
Book Reviews

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- 1 International Management of Research and Development by:
M. von Zedtwitz, J. Birkinshaw and O. Gassmann Published 2008 by
Edward Elgar Publishing Limited, Glensanda House, Montpellier
Parade, Cheltenham, Glos GL50 1UA, UK, 579 pp,
ISBN: 978-1-84542-428-2**

This book is a compendium of some of the most influential and renowned articles written about managing and organising international research and development (R&D).

The idea of a book that pulls together the key articles on the young, but increasingly important, phenomenon of R&D internationalisation arose when authors discussed the topic in PhD and Master's courses. Having the most relevant papers together in one book seemed to be attractive for students, and also for other researchers and for reflective practitioners working in the field of R&D. Even several managers in large firms have asked for such literature in the field of international R&D. These are typically managers who have to deal with the opportunities and expectations of shifting R&D abroad, and who have to do so in an increasingly complex and interconnected business world. And many are seeking frameworks and ways of thinking to help them make better decisions. This collection is thus a handbook on international R&D for all of them: managers, students and researchers alike.

Academic research on the internationalisation of R&D started in the 1970s, with a number of articles documenting the phenomenon of R&D centres away from the multinational corporation's home country, and identifying the factors explaining the phenomenon. Other issues that emerged in the literature in this period were the challenges associated with technology transfer across borders, and the ways in which products were adapted for local use through technological modifications. During the 1980s, the debate shifted towards a more sophisticated analysis of the choices, and new issues emerged, including project management, and the potential of new information and communication technologies for managing international R&D more effectively. During the 1990s, multinational corporations were increasingly characterised as network organisations, and this influenced a lot of the writing on international R&D as well, for example, in terms of the nature of the linkages between R&D units in a single corporation, and the roles of knowledge management and incentive systems for managing decentralised R&D. The organisational models used to manage such complex innovation networks were also increasingly discussed, and at multiple levels of analysis – the corporation as a whole, the R&D unit, and the single R&D activity. Since about 2000, the body of literature on international R&D has become somewhat broader, perhaps because the management of innovation has become increasingly central to the long-term success or failure of companies.

This book includes the following contents:

- Part 1 principles of international R&D (six papers)
- Part 2 trends and drivers of international R&D (six papers)
- Part 3 organisation and coordination of international R&D (seven papers)
- Part 4 transnational R&D project management (6 papers)
- Part 5 knowledge and networks in international R&D (seven papers).

The field of international R&D continues to grow and evolve, fuelled by the (interrelated) trends of globalisation and technological innovation.

I hope that the reader will find this selection a convenient presentation of entry points into the truly exciting world of international R&D management, a discipline that holds the keys to future innovation and competitiveness of multinational corporations.

2 Design Reuse in Product Development Modelling, Analysis and Optimization by: S.K. Ong, Q.L. Xu and A.Y.C. Nee Published 2008 by World Scientific Publishing Co. Pte. Ltd., 5 Toh Tuck Link, Singapore 596224, 298 pp, ISBN-13: 978-981-283-262-7, ISBN-10: 981-283-262-9

Today's market is characterised by intense competition in the global manufacturing environment. In order to succeed or even to survive, manufacturers must be able to deliver their products with speed, diversity, high quality, environment compliance, and at low cost. Outstanding product design meeting the above-mentioned requirements will ultimately determine the final winner in this competition. In fact, there is a growing awareness of the vital role of product design for business success. Therefore, the desire for advanced design paradigms and powerful design tools has been persistent. On the design paradigm side, systematic product design and manufacturing principles are advancing, such as concurrent engineering, Taguchi method, axiomatic design, theory of inventive problems solving, design for manufacturability and assembly, mass customisation, etc. On the practical design tool side, various computer-based systems and tools have been thriving, such as computer-aided engineering, product data management, expert systems, virtual reality and augmented reality, etc.

The book consists of the following chapters:

- Introduction: design reuse – what and why, product conceptual design, major issues in design reuse, engineering design reuse applications, barriers to design reuse, summary.
- Design Reuse Systems and Enabling Tools: engineering design reuse approaches, reasoning in design reuse, summary.
- Product Information Modelling: data, information and knowledge, information modelling – state-of-the-art review, function-based product information model, summary.
- Design of Product Platform: role of product platform, product platform and product family design, computational tools for product architecture building, product

architecture building using self-organising map, other relevant issues in product platform design, summary.

- Optimisation in Product Design: introduction, automated design synthesis, multi-objective struggle genetic algorithm design synthesis, post-optimal solution selection, a case study, summary.
- Cost Estimation in Product Development: introduction, product development cost, cost estimation in product family development, an empirical cost model for design reuse, summary.
- Product Performance Evaluation: introduction, robust design, the information content assessment method, summary.
- A Product Family Design Reuse Methodology: introduction, an integrated design reuse process model, a web-based product family design reuse system, design of cellular phone product family, design of TV receiver circuits, summary.
- Design Reuse for Embodiment and Detailed Design: introduction, online design reuse system, embodiment design, detailed design, summary.

This book covers topics in knowledge gathering, deployment and utilisation. It is intended to be useful for undergraduate and graduate students, and researchers in mechanical/industrial engineering and computer science to improve their understanding of the principles of product development. It can also be used as a reference book for practicing engineers and engineering managers to expand their visions of systematic product development and project management. The reader should have a basic understanding of mechanical products and systems. Fundamental knowledge of artificial intelligence is also helpful to understand the content of this book.

**3 Mechanical Properties of Engineered Materials by: W. Soboyejo
Published 2003 by Marcel Dekker, Inc., New York, Basel, 2003,
270 Madison Avenue, New York, NY 10016, 583 pp,
ISBN: 0-8247-8900-8**

Book's primary objective is to provide a simple introduction to the subject of mechanical properties of engineered materials for undergraduate and graduate students. The author has been encouraged in this task by his students and many practicing engineers with a strong interest in the mechanical properties of materials and he hopes that this book will satisfy their needs. The author endeavoured to cover only the topics that he considers central to the development of a basic understanding of the mechanical properties of materials. It is not intended to be a comprehensive review of all the different aspects of mechanical properties; such a task would be beyond the capabilities of any single author. Instead, this book emphasises the fundamental concepts that must be mastered by any undergraduate or graduate engineers before they can effectively tackle basic industrial tasks that require an understanding of mechanical properties. This book is intended to bridge the gap between rigorous theory and engineering practice.

The book covers essential principles required to understand and interpret the mechanical properties of different types of materials (i.e., metals, ceramics, intermetallics, polymers, and their composites). Basic concepts are discussed generically,

except in cases where they apply only to specific types of materials. Following a brief introduction to materials science and basic strength of materials, the fundamentals of elasticity and plasticity are presented, prior to a discussion of strengthening mechanisms. A simple introduction to the subject of fracture mechanics is then presented along with fracture and toughening mechanisms and a description of the effects of fatigue and the environment.

The book concludes with an overview of time-dependent viscoelastic/viscoplastic behaviour, creep, and creep crack growth phenomena. Wherever possible, the text is illustrated with worked examples and case studies that show how to apply basic principles to the solution of engineering problems.

4 Metal Cutting Theory and Practice, Second Edition by: D.A. Stephenson and J.S. Agapiou Published 2006 by Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742, USA, 846 pp, ISBN: 0-8247-5888-9 (Alk. paper)

Metal cutting applications span the entire range from mass production to mass customisation to high-precision, fully customised designs. The careful balance between precision and efficiency is maintained only through intimate knowledge of the physical processes, material characteristics, and technological capabilities of the equipment and metals involved. The best-selling first edition of *Metal Cutting Theory and Practice* provided such knowledge, integrating timely research with current industry practice. This brilliant reference enters its second edition with fully updated coverage, new sections, and the inclusion of examples and problems.

Supplying complete, up-to-date information on machine tools, tooling, and workholding technologies, this second edition stresses a physical understanding of machining processes including forces, temperatures and surface finish. This provides a practical basis for troubleshooting and evaluating vendor claims. In addition to updates in all chapters, the book features three new chapters on cutting fluids, agile and high-throughput machining, and design for machining. The authors also added examples and problems for additional hands-on insight. Rounding out the treatment, an entire chapter is devoted to machining economics and optimisation.

This edition contains updates latest research and industrial information covering the following items:

- contains complete, updated information on machine tool, tooling, and workholding technologies
- provides an overview of computer analysis methods for process design along with industrial application examples
- includes troubleshooting charts for tool life and quality issues in milling, turning, boring, and drilling
- presents basic machinability data on a variety of engineering materials
- contains three new chapters on cutting fluids, agile and high-throughput machining, and design for machining.

The book offers practical knowledge and a fundamental understanding of underlying physical concepts, metal cutting theory and practice, Second supplemented edition is useful in studying designing, evaluating, purchasing, and using machine tools.

5 Composite Materials, Design and Applications by: S. Zhang, L. Li and A. Kumar Published 2007 by CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742, USA, 548 pp, ISBN: 978-1-4200-4519-2 (Alk. paper)

This book is a major work that contributes greatly to the domain of ‘composite structures’ both for academic and industrial use. This new edition responds to the concerns of experts that deal with the conceptualisation and design of components made from composite materials, i.e., engineers or technicians, teachers, graduate or undergraduate students.

There is a need by engineers working in composites for a practical source of reference for the design and application of composites. In the educational sector, composite materials are now taught at many universities around the world. The topic usually covered is laminate theory. Composites design courses also exist in a few universities and institutes. The demand from students and also practitioners of composites for knowledge and training in the design of composites is increasing. The content of these design courses concentrates mostly on analysis, while applications still remain at the specimen level.

The technical level increases from one part to the next, and one can also use each part independently from the other parts. A fourth final part groups a large number of original case studies that are themselves totally formulated and classified according to different levels of difficulties.

The first part presents an introduction to composite materials, the fabrication processes, the properties of a single ply, sandwich materials, conceptual design, assembly and applications of composites in aerospace and others areas. The principal ideas in the preliminary step, which consist in the sizing of a laminate makes up a novel method for design.

The second part presents the mechanics of composites materials. This consists of a discussion on elastic anisotropic properties, the directional dependence of different properties, and mechanical properties of thin laminates.

The third part presents the orthotropic coefficients that may be conveniently used for design: the failure criterion, bending and torsion of any cross-section composite beams, and bending of thick composite plates. The proposed method of analysis for the composite beams is original, as well as the proposed method for the analysis of thick laminated composite plates, which goes along the same principles as the composite beams.

The ‘applications’ part provides more than 40 case studies with complete solutions. There are three levels of applications, each deal with one of the three parts above. These cover the large majority of the practical cases encountered in industry. These problems have been posed in such a way as to allow the reader to get right into the essential part of the problem.

This book can be used to teach students at the first year graduate level as well as the final year undergraduate level. It is also useful for practical engineers who want to learn, on the job, the guidelines for the use for composites in their applications.

6 Flow Visualization, Techniques and Examples by: A.J. Smits and T.T. Lim Published 2000, reprinted 2003, 2010 by Imperial College Press, 57 Sheldon Street, Covent Garden, London WC2H 9HE, 396 pp, ISBN-13: 978-1-86094-193-1, ISBN-10: 1-86094-193-1

Flow visualisation is one of the most effective tools in flow analysis, and it has been crucial for improving our understanding of complex fluid flows. In fact, some of the major discoveries in fluid mechanics were made using flow visualisation.

The book is designed to provide source material for those who are intending to carry out flow visualisation studies. Although it is written primarily for students and researchers in areas of mechanical, aerospace, and civil engineering, as well as oceanography and physics, we hope that other research workers, including those in medical fields will find the book useful. To obtain a complete understanding of the flow behaviour, it is usually necessary to complement the flow visualisation with quantitative measurements. One of the most exciting advances in flow imaging is that some flow visualisation techniques, such as particle image velocimetry and molecular tagging velocimetry, can also provide quantitative results.

The text is organised into two major parts. The first one consists of 12 chapters, each dealing with a different technique, or a related set of techniques for flow visualisation. The second part of the text is made up of a collection of flow images taken by leading researchers from around the world. These illustrations give examples of the techniques described in the book, and they were chosen to provide high-quality images of some fascinating fluid flow phenomena.

Throughout history, flow visualisation has been an important tool in fluid dynamics research. It has been used extensively in the fields of engineering, physics, medical science, meteorology, oceanography and sport aerodynamics, to name just a few.

Unlike previous publications which concentrated mainly on the theoretical aspect of flow visualisation, this book focuses on the practical aspect. Obtaining high quality flow visualisation results is, in many ways, more an art than a science, and experience plays a deciding role. Hence, each chapter of this invaluable volume has been written by an expert in a particular technique.

The contents of the book will be valuable to experts in flow visualisation as well as to those with considerable experience in this subject.

7 Statistical machine translation by: P. Koehn Published 2010 by Cambridge University Press, The Edinburgh Building, Cambridge CB2 8RU, UK, 446 pp, ISBN: 978-0-521-87415-1 (Hardback)

The field of machine translation has recently been energised by the emergence of statistical techniques, which have brought the dream of automatic language translation closer to reality. This class-tested textbook, authored by an active researcher in the field,

provides a gentle and accessible introduction to the latest methods and enables the reader to build machine translation systems for any language pair.

Machine translation has a long history, but over the last decade or two, its evolution has taken on a new direction – a direction that is mirrored in other subfields of natural language processing. This new direction is grounded in the premise that language is so rich and complex that it could never be fully analysed and distilled into a set of rules, which are then encoded into a computer programme.

It provides the necessary grounding in linguistics and probabilities, and covers the major models for machine translation: word-based, phrase-based, and tree-based, as well as machine translation evaluation, language modelling, discriminative training and advanced methods to integrate linguistic annotation. The book reports on the latest research and outstanding challenges, and enables novices as well as experienced researchers to make contributions to the field.

In the book the following chapters are included:

- 1 foundations: introduction, words, sentences, corpora and probability theory
- 2 core methods: words-based models, phrase based models, decoding, language models and evaluation
- 3 advanced topics: discriminative training, integrating linguistic information and tree based models.

The book is ideal for students at undergraduate and graduate level, or for any reader interested in the latest developments in machine translation.

8 Phase Transformations in Metals and Alloys, Third Edition by: D.A. Porter, K.E. Easterling and M.Y. Sherif Published 2009 by CRC Press, Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742, USA, 536 pp, ISBN-13: 978-1-4200-6210-6 (0)

The fundamental theories of phase transformations in metals and alloys remain largely unchanged, so the third edition is essentially an expanded version of the second edition with additional material covering some of the more important application developments of the last 17 years.

Expanded and revised to cover developments in the field over the past seventeen years, phase transformations in metal and alloys, the third edition provides information and examples that better illustrate the engineering relevance of this topic. It supplies a comprehensive overview of specific types of phase transformations, supplemented by practical case studies of engineering alloys.

New in the third edition:

- computer-aided calculation of phase diagrams
- recent developments in metallic glasses
- the Scheil method of calculating a CCT diagram from a TTT diagram
- expanded treatment of the nucleation and growth of polygonal ferrite and bainite

- new case studies covering copper precipitation hardening of very low carbon bainitic steel and very fine carbide-free bainite
- detailed treatment of strain-induced martensite provides a theoretical background to transformation-induced plasticity (TRIP) steels

In the book the following chapters are included:

- thermodynamics and phase diagrams: equilibrium, single-component systems, binary solutions, equilibrium in heterogeneous systems, binary phase diagrams, influence of interfaces on equilibrium, ternary equilibrium, additional thermodynamic relationships for binary solutions, computation of phase diagrams, kinetics of phase transformations.
- diffusion: atomic mechanisms of diffusion, interstitial diffusion, substitutional diffusion, atomic mobility, tracer diffusion in binary alloys, diffusion in ternary alloys, high-diffusivity paths, diffusion in multiphase binary systems.
- crystal interfaces and microstructure: interfacial free energy, solid/vapor interfaces, boundaries in single-phase solids, interphase interfaces in solids, interface migration.
- solidification: nucleation in pure metals, growth of a pure solid, alloy solidification, solidification of ingots and castings, solidification of fusion welds, solidification during quenching from the melt, metallic glasses, case studies of some practical castings and welds
- diffusional transformations in solids: homogeneous nucleation in solids, heterogeneous nucleation, precipitate growth, overall transformation kinetics: TTT diagrams, precipitation in age-hardening alloys, precipitation of ferrite from austenite, cellular precipitation, eutectoid transformations, massive transformations, ordering transformations, case studies
- diffusionless transformations: characteristics of diffusionless transformations, martensite crystallography, theories of martensite nucleation, martensite growth, premartensite phenomena, tempering of ferrous martensites, case studies.

Adding new case studies, detailed examples, and exercises drawn from current applications, the third edition keeps the previous editions' popular easy-to-follow style and excellent mix of basic and advanced information, making it ideal for newcomers to the field. The book's unique presentation links basic understanding of theory with application in a gradual, easy to follow, yet exciting manner. Based on the author's teaching notes, the book takes a pedagogical approach and provides examples for applications and problems that can be readily used for exercises.

This book has been written as an undergraduate course in phase transformations for final year students specialising in metallurgy, materials science, or engineering materials. It should also be useful for research students interested in revising their knowledge of the subject. The book is based on lectures originally given by the authors at the University of Lulea for engineering students specialising in engineering materials.