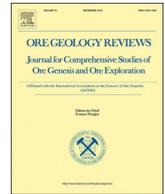




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Book review

Modern Management in the Global Mining Industry, Robin G. Adams assisted by Christopher L. Gilbert & Christopher G. Stobart, Emerald Publishing (2019). 292 pp., Hardback, ISBN: 978-1-78973-788-2. Also available as an ePublication.

“...this book directly addresses what I think is the single greatest cultural obstacle to more effective management in mining, namely that the only viable business strategy in a commodity sector is to build or acquire low-cost operations...”

Robin Adams (2019)

Modern Management in the Global Mining Industry is unique in its approach, looking at critical aspects of mineral economics from first principles and an applied industry perspective, in the process highlighting some of the myths and management-led distortions in common industry management and economic practices.

The content of the book draws upon firsthand experiences from the 40-year career of the author, Robin G. Adams, principally from his long-time association with independent mineral economics consultancy CRU Group. Robin, sadly, passed away in 2014, focusing his last few months on writing this book and finishing it the day before his passing. The book was subsequently finalised and brought into publication by his wife, Judith, and long-time colleagues Christopher Gilbert and Christopher Stobart.

Advance praise at the start of the book is drawn from Professor John E Tilton (Colorado School of Mines), Professor Marian Radetzki (Luleå University of Technology) and Dr David Humphreys (Former Chief Economist of Rio Tinto and Norilsk Nickel) signalling the quality of the content.

The book is reminiscent of Philip Crowson's excellent *Inside Mining: The Economics of the Supply and Demand of Minerals and Metals*, published some 20 years earlier. It presents a minerals economics perspective that speaks to the 'way the global mining industry and commodity markets actually work'.

Like Crowson's book, Robin Adams' book is a valuable addition to those very few scholarly books seeking to thoroughly explain the minerals industry from an economics and financial standpoint whilst also capturing the key domain-based knowledge that is critical to a full understanding of each mineral market.

In contrast to the other required mineral economics texts, such as 'Mineral Economics and Policy' by Tilton and Guzmán (2016), 'Mineral Economics' edited by Maxwell and Guj (2013), and the aforementioned 'Inside Mining' (Crowson, 1998) which focus more on mineral economics' role in public policy, Adams' text focuses more on the field's role in business strategy, though inevitably there is also useful material for policy makers too.

The book's focus on mineral economics and business strategy obviously makes it useful to minerals industry professionals, especially strategic decision makers, however, it also stands as an example of the

growing divergence between the academic and professional disciplines of mineral economics, and as such may also be of substantial interest to those academics wishing to better knit the disciplines together. For example, it is clear from this book that the focus of professional mineral economists is often 'better data' whereas typically academic journals focusing on mineral economics publish 'better theory'.

The book comprises 14 chapters: Introduction; Commodity Price Forecasting; Recycling; The Marketing of Commodities; The Role of Commodity Exchanges in Pricing; Price Risk Management; Shareholder Value; Measuring Mine Production Costs; Performance Improvement and Capital Productivity; Risk and the Cost of Capital; The Mining Cycle; The Myths and Realities of Resource Depletion; The Environment – Cost or Constraint?, and finally a closing chapter entitled Unfinished Business.

Each chapter follows a common structure, commencing with brief real-world examples on the theme of the chapter from the author's practical experiences before embarking upon a thorough discussion of the specific topic. The discussion refreshingly adopts a 'first principles' approach with further examples of industry practices to clarify and illustrate key points.

In the **Introduction of Chapter 1**, Adams makes the case that the skills required to become an effective mining industry executive are akin to those of a modern-day 'Renaissance Man', requiring knowledge of many disciplines including the technical domains of geology, metallurgy and engineering, but also of economics, finance, sociology, anthropology, politics and communication. The specific challenges of the minerals sector are introduced, namely Demand volatility; Long cycles; Price volatility; Geographical specificity; Environmental impact and Lack of sustainability.

Chapter 2 on Commodity Price Forecasting neatly explains the microeconomic theory of supply curve and demand curve interaction, including the valuable but often forgotten approximation that in the short run mineral commodity demand is inelastic, but over the long run is elastic – a rule that greatly affects the strategic opportunities for commodity suppliers. It then moves on to detail the practical challenges of pricing data-collation and the reality of competing methodologies of forecasting future prices, both in the short-run and long-run. Some of the most interesting parts, include Adams' reflections on the role of theoretically sophisticated econometric models in forecasting, which although elegant, do not produce sufficiently better forecasts for the extra 'effort' required, and which are often more vulnerable to poor data quality – something the academic community should ponder. Practical concepts in analysing industries such as the Herfindahl-Hirschman Index (HHI), as a measure of supplier concentration, are explained, as are the consequences of differing industry structures upon producer surplus, consumer surplus and equilibrium pricing.

Chapter 3 considers the economic drivers and practicalities of **Recycling**, outlining the economic theory and examples from different metals markets. A quantitative example shows the impact of recycling rates and end-product asset-life upon long-term primary metal demand. The author makes the point, often missed by sustainability professionals and policy makers, that ultimately the level of recycling of a commodity

is limited whenever there is rapidly growing demand – a major challenge to the desirable notion of the circular economy. In these reviewers' opinion, too little has been written on the economics of recycling in recent years, and indeed, this is one section that the reviewers would like to have been much longer in this text.

Chapter 4 considers the **Marketing of Commodities**, introducing a classification of different commodity 'types', namely 'Pure Commodities' such as traded on the London Metal Exchange, Quasi-commodities where iron ore, bauxite and phosphate rock require customer-specific marketing and finally (downstream) Products, such as the output of brass mills, extruded aluminium products, sheet steel etc. An Appendix to the chapter outlines the pricing and trading of base metal concentrates. The 'revenue-side' of mine supply is often ignored by both economic theorists and industry executives, with the assumption that the industry is commoditised and thus the main lever of unit value generation is costs, not revenues. The author does a good job of explaining how this is not the case, and that whilst costs are important, significant value can be generated, and lost, in the realm of unit revenues and especially the marketing of commodities, where concepts such as 'value in use' rise to the fore. This subject is then built on more comprehensively in Chapter 7. Nonetheless, within the wider mineral economics community, commodities' marketing is an area about which there seems to be too little published research.

Chapter 5 considers the **Role of Commodity Exchanges in Pricing** and includes an insightful discussion on the factors that drive success and failure of specific exchange-traded contracts. The chapter extends the price discovery discussion to the role and practices of price reporting services and to consideration of futures and forward prices. The chapter closes with insights into the mechanics of London Metal Exchange transactions and the metal exchange warehousing business model. Again, the role of exchanges and price reporting seems to be an area with an absence of good recent literature (albeit there is some on the recent scandals associated with LIBOR, LBMA, and Fanya), especially when you note Adams' comments that this is an area of constant, rapid innovation.

Chapter 6 turns to **Price Risk Management** practices and purpose within the industry and introduces ideas for hedging program design and implementation. This chapter will be of undoubted use to industry participants and financiers who remain sceptical of hedging. The chapter also includes a discussion of the principles and practice of 'metal concentrate', rather than 'metal' hedging and concludes with a brief discussion of the long-term (full economic cycle) aspects of price risk management.

Chapter 7 comprises an evaluation of **Shareholder Value** as a principal basis for mining sector management. The chapter opens with a remarkable story of the author's work in the Soviet republics in the 1980s – and his attempt to convey the concept of 'profits' and 'value' to managers eager to learn the 'Western Way', but familiar only with the USSR central planning system of that time. Adams' explanations of the principles of Value-based Management, of Sustainable Competitive Advantage, and critically his explanations as to 'Why the (prevailing) Cost Culture Fails to Deliver Shareholder Value' (see opening quote to this review) should be compulsory reading by all industry managers charged with custodianship over mining operations.

Chapter 8 shifts attention towards the detail of **Measuring Mine Production Costs**. Adams describes the foundation to the Value-Based-Costing (VBC) methodology that details Site Costs, Business Costs, Corporate Costs and Economic Costs as the appropriate decision-making cost metrics depending upon the analytical focus of the decision-maker. The text goes on to outline the constituent constructs of Raw Material Costs, Conversion Costs (together comprising Site Costs), Realisation Costs (added to Site Costs to derive Business Costs), the criticality of capturing sustaining capital within a cost analysis and the role of Capital Costs (and associated Cost of Capital) to measure Economic Costs. Eloquent explanations are provided as to how to best manage the costings at co-product mines and the comparison of the

VBC methodology to accounting-based approaches. Adams makes a strong argument for the superiority of VBC over 'traditional' C1, C2, C3 approaches for cost-based decision-making – with special focus on the perils of by-product operations and properly accounting for capital and cost of capital within operational costs.

Chapter 9 moves into the 'engine room' of minerals sector management; the domain of **Performance Improvement and Capital Productivity** at mining operations. The use of structured problem-solving is described, including the critical fact-based identification of the production bottleneck at an operation. The chapter outlines the mathematical principles of capital productivity and identifies key areas where improvement potential may lie – namely in Machine Productivity, Capital Reduction Potential (building strongly on the previous chapter), Network Efficiency Potential. There is a simple but elegant nuance to this categorisation that is worth every industry manager knowing – 'machine productivity' is best thought of as reducing operating costs 'directly', with 'capital reduction potential' best thought of as reducing operating costs indirectly by reducing capital costs, and 'network efficiency potential' representing the further indirect flow through of operational effectiveness to elsewhere in the business. Finally, the principles of a number of best practice operations management tools, likely known to many readers (as for example showcased in management classics such as 'The Goal: A Process of Ongoing Improvement' by Goldratt and Cox, 2014), as well as 'Six Sigma' and benchmarking are also covered. Adams' performance improvement approach is presented in a clear, logical and succinct manner.

Chapter 10 covers the principles of capital investment and is entitled **Risk and the Cost of Capital**. The chapter clearly articulates a subject that many industry practitioners struggle with, covering Project Risk, The Capital Asset Pricing Model (CAPM), Cost of Equity, Return on Equity, Beta Coefficients, Cost of Debt, Tax Rates, Weighted-Average-Cost-of-Capital (WACC), the Effective Cost of Finance for New Projects, Risk and Return and finally Royalties. The treatment is necessarily brief but customised from the generic application of the concepts to bespoke mining-related discussions of each concept. Of importance, is the focus on pushing understanding of 'cost of capital' down through the organisation to those who often make the capital purchase decisions (usually mid-level technical managers) rather than just approve them (usually the CFO and finance team) such that better capital purchasing decision are made. There is some good discussion of royalties from an industry perspective, but for those readers seeking more in-depth discussions of all financial and royalty concepts applied to the mining industry are referred to the Australian Institute of Mining & Metallurgy (Maxwell & Guj, eds. 2013) Mineral Economics monograph (for minerals sector finance) and World Bank (Otto et al., 2006) analysis of mineral royalties respectively.

Chapter 11 turns to discussion of **The Mining Cycle**, commencing with the backstory to the Cobre Panama copper deposit, where Adams' first consulted on the potential impact on the local economy back in 1971. This sets up a discussion of the value accretion curve for projects as they progress towards development, the roles of junior and established mining companies in transitioning deposits into production, reserves/resources and the project gateway system. However, Adams cautions at an overly sequential perspective towards project development which implies that project challenges are overcome at each stage – whereas in practice the challenges remain throughout the development and production phases and thus require constant attention and management.

Chapter 12 looks at the perennial discourse of mineral economists, indeed of broader society, in synthesising the debate as to **The Myths and Realities of Resource Depletion**. Adams' view is that the in-ground numbers when it comes to resources debunk the resource depletion hypothesis. That said, he is conscious to emphasize the critical role of societal acceptance of mining wherever it takes place. The conclusion of the chapter is one of 'resource abundance' rather than

depletion.

Chapter 13 continues the societal level perspectives and speaks to the subject of **The Environment: Cost or Constraint?** Adams' thesis is that the industry should 'redefine' environmental issues as constraints to new projects rather than simply viewing environmental solutions from a cost-side perspective. The case of the Pebble copper project is discussed in some detail, with Adams viewpoint that the proposed development concepts suggested thus far have been 'too big for the ecosystem'. Contrasting Alaskan examples of more sustainable mine developments are presented in the Red Dog and Greens Creek mines. The author also makes the point that the industry faces collective liability by second rate actors and their approach to the environment and society, and thus industry leaders need to work together to bring the entire industry up to acceptable standards. Thus, in relation to this, the text summarises the industry's self-regulation, including the Equator Principles and International Council on Mining & Metals (ICMM). The chapter includes some interesting and progressive suggestions on wider stakeholder management, including with NGOs and governments, which should cause significant pause for thought amongst all industry practitioners.

Chapter 14 closes the book with some personal reflections on Adams' career under the title of Unfinished Business. Adams describes himself as an 'accidental mineral economist' after considering a career as a development economist. He highlights cost measurement as one clear area of unfinished business – and critiques again the overuse of accounting metrics such as C1-C2 and C3 rather than value-based metrics – with the accounting-based techniques often leading to over-capitalisation of assets and false economies. Environmental issues are flagged as the next area of unfinished business, while recognising the baby steps the industry is now making in this regard as a global custodian of resources. Finally, Adams' points to the poor governance record of many countries that host significant mineral resources, with a requirement to upskill societal leaders in the truths not myths of mineral economics and policy. Similarly, Adams highlights the need to better inform non-government organisations of the economics of the minerals industry and the perception that the industry cares little for the environment or the people affected by mine developments. Many more lifetimes work lies ahead.

In summary, this book is an excellent addition to the technical literature in the area of mineral economics and mining sector management. It offers a fresh view on high-level issues facing our sector's leaders and would be a valuable addition to the personal libraries of all minerals professionals and to the corporate libraries of minerals companies. Universities too should include this book in reading lists in development economics and resource economics, indeed in any minerals-related course targeting future leaders in the sector.

Finally, it is customary in any review to highlight potential areas of improvement should a second edition eventuate in time, notwithstanding the passing of the author. Two aspects, in this regard are the requirement for references and the interdisciplinary aspect of the book.

First, on a minor note, it would assist the reader, if pointers to the existing literature underlying the principles could be referenced at the end of the book – perhaps ordered by chapter content. This would also help substantially in bringing together the academic and professional disciplines covered in the book. With that inclusion, this book would stand even taller as a guide to future mining leaders.

Secondly, and more importantly, whilst the reviewers agree with the author that a modern mining manager needs to be a 'Renaissance Man' (or woman) conversant with geology, metallurgy, engineering, economics, finance, sociology, anthropology, politics, communication etc., and Adams' care for and understanding of the environmental and social impacts of mining are evident in the text, especially in the latter chapters and Robert Perlman's foreword, this is not quite a 'Renaissance text'.

Economics, and to a lesser extent, environmental thought dominate – the aforementioned anthropology is not discussed, and sociology and politics only briefly. Adams rightly highlights these areas and others, along with the general need for interdisciplinary understanding and broader stakeholder engagement as 'Unfinished Business' – and indeed, suggests several interesting and fairly radical proposals for a 'better' mining industry, based on this approach. It would have been nice to hear more of his thoughts in this area, and greater detail on their implementation. This would have been an obvious area for an interesting and important follow-up book, which alas, we will never see. Nonetheless, we hope the collective stakeholders of the minerals industry can 'finish' his work in this area.

All-in-all, a valuable contribution indeed to the mining industry management and mineral economics literature.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: In addition to my academic duties as a Professor at the University of Western Australia, I do, from time to time, undertake consulting work as an Associate Consultant to CRU Group. The book review pertains to a book published by the late Robin Adams, who was a long-time employee of CRU Group. I have no financial interest in the book itself. Co-author on the book review, Rebecca Gordon, is an employee of CRU Group. To my knowledge neither CRU Group itself, nor Rebecca, have any financial interest in the book being reviewed. Allan Trench January 2020.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.oregeorev.2020.103320>.

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