Book Selection

Edited by JM Wilson

Group Model Building: Facilitating Team Learning Using System Dynamics

JAM Vannix

John Wiley and Sons, Chichester, 1996. xiii + 297 pp. £24.95. ISBN 0 471 95355 5

This text is a useful addition to any collection of books on systems approaches, and will particularly appeal to those who favour a multidisciplinary approach to systems. Taking the view of systems dynamics as but one approach within the broader area of systems and soft OR, the text is refreshing compared to the efforts of others who try to argue for systems dynamics as a distinct discipline in its own right. This realistic placing of systems dynamics with a broader context is complemented by material giving practical advice on using systems dynamics and group decision and results in a credible and useful text.

The logical structure to the book makes for easy reading: preliminary sections introduce and discuss systems and systems dynamics; a middle section discusses the issues of group decision making; and the main body of the book brings the two together. A range of case studies is used throughout the text, with those based around the Dutch healthcare systems and the housing association particularly useful and interesting.

The material on systems is fairly standard and could, I felt, have gone into some areas in slightly more depth (for example in relation to the span and content of systems

where there is little mention of systemic metaphors). The author does, however, give generous and useful acknowledgement to a range of other systems approaches. The overview of Systems Dynamics which follows is extremely good given the limited space and the fact that this is not the main purpose of the text.

The chapters on group model building contain a lot of useful, if at times somewhat prosaic advice. Much of the discussion is independent of the use of systems dynamics; indeed my slight disappointment with the book was that the interplay between the two was not stronger. This said, a lot of the material would be useful for those wishing to make the transition from text book to practical OR.

The high points of the book are the chapters entitled 'Group model building in action', which are built around a pair of case studies. These make for extremely good reading, giving the sort of practical perspective which is so often lacking in more theoretical texts. Together the chapters illustrate the use of systems dynamics in a group environment from initial problem identification through to diagnosis and implementation. The case study of a housing association problem, is particularly good in its retention of detail which is so often omitted in sterile text book examples. I have only two slight criticisms: first, the author chooses to divide the discussion between qualitative and quantitative uses of systems dynamics which, perhaps, down plays the importance of using the two in concert. Second, the quantitative section puts a

little too much emphasis on prediction of values as opposed to understanding system behaviour.

In conclusion, this is a good book which I would recommend to two constituencies: those with catholic tastes who wish to include systems dynamics in their understanding of systems; and those who perhaps have a basic understanding of 'hard' systems dynamics who wish to see how this might fit into a softer overall approach.

NHS Executive, Leeds   S Peck

Managing Health Care under Resource Constraints: Proceedings of the 21st meeting of Operational Research Applied to Health

A Kastelein, J Vissers, GG van Merode and L Delesie (eds)
University of Eindhoven, The Netherlands, 1996. 276 pp. ISBN 90 386 0285 5

This book consists of papers from the 1995 meeting of 'the European Working Group on Operational Research Applied to Health Services (ORAHS)' which was held in the Netherlands. ORAHS was one of the first working groups on applications of OR established in 1975 by the association of European OR societies.

The book is split into four parts—reviews, methods, case studies and a discussion report.

The 'review' section includes four wide-ranging commentaries on developments in health care. I found the most concise and interesting was our own Dr Royston from the NHS Executive, identifying five key shifts in health services: when care is delivered; where it is delivered; how it is delivered; what is delivered and who is cared for. He then goes on to suggest how OR can assist with each of these shifts.

The 'methods' section includes nine examples of different techniques applied to particular problem areas. For example a dynamic model of waiting times for nursing home placements; a simulation of resourcing of renal services at national level and some useful ideas and pitfalls in priority setting in health care.

The 'case study' section provides seven useful experiences, including two from the UK. These cover modelling the staff/cost effects of changes to maternity services in Scotland and capacity planning for intensive care units.

The 'discussion' section summarises the conference and lays out a few themes for the future. I particularly liked the explanation of OR's increased use of 'soft' approaches: 'one could explain the tendency towards soft OR by establishing that people probably get softer as they get older, and that OR will get softer as it develops as a science'.

Overall I found this book helpful and thought provoking. The style and presentation is a little dull at times, and it would have been easier to see how the various papers could be applied (or not) in the UK had the editors included a brief description of the originating country's healthcare system (for example funding arrangements, range of coverage, alternative medical systems). However, it is a good read and nice to dip into when you are looking into particular healthcare areas.

J Lowther

Modelling for Management: Simulation in Support of Systems Thinking (Vols 1 and 2)

GP Richardson (ed)
Ashgate Publishing, Aldershot, 1996. xxiv + 940 pp. £55.00. ISBN 1 85521 888 7

This two volume collection reproduces previously published articles from the field of system dynamics. Although there are some theoretical pieces, the emphasis is on applications and a diverse range is featured. There are numerous figures and a name index.

After an Introduction by the editor, this collection is divided into five parts. The first, 'Modelling Perspectives', offers six papers—all excellent—which describe the fundamental ideas of the system dynamics approach. After his scene setting, the remainder of the book treats more practical usages. Part II, 'Systems Thinking and Decision Making' has a wide focus but generally the six papers treat the contribution that modelling based on feedback thinking can make to understanding and improving organisational decision making. In Part III, 'Corporate Policy and Management', 12 papers demonstrate the ability of system dynamics to illuminate a wide variety of business policy issues, whilst the second volume opens with 'Public Policy and Management', whose 13 papers do the same for problems in the public domain. 'Methods of Modeling with Management' has nine pieces which show how one goes about building and understanding such models and how the insights gained from them can be conveyed to a broad audience. A Name Index closes the collection.

George Richardson is to be commended for the quality of his editorial choices. The papers in this handy collection may all have appeared previously but its value is that it ranges across various journals and books and picks out the cherries from the field of system dynamics. This is a very useful job to have had done. I know that many still find the field somewhat closed and insular and the lack of recent, high quality books (with some exceptions[1]) makes it hard to judge, let alone join, the activities

of this strange cabal. The re-publication of the core texts of the field, reviewed previously in JORS,[2–4] has assisted matters but those wanting to get a sense of what system dynamics has done and can do would be well advised to put this collection high on their reading list. However, there are some minor criticisms. The pieces collected here show little connection to the world of operational research or to system science. This is less a comment on the editor than it is a reflection of the thinking of most system dynamicists; that field has only recently been connecting with other systems techniques[5,6] and problem structuring methods[7] or with group decision support theory and approaches.[1,8] The appearance of this collection cannot but assist the further exploration of such cross-disciplinary issues. The collection also seems a little expensive. Indeed, there is a hardback (ISBN 1-85521-697-3), the one to order for the library, which heaves into view at a majesterial £195. The release of the paperback was—I know—a particular wish of the editor in order to increase availability. We must hope that strong sales encourage Dartmouth to reduce the price of both versions for subsequent editions. Finally, the papers presented here have simply been photographically reproduced from paper originals. This means that they are in a variety of fonts and margin spacings. This is merely a quibble but there are one or two papers that have reproduced rather badly and are a little irksome to read. I can imagine this seeming less than adequate if one has shelled out for the £195 version.

To conclude, this is a useful collection in that it brings together a careful selection of high quality pieces into a form which makes those pieces accessible to a wider readership.

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Multivariate Statistical Analysis: In Honor of Professor Minoru Siotani on his 70th Birthday, Vol. III

T Hayakawa, M Aoshima and K Shimuzu (eds)
American Sciences Press, Syracuse, New York, 1997. 200 pp. $135.00. ISBN 0 935950 40 0

This is the third volume provided by the American Journal of Mathematical and Management Sciences in honour of Professor Minoru Siotani. It is a fitting tribute to one who has spent his lifetime contributing to our understanding of statistics and its many applications to our real problems. The volume consists of ten papers by prominent researchers in the area of statistical applications related to problems which occur in technology.

Of the ten papers, I had two favourites: Analysis of Means Type Tests for Variances Using Subsampling and Jacknifing by Wludyka and Nelson; and Bayesian Inference in the Multivariate Mixed Model MANOVA by Jelenkowska and S. James Press. The former reads like a tutorial and contains more information than the title might indicate. The latter is also of much recent interest to me as I have been using Bayesian statistics in conjunction with neural networks. However, do not let my preferences influence your decisions on the work. The book covers a wide range of very useful topics such as correlation, use of chi-square for large samples, sensitivity analysis, Hotelling's T squared, outliers, Langevin populations, heteroscedastic normal populations and nonparametric tests with missing observations. Surely there is something in this menu for all.

I recommend the book for all who are interested in using some of the newer and advanced statistical methods in management science. I enjoyed reading the book, and am a bit sad to know that this is the final volume in honour of Professor Minoru Siotani. I was hoping for more.

University of Maryland
C Leake

Optimization and Computational Logic

K McAloon and C Tretkoff
John Wiley and Sons, Chichester, 1996. xi + 536 pp. £50.00. ISBN 0 471 11433 9

This is a very interesting book deserving of close attention. The authors have taken the ideas of linear programming and integer programming and combined them with ideas from mathematical logic to provide a comprehensive intelligent decision support capability. An extensive problem class is capable of solution to optimality using

the techniques described in the book and via software enclosed on diskette.

The authors have researched extensively in mathematical log and its periphery and so are well-qualified to write such a text. To quote from the cover of the book: 'Featuring a crystal-clear presentation and superior organisation, this book fills a growing need for course materials on logic and optimisation. It serves graduate and undergraduate students in artificial intelligence, operations research, mathematics, management science and computer science'. These lofty claims are more or less justified.

The book is organised as a teaching and do-it-yourself book. In Chapter 1 LP is introduced and formulation using the authors' 2LP system is described. Loops (sigma notation) and the introduction of iteration form Chapter 2 and writing models in structured form takes the reader through Chapter 3. Each chapter relies on the use of software and there are many novel examples and exercises e.g. currency dealing. Chapters 4–6 bring in ideas from logic—conjunction and implication, disjunction and negation—but the route also passes through goal programming, local search (including genetic algorithms) and TSP. Sensitivity analysis is developed in Chapter 7, which takes the reader to approximately half-way through the book.

The second half of the book starts to introduce ideas of the ordering and control of the solution process. Chapter 8 looks at backtracking and Chapter 9 introduces the reader to concepts of problem hardness. Chapter 10 is fifty pages of hard-going material on soundness and completeness. Then it is into branch and bound in Chapter 11. Variations on branching form the subject of Chapters 12 and 13, with valid cuts and branch-and-cut being developed. By the time the reader has reached these later chapters sophisticated models are being built in a style not dissimilar to the modelling systems of standard LP/IP software. Chapter 14 effectively rounds off the book with further search methods, as the final chapter, Chapter 15, is essentially an appendix of mathematical ideas such as duality and other LP basics.

I particularly enjoyed the examples in this book. Puzzles such as 'Who has the zebra?', 'Salt or mustard', 'Mathematicians and physicists' and even an example with WWII origins are both jolly and instructive. (I also enjoyed the remark 'all's fair in love and modeling'.) throughout the presentation is both elegant and accurate but still makes large demands on the reader's concentration. The software is well organised and robust and fun to use. The format and tool bar are in line with many standard PC products. Error reporting is clear with a useful facility to click on to the error line, if like me you tend to make silly errors. The software allows you to develop certain models easily that would be more tortuous to handle in standard IP.

This book may not get the take-up it deserves in UK universities, where its approach could enthuse students, and it may remain confined to a specialist audience. It is one to recommend.

Loughborough University   JM Wilson

Project Risk Management: Processes, Techniques and Insights

C Chapman and S Ward
John Wiley and Sons, Chichester, 1997. xxii + 322 pp. £24.95. ISBN 0 471 95804 2

Risk, inherent in all projects, is especially prevalent in high tech fields such as IT where project managers are often working at the limit of what is possible. How often do we hear of projects coming in late, over budget, or of being abandoned altogether? This problem is likely to get worse as projects become ever more ambitious. How can we deal with project risk in a rational manner? Chapman and Ward, who have been wrestling with this problem for many years, have now offered us the fruit of their experience in this book. They do not offer any magic bullets, but do put forward a consistent framework within which risk management activities can be planned and carried out. This should lead to a more orderly and auditable process, even if it does not necessarily solve the Project Manager's immediate problems. The approach is illustrated with lots of examples from Chapman's own experience in the offshore industry.

Probabilistic aspects are fully covered and one special technique is discussed—the CIM (Controlled Interval and Memory) technique. This is a method of combining probability distributions using a numerical approach rather than a Monte Carlo sampling approach. It is claimed to be a thousand times faster for a given accuracy and to yield greater understanding. This part of the book could be of technical interest to professional risk analysts and perhaps more generally to statisticians and operational research analysts. Of course probabilities are difficult to explain to Project Managers, and although the authors do discuss how to collect subjective estimates they give little guidance on how to explain the significance of probabilistic results to end users. This is one of the practical problems with the approach advocated, and may indeed explain why formal risk management is not more used in practice.

The authors make the point that the formal approach is only justified on projects of a certain size. Managers of smaller projects therefore need not read this book. However I would certainly recommend the book to anyone responsible for planning or running a large and complex project. They may not wish to adopt the full methodology but they would benefit from seeing the range of techniques available. The style is a little cumbersome at times, which makes for a rather heavy read, but there is a

very complete bibliography and a good index. I found only two typographical errors.

JUM Smith

Advances in Sensitivity Analysis and Parametric Programming

T Gal and HJ Greenberg (eds)

Kluwer Academic Press, London, 1997. xxiii + 574 pp. £115.75. ISBN 0 7923 9917 X

I came to this book having enjoyed a series of articles by one of the editors, Greenberg, on how to analyse the results of linear programmes.[1,2] These articles gave a good tutorial guide to the subject. This book looks at related topics, but at a much higher level and gives a more intense treatment.

The book comprises of fifteen chapters, each of about 40 pages, on a particular aspect of sensitivity analysis and parametric programming. The book starts off with a short historical sketch by Gal, though he seems to get his history mixed up by citing two papers in the *Journal of the* **Operations** *Research Society* and getting the date of one of them wrong. The strange start to the volume continues with a chapter by Müller–Merbach on a systems perspective where LP post-optimal analysis gets linked with databases and entity sets. The chapter is interesting, but somewhat misplaced at the start of the volume. Chapter Three, by Greenberg, is more what the reader expects—a long treatise on basic principles of LP sensitivity. There is a lot of interesting material here, but it is quite hard going for the reader. The themes of this chapter are extended by Gal in chapter four on degeneracy graphs. This shows what we can do with post-optimal analysis in LP when solutions are degenerate. Chapter Five by Wendell completes a set of three on LP with a look at simultaneous changes in coefficients using the tolerance approach.

In Chapter Six, Berkelaar, Roos and Terlaky shift the emphasis to interior point aspects and look at LP and QP sensitivity when bases are absent. Chapter Seven, by Thompson, is a very lucid treatment of sensitivity in network models. Transportation, location and TSP models are considered here and relevant aspects of sensitivity and parametrics are developed. Networks are also considered in Chapter Eight by Gautier, Granot and Granot, who focus on pre-optimal aspects of sensitivity analysis prior to solving problems. This is an area the authors have researched and they bring together a set of useful material.

I looked forward to the chapter on integer and mixed-integer programming sensitivity, by Blair. As might be expected, however, it is quite short and demonstrates that sensitivity analysis is limited in IP. However, an interest-ing review of the topic is presented, emphasising his work with Jeroslow. New developments by Blair are also included. Chapter Ten is the first of a trio on more generalised programming models. Drud and Lasdon consider non linear models, Dauer and Lin consider multicriteria and goal programming models and Vladi-mirou and Zenios consider stochastic models. These three chapters are written by acknowledged experts in their fields and provide much specialist information.

In Chapter Thirteen Caron, Boneh and Boneh look at redundancy and new ways to detect it in models via simulation. Variations on 'hit-and-run' methods, 'stand-and-hit', are introduced and the whole area is very carefully described. Then in the next chapter, Chinneck moves into the area of feasibility and viability and develops out from the work of co-editor Greenberg to look at ways of detecting subsets of constraints where infeasibility will lie in MPs. Two systems, PERUSE and ANALYZE, are available for this task, the second of which receives an extensive, but deserved, puff on the back cover of the book. The book concludes with a chapter on fuzzy MP by Zimmerman.

I have deliberately listed the names of the authors of each chapter to show that the editors have sought out the best people to present each set of material. Each chapter is self-contained with references at the end, so the changes in font and style seem less tedious. There is a vast quantity of useful material available here for the interested reader, who may wish to model, research or implement code. My main gripe is the lack of practical computational results in the chapters. Many of the chapters could have been enhanced by the inclusion of details of runs of problems to show where the ideas are helpful, what they provide for us and at what computational cost, for example removing redundant constraints. Putting that niggle to one side, I can strongly recommend the volume to all who have an interest in the subject.

Loughborough University   JM Wilson

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Parallel Computing in Optimization

A Migdalas, PM Pardalos and S Storoy (eds):

Kluwer Academic Publishers, 1997. xix + 585 pp. £159.00. ISBN 0 7923 4583 5

One of the problems facing optimization is the enormous computational resource required to solve many of the

important and practical problems which arise in industry and commerce. The recent impressive improvements in computing technology have helped enormously and the optimization community has been well positioned to exploit the dramatic increase in memory and in MIPS. However, as technology improves so does the demand for better quality solutions to ever more complex problems. Algorithms are refined and developed; new techniques emerge and limited computing resource continues to be a constraint. Parallelism has been seen as a possible solution and many researchers have attempted to parallelise their approaches.

Parallel computing tends to be associated in most people's minds with large and enormously expensive super-computers. But this is not the whole story; parallel techniques can be used on networks of smaller computers. The work can be distributed between various processors and considerable speed-up can be achieved. Although the term 'parallel computing' usually assumes the processors are contained in a single box, many of the algorithms can be used where the processors are on a local area network. Any commercial OR department will have such a network of PCs and perhaps they should contemplate using this computational power as a single resource for large tasks, perhaps overnight and at weekends. More fortunate OR departments may have access to more pukka parallel machines and may already be aware of their enormous potential.

The book starts with some general introductory material describing models for parallelism, types of parallel algorithm, complexity issues and practical parallel machines. It is the parallel algorithms relating specifically to optimisation which interested me the most. Applications of parallelism to sparse linear systems, for network problems, branch-and-bound, modern heuristic search, cost approximation algorithms, projected dynamical systems and large-scale stochastic programming are all included. Somewhat out of context is the final chapter on logarithmic barrier function methods for neural network training.

Perhaps because each chapter is written by different authors, the editors have not really managed to impose a consistent style. There is even a complete change in font size for one chapter and numbering conventions for equations differ widely. Each chapter has its own list of references but too often the chapter is more a report of the author's own work and experience than a considered survey of the field. Most of the authors write well and the material is quite simple to follow. There is an index to the whole book which is helpful although often rather bizarre. For example Projected dynamical system, Projected Dynamical System, and Projected Dynamical Systems are all distinct entries and even stranger refer the reader to different pages!

I find it difficult to determine the market to which this book is addressed. It is specialist in nature and enormously expensive. One would thus expect a very advanced research book aimed at a few specialists in this field. However, this book is not that advanced. The material is often quite simple and there are even exercises at the ends of the chapters. One must assume that the publishers believe there is a student market for this book but the price will guarantee none of them ever buy it! It might find its way into the occasional library and some research groups might buy a shared copy. To see such a book heading for such oblivion seems a disappointment to me and a lost opportunity.

University of East Anglia   VJ Rayward-Smith

Planning Under Pressure: The Strategic Choice Approach (2nd edn)

J Friend and A Hickling
Butterworth-Heinemann, Oxford, 1997. xiv + 372 pp.
£16.99 ISBN 0 7506 2955X (pb)

The second edition of 'Planning under Pressure' appears ten years after the first.[1] Like the first edition, the book presents a detailed treatment of a particular approach to collaborative decision making, designed to assist in situations characterised by uncertainty, complexity and difference of view, namely the strategic choice approach. For those not familiar with it, the strategic choice approach originated in the work of the Institute for Operational Research (the IOR), formed in 1963, as a part of the Tavistock Institute of Human Relations in London. The IOR had as its aim the extension of the domain of application of operational research towards broader policy issues than had previously been the case, together with building stronger links between OR and the social sciences. A description of the strategic choice approach was first published in 1969 by the Tavistock,[2] when as the title reflects, it was seen as an approach for use in public planning. It was developed through a considerable body of work carried out in the early 1970s with various teams of local government officers tackling different planning problems in the public sector, and applications soon widened outside the public sector, to take in strategic business planning. The first edition of the current book was the first developed and detailed exposition of the approach.

For those familiar with the first edition, large parts of it (Chapters 1–9) dealing with the foundations, basic concepts and methods of the strategic choice approach, followed by the detailed treatment of the approach's four main stages, and a discussion of practicalities, remain with only minor changes. The final chapter of the first edition, on horizons for future development, is replaced with three new chapters. These new chapters reflect the authors' experience over the intervening decade and introduce useful new material. Chapter 10 focuses on the electronic resource,

introducing the computer software developed for the strategic choice approach and discussing its use by decision-makers and by teachers and students of management and planning. Chapter 11, on extensions in process management, reviews experiences in adapting the participatory style of planning to the challenges posed by working with what are called 'extended projects' those with large and more diverse groups, where diversity may be in terms of cultural background and/or interests represented, and where the timeframe over which the project takes place may also be lengthy. The new final chapter, Chapter 12, reviews the implications of the developments covered in Chapters 10 and 11.

As a detailed exposition of a particular approach to decision-making, the book is, by and large, exemplary. Students and practitioners will find it invaluable, as the first edition was. One advantage of the second edition is a better presentation—to my eye a sharper, clearer font etc., a second is some of the new material in Chapters 10 and 11. There are some irritations. The first is the replacement throughout Chapter 4 of the bullet points in the first edition by curious 'hook' type characters dropped below the line to the space before the line below—what, no proof-reading? That however is a very minor irritation; more serious are the inaccuracies in the index and the cross-referencing between different parts of the book (for a small fee I would be happy to supply a list to the publishers!). Chapter 11, on extensions in process management also contains some unhelpful inconsistencies between different parts of the text and figures, which make reading a more difficult task than it is in the earlier chapters.

The book does however have some features, which may be regarded as drawbacks. It does not present any detailed coverage of alternative participative methods for use in decision making, as these are mentioned only in passing, and in this respect it is unashamedly partisan; this statement is offered as an observation, and is not intended to represent a judgement, merely to indicate that people who are interested in discussions of relative merits and demerits of different approaches will not find them here. The authors mention the use of the strategic choice approach in combination with other participatory approaches, but this does not receive a detailed treatment, a shame in my view. Also irritatingly brief is the authors' speculation about an 'emergent body of theory within which the strategic choice approach can be located', to which they give the name 'developmental decision theory', asserting that this is in turn a springboard for a 'nascent field of academic study that might be called developmental decision science' (all quotes from page 327). The contours of this theory and its ontological and epistemological bases remain unexplored, beyond mentioning connections to grounded theory,[3] the decision theory described by Watson and Buede[4] and action research,[5] nor is there any reference to where such discussions might be found, hardly surprising I suppose since this is part of their

agenda for the future, but it does therefore seem a little premature to have identified this emergent beast. None of that should detract from the value of the book, as a guide to how to carry out the strategic choice approach it is a useful addition to the library of student, practitioner and organisation, both academic and non-academic.

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Re-Engineering the Manufacturing System: Applying the Theory of Constraints

RE Stein

Marcel Dekker, New York, 1996. xii + 306 pp. $59.75 ISBN 0 8247 9747 7

Eli Goldratt's Theory of Constraints (TOC), with its predecessor, OPT, is best known for its application to production scheduling, even though it has recently been applied to other areas, most notably Project Management.[1]   The title of this book was chosen to jump on the 're-engineering' bandwagon, no doubt. That may mislead, though, for in it, Robert E. Stein, a consultant from Dallas, provides detailed instructions on how to design, implement and use a manufacturing system based on TOC. He uses many small examples to illustrate his arguments, but it is frustrating that they usually change each time a new principle is demonstrated.

Stein starts by discussing the perceived problems of the traditional manufacturing system and then gives a survey of what an information system should do and how it should be organised. A TOC based information system is very different from a traditional MRPII system, and so the basic structure and processes have to be greatly modified. In particular, it is necessary to include explicitly the goal of the corporation as well as the manufacturing environment. Structures have also been designed to take advantage of new computer technologies and enhance the speed at which information can be obtained.

TOC has five steps:
1. Identifying the system's constraint(s)
2. Decide how to exploit the system's constraint(s)

3. Subordinate everything else to the above decision
4. Elevating the system's constraint(s)
5. If, in the previous steps, a constraint has been broken go back to step 1

In successive chapters, Stein deals with these steps in turn. He explains how the system identifies the constraint, and how it can be exploited to process more orders. Once the constraint has been exploited, all the remaining resources must give the constraint what it needs and nothing more: this is the 'subordination' step. The key requirements are to provide the constraint with what it needs to perform to the schedule, to exploit secondary constraints, and to overcome conflicts that may exist between the primary and any secondary constraints.

It is necessary to create buffers to protect the schedule from things going wrong. Buffer management allows the effectiveness of the scheduling system to be enhanced by controlling events and preventing them from negatively affecting the buffer origin. The approach can be reproduced in the information system once the schedule has been created and fitted into shop floor control. Stein argues that the effective use of the buffer management system can help by identifying those actions that need to be fixed in the schedule to increase the amount of protection available for the buffer origin and to reduce inventory and operating expense.

Once a complete definition of an information system has been made, how then can it be used to maximise throughput? Stein explains how it can help in the process of answering specific questions, such as what lot size should be used, whether a certain product should be obtained from internal or external resources, or what price should be accepted for a given product.

It is obvious that such day-to-day decisions can have a major impact on how well the company performs. However, of even more importance is the ability to deal with strategic issues, such as at what point should a new factory be built or what will be the impact of entering a new market. In Chapter 10, Stein demonstrates how the system can be used to segment markets, plan corporate growth, plan long-term efforts and recession-proof the company.

It may seem that to follow TOC, a company would need to throw out its current system. Not necessarily: because current information systems can provide a platform on which to build. In Chapter 11, Stein addresses the issue of how to modify current systems and discusses what should be eliminated and what should be kept. Clearly what Stein, and therefore Goldratt, is proposing is a very different kind of system to what has become standard. Implementing such a system may mean using a different approach. In the final chapter, Stein discusses changes that must be made in how the new information system is implemented.

A TOC system represents a paradigm shift from the standard approach and, as such, will change the way companies operate. The TOC information system is designed to solve many logistical and policy constraints that have hampered the effective use of computer based information systems since their development more than 30 years ago. Implemented correctly and used to its fullest extent it can be an asset in support of any manufacturing company. This book gives a very good introduction to the detail that lies behind Goldratt's TOC when it is applied to manufacturing.

Lancaster University   GK Rand

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Scenarios: The Art of Strategic Conversation

K Van Der Heijden
John Wiley and Sons, Chichester, 1996. xiv + 305 pp. £19.99. ISBN 0 471 96639 8

All reviewers have their prejudices. I come to this book as a 'forecaster' unimpressed as yet by the evidence, not to mention the intellectual framework, that scenario analysts have put forward to justify their particular approach to strategic planning. If you share these concerns this book will do little to help overcome them. It is not an academic book, argued through careful definitions, a theoretical framework and hypotheses presented for empirical evaluation. Instead, it is a thoughtful discussion of the author's experience as a planner for Shell working with scenarios in order to help that organisation recognise and respond to the major business uncertainties it faced.

Scenarios are essentially stories about the future, developed for their relevance to particular issues seen as important within the organisation. They are based on forecasts of various trends some of which are regarded as deterministic (with low uncertainty) and others that are included as a major component of the set of scenarios. They may also include significant events and the interaction between the two. While formal models have been proposed to examine such systems the Shell approach described here relies primarily on intuition to develop the 'story' (Huss 1).

The primary focus of this book is to explain, based on his experiences, how scenarios can have an effective role in organisational planning. Van Der Heijden first describes various different approaches to strategic planning starting with the 'rationalistic paradigm' of predict and control planning, where a future is envisaged based on deterministic predictions. Despite its prevalence as a mode of thinking about the future, this approach has been subject

to severe criticisms by, for example, Mintzberg,[2] on the fundamental grounds that it has proved unsuccessful in helping develop sustainable business success and also fails to describe managerial behaviour. Van Der Heijden is dismissive of this approach because the forecasts on which a rational approach is based do not 'communicate uncertainty ... where it really matters for the future'. An attempt to incorporate uncertainty through conventional sensitivity testing, he claims, does not deal with the interlinkages of variables in the situation under consideration. He then notes that one approach to scenario planning has certain similarities to this, where the scenarios are regarded as probabilistic assessments of different futures, for example optimistic, most likely, pessimistic. Scenarios, he claims, should be distinguished from such forecasts, because they represent 'a set of reasonably plausible, but structurally different futures' and therefore have no probabilistic interpretation.

The evolutionary approach to planning and the processual paradigm are then discussed. Van Der Heijden sees scenarios as a key element in improving the planning process within organisations; in particular the development of organisational scenarios should increase understanding of the organisation's environment and represents a developing theory of how the organisation interacts and learns from events. They provide 'an efficient organisation tool', increasing 'the range of what participants [in the scenario planning process] see and expands their mental models'. They also help clarify organisational conflict and 'permit coherent strategic action' by developing a shared vision of the future to which the organisation has to respond.

After this introduction to scenario development as a critical part of a successful strategic conversation, Van Der Heijden discusses 'The Principles of Scenario Planning' and, in Part 3. 'The Practice of Scenario Planning' where helpful guidelines are laid down as to how scenarios are best developed. The book ends with a discussion of how scenario planning should be institutionalised.

There are quite a number of interesting ideas in the book, in particular those concerned with the role of a 'successful business idea' in illuminating organisational planning. A key issue here is that such an idea must 'fit' with the environmental scenarios developed by the organisation. The author has obviously much experience within Shell of how best to develop and use scenarios and the book is worth reading for that reason alone. However, much of his argument is unreflective and provides little evidence apart from the Shell experience of the effectiveness of scenarios. This is now 25 years after the first documented cases. Where are the other convincing examples? How is it Shell lost ground to its competitors in the 1980s—were their competitors using scenarios more effectively. Some of the limited research

done with scenarios suggests that while they have a high managerial plausibility they fail to deliver on their key claim of better encapsulating uncertainty. This issue, related to the 'heuristics and biases' problem of human judgement isn't even mentioned by the author.

A final area of frustration with this book arises in its discussion of 'Dealing with uncertainty' in Chapter 4. The author's attitude to forecasting and its relationship to scenarios is confused: British Treasury forecasts are unimpressive, he claims, and yet any scenario will include in it some economic growth forecasts. What's a good forecast in this context and how could it be produced? Many of the building blocks of scenarios are necessarily forecasts with high levels of uncertainty in them. Few business ideas are robust to the ranges of uncertainty seen in these fundamentals, or if they are, no evidence is provided. How then can we do away with the probabilistic notion of a scenario? (An interesting but in the end inconclusive discussion of some of these issues can be found in Makridakis[3].) It really is not good enough to classify a scenario into the categories 'reasonable' and 'unreasonable' as Shell's recent experiences in Nigeria and with Brent-Spa demonstrate. We need methods for identifying the value of a set of scenarios beyond their face validity with a particular group of planners at a particular moment in time. This will require research and more rigorous thinking than is shown in this book. However, anyone working in strategic planning will gain insight into the critical link between possible futures and current strategic thinking. The author is certainly correct when he claims that adopting a strategy based on a forecast of a future that almost certainly will not happen is a wholly inappropriate approach to planning and that what is needed is imagination linked to analysis to identify 'robust' strategies.

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References

1 Huss WR (1988). A move toward scenario analysis. *Int J Forecast* 4: 377–388.
2 Mintzberg H (1994). *The Rise and Fall of Strategic Planning.* Prentice Hall: UK.
3 Makridakis S (1996). Strategy and forecasting, with discussion. *Int J Forecast* 12: 513–557.

Systems Maintainability Analysis, Engineering and Management

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The book consists of 23 chapters divided into five parts. The parts are: Concept of Maintainability, Maintenance Analysis, Maintainability Analysis, Maintainability

Engineering, and Maintainability Management. As can be seen from this list, the book does cover the spectrum of maintainability analysis, engineering, and management. The importance of this book is not only the amount of material covered by the book but its readability. The author makes every effort to make himself understood, which is no mean feat for a subject that can require a very deep understanding of physics and mathematics. This is done through the use of many illustrative examples, and an inclusion in the Appendices of the necessary tables which are often overlooked in a book of this sort.

As far as improving the book the author could have provided us with keys to the alphabet soup of maintainability theory, especially in some of the tables in the body of the text which were imported into the book. Another area which could improve the book would be to include illustrations of the engineering concepts and formulae to software maintenance. This is a major area in maintainability which is too often neglected. However, do not misunderstand my negative comments. They are provided as constructive comments for the next edition which I hope is forthcoming.

I recommend this book very highly. I wish I had owned it 20 years ago when I was testing all sorts of equipment. It would have enabled me to silence many of the snipers who take every advantage to find flaws in your reports.

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