Asset management
Whole-life management of physical assets

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Foreword

This book is timely and important. Timely because the number of organisations around the world which are embracing the whole-life, whole-cost approach to managing physical assets is rising fast. Important because successful asset management demands new ways of thinking and working at all levels and this book will help prepare people for this.

Economic and natural resources are finite, unlike the demands made on them. Governments and organisations seeking to make best use of limited resources have hard choices to make. Choices which concern the reliability and availability of physical assets necessary for the delivery of essential services are particularly difficult. Asset management offers a highly structured, long-term approach to determining options, sizing and evaluating risks and returns and justifying decisions and plans. Its whole-life, whole-cost disciplines are central to achieving sustainable economic performance.

This book brings us face-to-face with the array of challenges, options and benefits that asset management brings with it. It leaves us in no doubt that asset management is hard work. It requires functions and disciplines to interact more closely and boards of directors to make sure this convergence adds as much value as possible.

The book draws on research, path finding experiences and recognised best practices from some of the world's leading practitioners in asset management. The diverse backgrounds and perspectives it offers are particularly helpful in revealing the holistic aspect of asset management. The main message is that asset management is a rigorous long-term approach to delivering improvements in financial, social and environmental performance that is relevant wherever the reliability and availability of physical assets are key to success.

Readers less familiar with the practice of asset management are provided with an excellent introduction to the evolution of the discipline over recent years and a comprehensive introduction to its key elements. For those who are more practiced in the art, the many cross-sectoral examples of good practice provide a range of alternative methodologies and insights which can bring real value to your operation.

Organisations need to fashion their own asset management policies, strategies and plans and decide how best to implement these. The

book's great strength lies in the reflections, practical guidance and examples it gives on how to set about these tasks. Furthermore, every chapter is superbly referenced, providing a host of channels for deeper exploration into subjects of greater interest.

I commend this book to all of you, from novice to expert and have no doubt as to its lasting value to the advancement of the discipline.

Robert Davis
President, Institute of Asset Management
Group CEO, EA Technology Ltd

Preface

A year ago I met with some of the authors who have contributed to this book. We talked about producing a state-of-the-nation-style pamphlet on asset management for our clients, and from that idea this book grew.

If the volume of government initiatives, research programmes, professional body activity, training courses and conferences is anything to go by, interest in the whole-life management of physical assets is growing exponentially.

A few years ago, asset management conferences would be attended almost exclusively by engineers from utility, petrochemical, rail and highways businesses and their regulators. Today, you are just as likely to find people from government, defence, local authorities, health, property, education, banks, ports, interest groups and the emergency services.

Wherever the availability of reliable assets is important, asset management is giving organisations a new way of looking at what they do. It is a lens they can use to refocus their strategies and resources on delivering sustainable long-term value and performance.

If you are new to and serious about asset management, whatever stage of your career you are at, I hope this book of essays by some of today's leading lights on the subject will be a good companion to you as you travel onward. Whether the subject is strategic decision-making, trading off whole-life costs and risks, adapting to climate change, building careers, winning the argument in the boardroom, benchmarking or changing attitudes, this book has something to say and some useful advice to follow.

My thanks are due to my fellow authors for being prompt and perceptive; to Matthew Lane of Thomas Telford Ltd, who commented so usefully on early drafts; to my colleagues at CAS for holding the fort; and to my wife for her grace and patience.

Chris Lloyd
Director, CAS

List of contributors

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Penny Burns is an economist specialising in systems for improved decision-making in public infrastructure. Her work on the cost and timing of major infrastructure renewal for the South Australian Parliament in 1985–1987 led to national interest in asset management and to work being commissioned by local government in the UK, which was distributed to all councils throughout England and Wales prior to the roll-out of asset management. She was Foundation Director of the Australian Centre for Experimental Economics, and has been appointed to numerous boards, panels and ministerial advisory groups related to infrastructure asset management in power and water. She has written a book of analysis on infrastructure for the Grand Prix, and now edits and publishes *Strategic Asset Management* and advises governments on asset management strategy.

Richard Edwards

Richard Edwards MA, MIEE, is a Chartered Engineer who provides strategic advice to a range of infrastructure owners and regulators on the application and benefits of asset management and other business related issues. After graduating from Oxford University he worked in the rail industry for 15 years before moving into strategic asset management consultancy. He has been a director of Asset Management Consulting Ltd (AMCL) for 12 years and has been the nominated Independent Reporter for Asset Management to Network Rail and the Office of Rail Regulation in the UK since 2005. Richard is a board member of the Institute of Asset Management (IAM) and Deputy Chairman of the EFNMS Asset Management Committee. He is leading the work on behalf of the IAM on delivering one of its strategic objectives to establish an explicit, coherent and inspiring vision and plan for beyond BSI PAS 55.

Dr Charles Johnson

Charles Johnson is an Associate Fellow of the British Psychological Society and a Chartered Occupational Psychologist. Over the last 30 years he has supplied psychological and human factors expertise

into the health industry, financial sector, construction and engineering sectors, chemical and pharmacological industry, the military and emergency services, transport sectors and various government departments. His work has involved him in organisational development and change management, culture change, crisis management and disaster recovery, competence management, market research, assessment and selection, psychological testing, career counselling, job design and ergonomics. Charles is Technical Director of Competence Assurance Solutions Ltd (CAS), Director of Psychological Services for Cambridge Occupational Analysts Ltd and Chairman of Johnson Doughty Ltd. For the last 10 years he has been a member of the British Psychological Society's Steering Group on Test Standards, of which he was Chair from 2000 to 2004.

Chris Lloyd

Chris Lloyd BA Hons, MA, is Managing Director of Competence Assurance Solutions Ltd (CAS) a psychology based management consultancy which advises clients on asset management leadership and competence, structure and culture. He is a member of the Council of the Institute of Asset Management (IAM), Chair of its Qualifications and Professional Development Committee and led the development of the IAM Competences Framework which was published in 2008. Chris has written and lectured widely on competence issues and co-authored *Implementing Standards of Competence: Practical Strategies for Industry* which was published by Kogan Page London in 1993. Chris is a non executive director and chairman of a number of other businesses offering asset management, engineering and environmental consultancy and research services. He is a Fellow of the RSA.

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Steven Male is Professor of Property and Infrastructure Asset Management, School of Civil Engineering, University of Leeds. Steven is also Director of the Institute for Resilient Infrastructure. During 2004–2005 he led a team to develop a national asset management framework for the UK Environment Agency's £23 billion replacement value asset base and associated £300–400 million/annum capital programme. During 2005–2006, Steven led a team to undertake the UK Office of Government Commerce's (OGC) research project to investigate improving asset management of the £220 billion central civil government estate. He recently completed a study for the OGC and UK Commission

for Architecture and the Built Environment of capacity, capability and skills in the procurement of major construction programmes and projects across the public sector.

Martin Pilling

Martin Pilling BEng, CEng, MIET, is a Chartered Engineer with extensive knowledge of technical, performance and regulatory issues affecting the major utilities and the rail industry. He sits on both the Council of the Institute of Asset Management and its Patrons Group. He is a founding director of Asset Management Consulting Ltd (AMCL). An internationalist from an early age, he was one of the first people in the UK to complete the International Baccalaureate Diploma and, fluent in several languages, he was selected as the UK Youth Representative at the Council of Europe in Strasbourg. Graduating with honours in electrical and electronic engineering in 1990, he went on to hold key front-line management positions in asset-intensive industries before joining the consultancy group Atkins in 1995, where he helped create its asset management services. Martin left Atkins in 1997 to establish AMCL.

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John Woodhouse

John Woodhouse MA, FIAM, MSaRS, is a Council member, the Chairman of Faculty and first Fellow of the UK Institute of Asset Management. He also chairs the Development and Standards Committee, and was the project director for the development of the

BSI PAS 55 standard. John is also Managing Director of TWPL, one of the world's leading asset management training and consulting companies. Between 1995 and 2000, he was the project manager, on behalf of the UK government, for the European MACRO project, a 20-organisation consortium developing risk-based methods (asset performance tools) for optimised asset management decision-making. He is currently managing the SALVO R&D programme in this area, focusing on best practices in the management of ageing assets, whole-life cycle costing and optimal renewal timing. John is also a visiting lecturer and external examiner on various masters degree programmes, and is author of the book *Managing Industrial Risk* published by Chapman and Hall in 1993. He is a member of the UK Safety and Reliability Society, and has a masters degree from Cambridge University.

Introduction

Chris Lloyd Director, CAS and Member of the Council of the Institute of Asset Management, UK

Simply pushing harder within the old boundaries will not do.

Karl Weick

1 The whole life management of physical assets

Until recently, the term *asset management* was most commonly associated with financial asset management. Financial asset management is concerned with managing and guiding investments for increased returns which are conceived of purely in financial terms. Physical asset management is similarly concerned with returns on investment, but it focuses on the whole life of capital assets and calculates value in terms of the optimum trade-off that can be achieved between social, environmental and economic objectives.

Asset management is a strategic discipline which gives rigour and accountability to the way organisations decide:

- how, where and in what to invest
- what assets are most critical
- what risks need to be managed
- what demands must be served
- what needs to be known
- how this knowledge should be captured and disseminated
- how organisations should be structured and led
- what types and teams of people they need
- how activities should be carried out
- how actual performance should be measured
- that improvements are needed.

Asset management involves bringing these and many other decisions into a coherent framework to ensure their outputs serve organisational goals. It is a holistic and integrative approach to managing the whole life of assets, from their inception through to their disposal, which involves looking forward as well as backwards, outwards as well as inwards, and balancing the needs of all stakeholders – those of today and those of the future.

In Chapter 5, 'Asset management strategy: leadership and decision-making', Penny Burns calls asset management an art form. Perhaps

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there are analogies that can be drawn with juggling or high-wire walking but, first and foremost, as all the contributors to this book make clear, it is a systematic application of principles. Good asset management is characterised by a clear line of sight from the directors in the boardroom to staff on the front line, from the asset management strategy to the individual task. It requires asset policies to be justified, strategies to be evidence based, impacts to be traceable and asset information to be up to date and reliable. It also requires a clear, well-communicated end-to-end process backed up by unambiguous roles and responsibilities, and managers who have the knowledge, skills and experience to understand, contribute to and enact asset management policies, strategies and whole-life asset management plans. Above all, it places a high premium on knowledge and learning and demands serious commitment to continuous learning from people, teams and organisations.

2 An idea that has found its time

There was never a better time for the whole-life management of physical assets to enter mainstream corporate thinking than now. For the foreseeable future, organisations, industries and whole economies which depend on the availability and condition of physical assets are going to succeed or fail on their ability to manage them efficiently and sustainably with insufficient resources. The fine print of success may vary but the overall goals will be the same:

- spending less to get more
- leaving assets in the same state as you would wish to find them
- managing risks not resources
- thinking in whole systems not their parts
- applying a whole-life perspective
- everyone reading from the same page
- stakeholders understanding the choices made.

The return on investment in physical assets can take many forms. It could be:

- more profitable delivery of services
- the contributions their condition makes to maintenance and operational costs
- how long-term planning reduces capital and operational expenditure and associated funding calls on investors
- how their availability helps communities access essential services

- how their resilience to severe weather or terrorist threat bolsters the reputation of a business
- how healthy they are when handed over to the next generation
- how historical decline in their condition is halted or reversed.

Whatever success looks like for you, this book considers the role that whole-life management of physical assets can play in delivering it. It challenges the reader to consider the balance between short-term efficiencies and long-term sustainability. It examines how organisations accommodate both of these and achieve the degree of integration across disciplines and activities that effective asset management requires. It gives practical examples of how asset management principles can guide organisations to make better risk-based decisions, calculate long-term funding requirements in uncertain environments, smooth out demands on the people who pay for them, and demonstrate value for money and good governance to regulators, shareholders and other stakeholders.

In Chapter 2, 'Asset management in the oil and gas, process and manufacturing sectors', John Woodhouse describes how asset management has helped organisations 'break the cycle of just chasing efficiency gains from doing the same thing quicker/cheaper and forced a first-principles consideration of what was worth doing in the first place'. Asset management provides a way of calculating which outputs can be delivered for the available funding in a sustainable way. Organisations in the early stages of adopting its principles may be more concerned with delivering efficiencies in the next performance period. As their grasp of its principles and methods of application improve, asset management will help them think about how they can do this without detriment to the period after the next one, and the one after that. As their capabilities mature, the decisions they make will involve less whole-cost and through-life value sacrifices, and where these occur they will be able to justify them.

Asset management enables all parties with a stake in the performance of an organisation or an industry to engage in evidence-based debate about cost, risk and performance, and how these should trade off over time to deliver sustainable outcomes. This raises the thorny issue of how organisations, particularly those which are monopolies or in public ownership or both can be incentivised to embrace asset management and how incentives can endure changes in senior personnel, regulatory bodies, owners and government administrations. Richard Edwards addresses this in Chapter 9, 'Regulating asset management', as does Steve Male in Chapter 3, 'The challenges facing public sector asset management'.

3 Growing momentum and consensus

The emergence of asset management has gained impetus from growing public and consumer scepticism and demands for greater accountability from the government bodies responsible for major capital investments in infrastructure and from transport and utility service providers amongst others. In the USA this has led to a more asset-based approach to state financial reporting of facility condition and asset valuation. The work in recent years of the US Federal Highways Administration Office of Asset Management is a good example of the efforts now being made to disseminate asset management practices to policy-makers and their infrastructure maintenance and renewal supply chains.

In the UK and elsewhere, economic regulators have been appointed to oversee asset management performance in all sectors where it is a major issue. An array of guidelines has also appeared over the last few years from organisations seeking to promote or influence asset management thinking and techniques amongst their members or constituencies or client bases. In the UK, these include the County Surveyors Association, the Construction Industry Research and Information Association, the Royal Institute of Chartered Surveyors, the Highways Agency, the Department for Communities and Local Government and the Office of Government Commerce, not to mention the Institute of Asset Management, which in 2008 launched updated versions of BSI PAS 55 and its Competences Framework. Close co-operation between the European Federation of Maintenance Societies and its counterparts in the USA, Australia, the Arabian Gulf Region, Brazil and Latin America led recently to the formation of the Global Forum on Maintenance and Asset Management. The work of the New Zealand Asset Management Steering Group continues to exert influence on international asset management thinking and practice, as it has done since 1995.

The results of all these efforts are impressive. A strong consensus is building on the meaning of asset management, people are starting to use a common language to discuss and debate its application and benefits and, in BSI PAS 55, there is an internationally accepted standard for asset management systems.

4 A new way of thinking

Imagine you are the MD of a business of which 90% of everything it spends goes on creating, maintaining, renewing and disposing of its

assets, and which makes profits only when those assets are in service. Regulators are holding your prices down, energy costs are fluctuating wildly and politicians are pressuring you to reduce your carbon footprint. Shareholders don't like your investment strategy but regulators and customers are demanding it.

Judging by the way your organisation is structured and the day-to-day preoccupations of your managers, you wouldn't think any of this was happening. Departments are working in silos and conniving against each other, annual planning cycles dominate the internal fight for funds, and performance targets are pegged to short-term targets. Not surprisingly, it's getting harder and harder to explain the thinking behind the decisions you and your fellow directors are making. Your managers know this, and they understand why, but the credibility gap between what the company says it stands for and how they have to behave is wearing them down. Key people are leaving and new ones are hard to bring on line.

Why not reorganise? Your organisation has been doing that for years. How about refocusing the strategy? The long-term corporate vision and strategy has been under development for years. What about some fresh blood? The last lot didn't stay fresh for long. You could create an internal communications team, but you know that's only a temporary dressing.

There is some good news. Most of the elements needed for a successful turn-around are already in place. You have good people, most of the processes and procedures that would be expected of an organisation working to high standards are in place, customers are sticking around, and your research team is saying you are in the upper quartile for economic and effective service. The bad news is that processes might look good on paper but they don't join up, more is spent on compliance than improvement, you don't know what condition most of your assets are in and your people don't believe you when you say things can change. It's a vicious circle. Events are running the business. There is a lack of confidence in people's planning abilities. The organisation is becoming increasingly reactive. Some of your directors are wearing rose-coloured spectacles – they don't know the asset portfolio and they don't know the asset policies. The quality of upward reporting is poor. This is creating lots of spaces that some of your managers are hiding in. Does this sound familiar?

Asset management offers a way out of these problems but it is not an instant solution. It gives you a way of achieving your business goals but only if you define them first – no business is in business just to become good at asset management. It can help you integrate your management

and information systems, technical resources and human capabilities in focused, long-term pursuit of your objectives but only if you are clear what these objectives are and understand their implications. In this respect, asset management is not a new discipline so much as a new amalgamation of old disciplines galvanised around whole-life principles of cost, risk and sustainable performance.

5 The purpose of this book

This book is for people new to the subject of asset management who want to get to grips with its principles, characteristics and benefits. It contains a compendium of short, thought-provoking pieces contributed by leading practitioners and thinkers in the field.

The chapters of this book deal in different ways with the practicalities of asset management such as investment decisions, whole-life costing, demand forecasting, strategy and planning, risk-based maintenance and the management of change. The authors bring their different perspectives to bear on the application of a common conception of asset management as a strategic, whole-life, risk-based, enterprise-wide, multidisciplinary, game-raising endeavour. They trace its evolution, take stock of current best practices, review the benefits and consider future directions. They have written research and practice-based articles covering all the key dimensions of asset management. The book is, therefore, a unique starting point for readers new to asset management or with new asset management responsibilities, and for students of asset management and their teachers. The multidisciplinary character of the book also gives managers and executives a coherent introduction to how asset management principles can provide an organising approach for their businesses.

6 Main themes of the book

Four themes recur throughout this book.

6.1 Sustainability

This means different things to different stakeholders; so, how do businesses, government, regulators and the general public ensure that assets are fit for the next generation? How can resources be allocated

efficiently and fairly between competing short- and long-term commercial, social and environmental interests? How do you get key players in the boardroom or in government to think beyond their own tenure? How do you make sure knowledge and understanding aren't lost when functions or activities are outsourced or people leave?

The rationale for the widespread adoption of asset management is based on the related factors of reduced operational and capital expenditures and the standardisation of processes and competences. The arguments for this rationale are made from financial, social and environmental standpoints throughout this book.

Driving the demand for asset management are the forces of competition – between individual organisations and whole industries, between today's consumers and tomorrow's, between short-term and long-term priorities, between output and sustainability, between shareholder and wider stakeholder expectations.

Finding a response to global warming is another major imperative on organisations to get their asset management strategies right. In Chapter 8, 'Incorporating climate change within asset management', Ralph Rayner states that 'There is now a high level of confidence that our climate is changing due to human activity and especially due to emissions of greenhouse gases.' He goes on to observe that organisations now have only a 'limited capacity to accurately project environmental conditions over the lifetime of assets and asset systems'. The stakes couldn't be higher for organisations responsible for delivering essential services. In this context, rigorous, risk-based whole-life asset management isn't a choice, it's a necessity.

6.2 Organisation

For most organisations, the adoption of asset management will mean developing mechanisms to enhance, encourage and facilitate coordination between previously distinct functions. For example, the relationships between the information an organisation needs for whole-life costing purposes, the knowledge standards it sets and the data it collects need to be seamless. Fragmentation of roles and responsibilities and rival subcultures are known to be significant barriers to the successful practice of asset management. In particular, they can affect the efficiency with which the individual components of an asset management system interact.

So, what does a good asset management organisation look like? Where do you start? How do you incentivise and control change? How do you balance innovation and risk and who decides this? How do

you get line-of-sight between the asset management policy and strategy and the functions and activities their success depends upon?

6.3 Measurement

Best practices emerge from a few organisations and are standardised for adoption by the many. Over time they become custom and practice in whole sectors, and this enables less advanced organisations to compare themselves with their peers and use the results to plan the next stage of their development. So, how do we measure good asset management? How can businesses be challenged to move beyond compliance? How do you define the level of process maturity your organisation requires?

The systematic application of asset management principles has been proven to make a positive contribution to organisations. It leads to a greater efficiency in asset stewardship, greater cohesion between the various functions of the organisation, improved communications with regulators and other stakeholders, increased confidence in investment decisions and their justifications, and more effective knowledge and skills management and transfer. All this requires measures organisations and their stakeholders have confidence in and evidence they believe.

Standards may be set in a number of ways – by an unchallenged innovator, through contestation, by industry consensus or by state imposition. They are validated in the marketplace by the demand for the products and services that embody them. BSI PAS 55, the specification for the optimised management of physical assets, was developed by the Institute of Asset Management on behalf of the British Standards Institution. It has grown out of industry consensus spanning sectors and continents, and, judging by the demand for assessment and certification against its requirements since it was first published in 2004, its arrival has been timely. Companies such as Serco are using it to establish and verify asset management systems. Others such as National Grid are using it to enhance international cooperation and comparison between business units. It is also increasing demand for and raising the profile of asset management specialists, which is attracting the interests of educators, training companies and the professions. If further evidence of its impact is needed, work is now underway to turn BSI PAS 55 into a full-blown ISO standard.

BSI PAS 55 is not an end-point but it is an important waypoint on the journey to what Martin Pilling calls ‘appropriate best practice’ in Chapter 4, ‘Beyond BSI PAS 55 compliance’. Most organisations

which take asset management seriously are thinking more about value than compliance. To raise consumer and regulator confidence in their decisions, asset management organisations need to do more than simply wave certificates.

6.4 Change management

Successful organisations get the relationships right between opportunity, strategy and structure, and they manage to keep these relationships strong in the face of external changes and uncertainties. This is especially difficult when an organisation faces sudden shocks to its system after a lengthy period of stability. Is asset management evolutionary or revolutionary? How widespread are its implications? Can it help organisations deal with uncertainty and future changes better?

In Chapter 1, 'Asset management in the rail and utilities sectors', Richard Edwards identifies the major activities which need to be aligned and integrated in an asset management system. Few organisations will come to asset management without a history, so change management has a big part to play in how successfully they will be able to adopt and apply its principles. Charles Johnson examines the implications asset management has for asset management, and vice versa, in Chapter 6, 'Creating an asset management culture'.

The implications are most significant in the boardroom, where it is not unusual for established heads of functions to resist moves to bring asset management under a single authority. This is difficult enough to achieve in the operational business, but without director support, efforts to achieve the level of integration that good asset management requires face being subordinated and stymied by rivals. If you want to give leadership to asset management, you have to think and operate at the right level, as Penny Burns argues in Chapter 5, 'Asset management strategy: leadership and decision-making'.

One of the key battlegrounds in organisations on the lower rungs of the maturity scale is information and data sharing. Asset management decisions feed on detailed data on condition, resources, demand and performance. Without this, there can be no real appreciation of constraints, returns or long-term value, and the ability to weigh the impact of different options, carry out 'what if' analyses and articulate choices to stakeholders is seriously diminished. Moreover, without a steady flow of reliable and valid data, decision-making becomes less consistent and less transparent, and decisions become harder to defend. However, to deliver qualitative and quantitative system or network-wide data, people have to trust each other, be willing to share

and be committed to the overall goal. For these reasons, information sharing is a litmus test of progress towards an asset management system.

7 Structure of the book

The ten chapters in this book are arranged in three sections. A short postscript closes the book with some reflections on the role of directors, regulators and governments.

Section 1: The story so far

This considers the origins and development of asset management thinking, systems and techniques within major industries and government. Chapter 1 gives an explanation of why and how asset management has emerged in the transport and utilities industries and Chapter 2 does the same for the process and manufacturing industries. Chapter 3 focuses on asset management in the public sector. Chapter 4 considers the role of BSI PAS 55 and looks beyond compliance to the pursuit of appropriate best practice.

Section 2: Organising for asset management

This is concerned with strategic asset management and its implications for the asset management capabilities of people and organisations. Chapter 5 examines the nature, scope and implications of strategic asset management decision-making for industry and government. Chapter 6 considers how organisational structures and cultures need to adapt to support asset management, and Chapter 7 is concerned with the development of asset management competence – in the boardroom, the workplace and the supply chain.

Section 3: Looking ahead

This focuses on the contribution asset management needs to make in decades to come. Chapter 8 discusses how asset management performance can be regulated. Chapter 9 examines the implications of climate change for asset management policy and strategy. Chapter 10 looks to the future of the asset management discipline and the benefits it can be expected to deliver.