



PGP 2015-2016

Term V (Slots IX and X)

Credit: 1 Unit

Managerial Applications of OR		
Area Elective P & QM	Faculty N Ravichandran and Sundaravalli	Sessions - 20

Background:

There are several challenges in using formal Operational Research (OR) tools and techniques in an organizational context (profit / not-for profit, NGOs). The lack of expertise in OR within the organization and / or inadequate exposure at the CXO level in the organization to appreciate the use, relevance and effectiveness of such tools / techniques / concepts are major contributing factors to the situation.

It is the firm belief of the course instructors that the PGP participants would immensely benefit from a course which shows by using documented evidence the relevance, applicability and effectiveness of Operational Research tools, techniques and concepts to resolve challenges in practice. This is the prime motivation to design this course.

Operational Research is usually taught in Business schools with a focus on tools and techniques. Standard textbooks are used, supported by a few cases. We have chosen a different view in the design of this course. The central focus of this course design is problem solving approach. The core to the discussion is problem context. Tools and techniques are secondary. Appropriate modelling is the name of the game. Implementation issues play a vital role in designing solution approaches.

Keeping these objectives in mind, we have assembled a set of well documented problem situations from practice oriented, academically rigorous publications. The criteria used in assembling the course material is (a) Contemporary nature, (b) Complex, but manageable situations, (c) Exposure to a range of modelling tools and (d) Impact of the solutions implemented.

A typical class would focus on problem / opportunity context, challenges in developing an approach to manage the situation, critical discussion on the choice of tools and techniques used in modelling, conversations on the reported conclusions with an emphasis on implementation.

We are aware that building a course on a set of academic and scientific journals may not provide an in-depth exposure to the tools and techniques. This is a conscious trade-off arising out of our emphasis on bias for action. The choice of material was influenced by the rigor, the content, which is appropriate to the MBA students.

We have listed a set of classic textbooks which are to be used as supplementary reading. There may be a need to reprioritize the course material based on the first offering.

Prerequisite:

There is no specific prerequisite to this course. However, an inclination and interest to quantitative modeling would be an advantage. Those who aspire for a consulting career with a scientific basis would greatly benefit from this course.

Class Size:

To ensure effectiveness in the class and maximise learning objectives, we would like to restrict the class size to 30. The course is meant only for PGP.

Learning Objectives:

1. To provide an opportunity to the participants to experience the joy of solving real-life, complex, meaningful administrative situations.
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2. To demonstrate the power of modelling in responding to the challenges in a given context.
3. To illustrate the use and applicability of formal, operational research methods in resolving real-life situations.
4. To appreciate the trade-off required in balancing an optimal vs. appropriate solutions.
5. To sensitise the participants to the implementation challenges of a solution recommended by a formal procedure in a real-life context.

Evaluation:

Group Assignments (2 @ 20% each))	– 40%
Class participation	– 20%
Midterm	– 40%

Detailed Sessions Plan

Module I: Introduction to OR Modeling

Session 1:

Ashish Goel et. al., “The Who-To Follow System at Twitter: Strategy, Algorithms and Revenue Impact”, Interfaces 45(1) pp 98-107

Session 2:

T C Bachman et. al., “PNG: Effective Inventory Control for Items with Highly Variable Demand”, Interfaces 46(1) pp 18-32

Sessions 3 and 4:

S L Ahite, M K Malhotra and John Jensen, “Carton-Mix Optimization for Walmart.com Distribution Centers”, Interfaces 45(4) pp 341-357

Session 6:

Tirumala Tirupati: Wait A Moment (UV6959)

Session 8:

Case: Harvest: Organic Waste Recycling with Energy Recovery (A) – HBS 9611033

Case: Harvest: Organic Waste Recycling with Energy Recovery (B) – HBS
9611034

Module II: Risk Management Models

Session 5:

Case: Tastee Snax Cookie Company A (UV5918)

Case: Tastee Snax Cookie Company B (UV3528)

Session 7:

K Hasse, “Improving Pilgrim Safety During the Hajj: An Analytical and Operational Research Approach”, Interfaces 46(1), (2016), pp 74-90

Session 10 and 11:

David Simchi-Levi et. al., “Identifying Risks and Mitigating Disruptions in the Automotive Supply Chain”, Interfaces 45(4) (2015), pp 375-390

Module III: Optimization Models

Session 9:

KL Maass et. al., “Maximising Diversity in the Engineering Global Leadership Cultural Families”, Interfaces 45(4), (2016) pp 293-304

Session 12 and 13:

S Sampath et. al., “A Decision- Making framework for Project Portfolio Planning at Intel Corporation”, Interfaces 45(5), pp 391-408

Session 14:

Case: Central Parking Services Limited (IMB 451)

Module IV: Comprehensive Models

Session 15:

Z C Taskin et. al., “Mathematical programming-based Sales and Operations Planning at Vestel Electronics”, Interfaces 45(4) (2015), pp 325-340

Sessions 16 and 17:

M Plaza, “Balancing the costs of human resources on an ERP project”, Omega 59 (2016) pp 171-18

Module V: Heuristic based Optimization

Sessions 18 and 19:

R A Valdes et.al., “Optimizing the level of Service Quality of a Bike Sharing System”, Omega (2016) pp 163-175

Session 20:

S Beheshtifar and A Alimohammadi, “A Multiobjetcive Optimization Approach for Location-Allocation of Clinics”, International Transactions in Operational Research (2015) Vol. 22, pp 313-328

References:

1. V L Mote and T Madhavan, “Operations Research” (2016) John Wiley.
 2. Harvey M Wagner, “Principles of Operations Research: With Applications to Managerial Decisions”, 2nd Edition, (1975) Prentice Hall.
 3. Tom Magnanti, S. Bradley and A. Hax , “Applied Mathematical Programming”, (1977) Addison-Wesley.
 4. Hamdy A Taha, “Operations Research: An Introduction”, 10th Edition, (2016) Pearson.
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Table: Course Material Summary

Sessions No.	Problem Context	Challenges	Tools and Techniques	Learning Opportunities
Module I: Introduction to OR Modeling				
1.	Impact of a Social Media product	Qualitative aspects related to impact assessment and revenue model of Twitter as a Social Media product	Customized algorithms	Modeling a phenomena and its impact by a combination of analytics and OR tools
2.	Inventory management	Management of Inventory items with high demand variability	Inventory control models	Problem formulation, creative approaches to problem situations, collaborative efforts between OR practitioners and management
3 & 4.	Packaging material optimization	Multiple distribution centers, opportunity to reduce shipping, material and labor cost without compromising customer service	Heuristics	Problem conceptualization, challenges in data collection, development of heuristics, implementation and impact assessment
5.	Managing waiting time	Limited server capacity, large volume, variable demand	Little's law, queuing models	Queuing model approach to manage a facility to enhance customer experience

Table: Course Material Summary

6.	Plant location	Sourcing choices	Generation of alternatives and their evaluations	Factors that influence facility location decisions
Module II: Risk Management Models				
7.	New product launch	Reduction in product launch time	Project management	Managing launching of new products
8.	Managing crowd related disasters in Hajj season	Large visitors, limited infrastructure capacity, poor tracking systems, congested traffic	Mixed Integer program	Develop systems to prevent casualties arising out a disaster
9. & 10.	Disruptions in supply chains	Manage and respond to disruptions (low probability / high impact) to supply chain	Development of risk exposure index	Develop a new approach to manage risks in supply chains
Module III: Optimization Models				
11.	Group formulation	To ensure maximum diversity in groups	Maximally diverse grouping problems (MDGP)	Understanding the processes related to forming groups to maximize desired objectives

Table: Course Material Summary

12. & 13.	Project portfolio	Complex interactions between projects and products, funding constraints, head count constraints	Development of a planning framework with an emphasis on mapping the resources and product portfolio, optimization and their decisions	Optimizing product portfolio decisions
14.	Capacity Creation	Managing high growth in demand, responding to client (institutional) expectations, pricing and manpower decisions	Investment analysis	Capacity planning
Module IV: Comprehensive Models				
15.	Sales and operations planning	Large portfolio of products, volatile demand, long procurement lead times	Mathematical programming formulation, decision support systems	Standard operating procedures, DSS based sales and operations planning

Table: Course Material Summary

16. & 17.	Manpower planning in an ERP project	Reduced duration of ERP project, limited internal resources, need to contract consulting firms	Decision Support Systems	Staffing of ERP project implementation
Module V: Heuristic based Optimization				
18. & 19.	Public bike sharing system	Quality of service, imbalanced availability of bikes in various stations	Interactive heuristics, routing algorithms, forecasting	Allocation of resources to service stations to improve overall system performance.
20.	Location of health care clinics	Travel cost, equity in access to clinics, land usage, cost of land acquisition and facility establishment	Geographical information systems, multi-objective Genetic algorithms	Facility location to satisfy multiple objectives