and organizational structures. System dynamics is increasingly used in organizations all around the world and has been applied to a wide variety of issues including organizational change, climate change, healthcare and project management.

#### **Class description/introduction**

The course will begin by introducing students to business simulations in general. It will then focus on the main two forms of business simulation; discrete-event simulation and system dynamics (a continuous simulation technique). For discrete event simulation (DES) the class will start with an introduction to DES aiming to familiarise students with the concept and its use as well as specific features of a typical DES tool. The class continues with discussing a rational approach to simulation using a number of examples from manufacturing and service operations. The link between simulation and performance measurement is discussed at this part. This is followed by a detailed discussion on the use of probabilistic distributions in simulation where the emphasis is on 'relevance for use' rather than the underlined statistical theories and techniques. The issues of certainty of output and validation of the model are discussed in the next stage where students understand the importance of trials in simulation. While the main emphasis is on DES in general, a number of basic and advanced techniques of Simul8 (a popular DES software) are explained and demonstrated for students. The discussion on DES concludes with addressing some practical issues with regard to doing a DES project for a business client.

For system dynamics the class will provide a background to system dynamics including its links to other modelling techniques being taught on the course. In particular, its links to problem structuring methods. A complete approach to system dynamics modelling is then covered in detail. The behaviour of various systems, in particular complex business problems, are examined through the construction of causal loop diagrams. The class then goes on to introduce computer software used specifically for system dynamics modelling. After familiarisation with the package, students will be expected to use it to model and investigate a variety of systems. In particular, the class will explore how such models can be used to investigate complex business problems and how they can be used to decide upon managerial actions that should be taken to help alleviate the problems.

The class will end by getting students to reflect on the two forms of business simulation and how they differ from one another. In addition, the class will explore the types of business problems for which these techniques are appropriate, so that a student is aware when these techniques should be chosen out of the toolbox of kits being taught on the course.

### **Class aims**

To introduce students to two simulation methods widely used in business. The first, discrete-event simulation, is a visual interactive tool that facilitates decision making in an operating system. The objective is to make students competent in applying DES in any operation system and specifically to enable them to use a popular DES software (Simu8) for this purpose. The second, a form of continuous simulation, is system dynamics. This technique is used to help provide understanding about complex systems through the construction of qualitative diagrams and quantitative simulation models.

### **Learning outcomes**

#### 1. subject specific knowledge and skills

- To understand the main uses of business simulations and when to use the two different types; discrete event simulation and system dynamics
- To understand specific features of discrete event simulation
- To be able to approach a DES project in a rational way, using performance measures
- To be able to investigate certainty of output and validation of a DES model
- To understand how to use features like trials and warm up period to make the model and its outcome more reliable
- To be able to work with Simul8 software and some of its advanced tools
- To understand and appreciate practical issues involved with a typical DES project
- To be able to determine the type of systems whose behaviour can be investigated using system dynamics
- To develop an understanding of the elements involved in the basic construction of a causal loop diagram;

- To appreciate how a verbal description of a system can be translated into a causal loop diagram and used to examine the system's behaviour;
- To appreciate how a causal loop diagram, representing a given system, can be translated into a quantitative system dynamics model;
- To develop an understanding of the procedures used to validate a system dynamics model;
- To appreciate the process by which system dynamics models can be used to investigate systems behaviours so that practical recommendations can be made to help improve the system;

## 2. cognitive abilities and non-subject specific skills

The learning activities are designed within the class to develop the students within the following areas:

- Problem structuring skills
- Written Communication skills
- Presenting and reporting skills
- Express problems in forms conducive for the software support available

## (2) Business Information Systems

### **Rationale**

Business information systems (BIS) are used to support all aspects of the knowledge workers; therefore all changes in organisational processes also mean changes in the BIS. As most of the work of business analysts result in changes in the organisational processes, business analysts should be familiar with BIS at least on conceptual level. Furthermore, many consulting projects are explicitly aimed at the BIS which requires understanding of the basic types of information systems (IS), what they are appropriate for, what we cannot expect from them, how to use them together. Specifically Enterprise Resource Planning (ERP) systems are today part of the everyday life of most knowledge workers and thus a business analyst needs a thorough understanding of them.

### **Class description/introduction (including cohesion with rest of course)**

The class adopts a process-based approach; i.e. all discussion follows the logic of the business processes. After having the business and IS context of the knowledge work introduced, the various types of IS, namely the databases, ERP systems, knowledge-based systems, corporate portals, collaboration support systems. The course will provide the students with conceptual knowledge introduced in the lectures, as well as hands-on experience gained in tutorials using appropriate packages of the various IS categories.

**Class aims**

The aim of the class is to provide students with understanding of the business and IS context of BIS as well as with understanding of the different types of IS in sufficient depth to recognise what type of IS fits a particular problem/decision situation as well as to realistically see what can and what cannot be expected from a particular IS. Additionally, the students should get familiar with the language and approach of IS which will enable them to communicate with people making and using IS (especially ERP).

**Learning outcomes**

## 1. subject specific knowledge and skills

- Understanding the business and IS context of BIS.
- Conceptual knowledge of the introduced IS types.
- Ability to recognise what type of IS is needed for a particular problem/decision situation.
- Basic skills in mapping business processes.
- Some experience using various software packages; more substantial experience using ERP.

## 2. cognitive abilities and non-subject specific skills

- Looking at the big picture in order to see the whole entity rather than a part.
- Thinking in pictures rather than words.
- Team working and individual working skills.
- Data collection, processing and presenting skills.

**(3) Risk Analysis and Management****Rationale**

Risk analysis plays an important role in most business operations. This module is concerned with assessment and measurement of risk, and with the development of risk mitigation strategies that address stakeholder concerns.

**Class description/introduction**

Through this module we will explore the entire process of structuring a risk problem, modelling it, supporting and communicating recommendations, both theoretically and in practice. Risk management is linked with decision analysis in so far as we explore decision making under uncertainty and it has links with quantitative business

analysis as we explore the use of statistics in understanding risk. However, the topic has some unique attributes such as risk communication and the role that experts play in risk assessment.

### **Class aims**

The aim of this module is to develop an understanding of the fundamental techniques used with risk analysis and explore how these are used within practice.

### **Learning outcomes**

#### 1. subject specific knowledge and skills

- Understand theory that underpins standard approaches to elicitation of expert judgment
- Understand basic theory of fault and event tree modelling
- Understand the standard approaches to modelling dependency between random variables
- Develop the ability to assess the robustness of a risk model
- Understand the standard methods used in ALARP decision making
- Appreciate the consequences of choosing specific measures for risk
- Appreciate the implications of different communication strategies

#### 2. cognitive abilities and non-subject specific skills

- Develop students ability to construct rational arguments
- Critical thinking
- An ability to express problems in forms conducive for the software support available

## **(4) Performance Measurement and Management**

### **Rationale**

The class is devoted to the concepts and approaches to effective performance measurement and management at an organisational level. Performance Measurement and Management (PMM) is one of the key factors for survival and prosperity of business systems. Business analysts can typically expect to be involved in the design of PMM systems and in the evaluation of performance information. This module focuses on the different approaches to performance measurement and management commonly used across public and private sectors.

## **Class description/introduction**

The class focuses at the strategic, organisational level of PMM while providing the essential knowledge and skills at the technical level. The module starts with presenting the background to performance measurement to provide the students with an understanding of the roots of some of the common problems in measuring and managing performance in organisations. This will follow with discussing PMM from five different but highly inter-related perspectives, namely stakeholder, customer, comparative, operations and integrative perspectives. Students are encouraged to get more insight into the techniques and concepts by carrying out directed readings as well as completing a group and an individual assignment. The class will be concluded by discussing implementation and managerial issues in measuring business performance.

### **Class aims**

To provide an overall view of the role and the place of PMM in organisations

To give insights that can help in evaluating the degree of effectiveness of a performance measurement system/tool.

To look at PMM from different perspectives and to introduce the most commonly and effectively used tools in performance measurement.

To illustrate the importance of stakeholders in a PMM project.

To discuss the main challenges in managing and measuring business performance.

### **Learning outcomes**

#### 1. subject specific knowledge and skills

- To appreciate new challenges and conditions of the business world and their effect on PMM systems.
- To appreciate the importance of stakeholders and their influence on the success or failure of a PMM system.
- To know and to be able to apply a range of performance measurement systems/tools in a real situation.
- To understand the most recent challenges in the field of PMM
- To be able to critically investigate the PM activities in organisations

#### 2. cognitive abilities and non-subject specific skills

The learning activities are designed within the class to develop the students within the following areas:

- Adopting a critical view on managerial practices
- To discuss managerial challenges in organisations from a practical point of view
- Challenging presumptions in a business environment
- Team working skills
- Communication skills – written and verbal