

*Organizational Mastery
with Integrated
Management Systems:
Controlling the Dragon*

Michael T. Noble

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Management Systems:
Controlling the Dragon*

*A Manager's Tool Box for Enhancing
Process Quality and Environmental
Health and Safety (QEH&S)*

Michael T. Noble



A John Wiley & Sons, Inc., Publication

New York • Chichester • Weinheim • Brisbane • Singapore • Toronto

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Published simultaneously in Canada.

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For ordering and customer service, call 1-800-CALL-WILEY.

Library of Congress Cataloging-in-Publication Data:

Noble, Michael T.

Organizational mastery with integrated management systems : controlling the dragon / Michael T. Noble.

p. cm.

“A manager’s tool box for enhancing process Quality and Environmental Health and Safety (QEH&S).”

“A Wiley-Interscience publication.”

Includes index.

ISBN 0-471-38928-5

1. Industrial safety — Management. 2. Quality assurance — Management. I. Title.

T55 N53 2000

658.3’82—dc21

00-020685

Printed in the United States of America.

10 9 8 7 6 5 4 3 2 1

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Forewords

In 1996, the opportunity to develop yet another international ISO standard for occupational health and safety was turned down by the overwhelming consensus of representatives from industry, labor, and various governments from both developed and developing countries. There were many contributing reasons for this unusual and unexpected consensus, among which was the realization that organizations cannot and should not be expected to implement multiple, overlapping, redundant, and possibly conflicting management systems. That year, ISO 9000 was already well-established throughout the world and ISO 14000 had just been released after a relatively short three-year development effort in ISO Technical Committee 207. There was very little appetite at that point for yet another set of specifications that would inevitably lead to a new layer of system procedures, programs, and metrics for organizations to implement and seek certification. The belief at that time was that these standards were additive and that they resulted in multi-layered systems within an organization.

In the intervening years, that view has been overtaken by the realization that an organization should really have only one management system—not a stack of them—and that the specifications in ISO standards are simply elements that can and should be integrated into the existing organizational system. ISO 9001 and ISO 14001, and all such “system standards”, are now more often considered as sources of system elements that address a specific part of an organization’s structure and dynamics. Once integrated, these elements become components of the overall system, undifferentiated and totally congruent with the underlying principles of employee involvement, management leadership, process consistency, prevention, and continual improvement. These systems are also expected to include common organizational elements for training, corrective

and preventive actions, and communications, document control, record keeping, system audits, and periodic reviews by top management.

Mr. Noble has made the strongest case yet for the integration of disparate management systems in the quality, environmental, health, and safety areas. This volume presents a very compelling case for such integration, while usefully providing an abundance of tools, methods, and checklists that the prospective users can apply to their own systems. In an academic setting, this volume could effectively serve to provide a pragmatic view of management systems theory to students of safety, environmental, or risk management disciplines. This text may also engage the parties and breathe new life in the ongoing debates on the desirability of an OH&S standard and on the best way to promote system integration.

—*Joe Cascio, Global Environment & Technology Foundation; Chair, U.S. Technical Advisory Group for ISO 14000*

For the person who is a professional in the field of risk evaluation and management, this volume will prove to be a useful source of information. This book has a richness of figures, “how-to” diagrams, and process analysis models that complement the explicit instructions to auditors. It has a nice focus on OHS management systems, which are important today and will be ever more important in the future.

The compelling case for an integrated occupational hygiene, safety, and environmental management system integral to the quality system of an organization is made in this book. Because of its efficiency and effectiveness, this integrated system will work. Even if we ignore the compelling ethical arguments in favor of using all available effective tools in our arsenal to protect workers domestically and globally, this book explains why clear-seeing organizations will implement such an approach because this approach represents good business.

ISO 10441 as a pure environmental management system without OHS aspects integral to its philosophy and practice simply was, is, and will be illogical. Even in the meeting in Chicago during which “international ISO standard for OHS was turned down by the overwhelming consensus of representatives from industry, labor, and various governments from both developed and developing countries”, this point was already moot. At just about the time of that meeting, an article was published in the technical press entitled “IBM spells SAFETY I-S-O”. Indeed, a representative of one of the largest companies in the world stood up in that Chicago meeting and said, “Whom do we think we are kidding? We are either already doing this [integrated E&OHS MS], or are planning to do it because it makes sense!”

This book explains why that is so, and how to achieve such an integration. Let us hope that practitioners and policy makers alike will embrace this idea. Indeed, there are many such efforts in progress. The British Standards Institute has its BS 8800 and BS 18001 products; the American Industrial Hygiene Association has its ISO 9001-based OHS MS and its ANSI Z-10 committee; and the ILO has its landmark report published in 1999 surveying and analyzing the world’s

OHS management system standards. These groups, and Michael Noble with this book, are leading the way. One result will be that this practice becomes accepted worldwide, as well as a clearly integrated part of ISO 14001:200X, and thereby part of the world's contract specification systems.

— Steve Levine, Ph.D., CIH, University of Michigan, President-Elect of AIHA

In *Organizational Mastery with Integrated Management Systems*, Michael Noble has achieved a work for leaders who oversee the strategic management of quality, environmental, health and safety (QEH&S) issues within their organizations. It is a key process risk management tool to integrate QEH&S policy, planning, implementation, measurement & evaluation, management review and continuous improvement strategies.

To maintain a competitive advantage in the global economy, organizations are looking toward third party verification of their product quality, environmentally sound manufacturing processes and worker health and safety. The International Standards Organization is internationally recognized by business as the standards setting body for Quality Management Systems (ISO 9000) and Environmental Management Systems (ISO 14000). The integrated management systems approach presented in this work is aligned with these internationally recognized standards.

Organizational Mastery with Integrated Management Systems sets QEH&S in the language of business, not the typical quality, environmental, health or safety technical jargon that stands as a barrier to organizational understanding and implementation of business solutions. Of particular note are the real world examples which provide a “how to” approach to integrated management systems. This approach includes case studies and “hands-on” tools such as a Critical Process Observation Checklist and Job-Task Observation Report.

The influence of this book on the future of quality, environmental, health and safety management will be considerable. You will find this may be the only book you will need to assist you in meeting the challenges of an ever changing global economy, workplace, workforce and regulatory environment.

— Kathy A. Seabrook, CSP, RSP (UK), President, Global Solutions, Inc., Vice President, Practices and Standards, American Society of Safety Engineers

Mike Noble understands that safety is often not well-managed within an organization, and that there is a better framework for safety management. This book will be useful to several levels of business people. It will be valuable to management consultants, safety consultants, corporate safety directors, risk managers, financial officers, manufacturing managers, and production managers. The topics that Mike discusses are not new, but he has arranged them in a new and very readable way. I have discussed these topics, in one form or another, with my clients in recent years. It was good to see them all in one book.

Safety consultants and management consultants will use the information they learn to spur their clients to move to the next level of corporate control of their resources. Risk managers will use the information as a guideline to move forward with their management and with their chief financial officers (CFOs).

Management and CFOs will find the book easy-to-read. They will understand why their safety and management consultants are suggesting that certain processes be adopted. I like the way Mike has concluded each chapter with an “Action Plan”. Each level of reader will get something different from each chapter and will develop an action plan and strategy based on his or her insights from the text. Covering all this material, anyone wishing to implement Mike’s suggestions will have the same goal, but each will have a unique understanding of his or her role in the process.

I have read other safety texts published by John Wiley and Sons, Inc. “Controlling the Dragon” is one of the books that will make a difference for me in terms of improving my thought process, in presenting ideas to clients, and enhancing my consulting ability.

—*Frank Mastroianni, SrVP Marsh, Inc.*

With the rapid growth of ISO 14000, integration of management systems into a complete operating system is a key objective of many organizations. Mr. Noble’s book deals with this timely subject in a comprehensive and lively manner. He not only covers the specific items relative to an ISO 9000 QMS and an ISO 14000 EMS but also is able to show the relationships in a way that makes good common sense.

Beyond Mr. Noble’s coverage of ISO 9000 and ISO 14000, he breaks new ground in integrating concepts of health and safety (H&S) into his coverage of an integrated management system. A prospective “ISO 16000” for H&S was tabled by ISO, but the need for integrating H&S issues into the corporate management system nonetheless remains. Indeed, a significant multi-national client of ours has specifically requested incorporating H&S procedures into its ISO 14000 and QS-9000 management system. Mr. Noble’s book provides in-depth guidance on doing just that.

I think Mr. Noble’s book could become a standard treatise on the subject, and I look forward to its publication.

—*Robert C. Wilson, President of IQUES, a leading ANSI-RAB accredited ISO 14000 training and consulting company*

The United States, in general, has historically provided high-quality goods and services. Unfortunately, U.S. firms have used many different systems in providing these quality goods and services. Each of these systems has strong vocal advocates, and collectively they result in a lot of “quality noise” in the marketplace. This result, in turn, makes it difficult for practicing professionals to discern what really is important and what isn’t.

As a senior officer of a publicly held engineering firm for the past 19 years, I have often been confused with all the professional “quality noise” in the marketplace. The real compelling value of Mr. Noble’s work is that he takes this large mass of quality information and boils it down into something that one can readily understand. I enjoyed reading the book and I think significant numbers of other professionals will also.

—*Vic Johnson, Senior Vice President, Harding Lawson Associates*

It has been a professional highlight for me to be asked to review and comment on Mr. Noble's book "Controlling the Dragon". As a member of the Occupational Safety & Health field since 1973, I have had many profitable experiences but none have equaled the opportunity to contribute to such a comprehensive body of work.

The high watermarks of my career include positions of leadership, management, strategic planning, and program directing requiring knowledge of key literature that defines the state-of-the-art in this profession. Unfortunately, all of my quality program experience has been manufacturing-oriented without regard to service fields such as environmental health and safety (EH&S). Similarly, as a developer of national and global programs, I have continually struggled to provide direction to EH&S resources in the effort of quality systems and programming. These endeavors had led to the realization of the unfortunate fact that no one until Mr. Noble has approached the ES&H field with as comprehensive a volume of literature designed to make a major impact on program and system quality.

Mr. Noble's expertise in the EH&S field has allowed him to organize this book and present the "quality" message in a way that industry and the EH&S field will benefit considerably. In my view, Mr. Noble earns his credibility throughout the book starting with the introduction, as he details the historical perspective of "quality management", to the conclusion, wherein all levels of management are provided with a road map to success. In addition, the full text contains a richly filled toolbox to assist management in the design of policies, strategic planning, business improvement scenarios, quality EH&S program development, audits, cost-benefit analyses, and training.

The added bonus many multi-national companies will discover is that the concepts, principles, tools, plans, programs, processes, templates, forms, and overall philosophies in the book are global in nature and can be applied to any system worldwide. This information will better prepare companies for the ISO certification that will be required to compete in the global market.

In summary, I support Mr. Noble's concept of integrating EH&S into a company's "quality management system".

—James D. Griffin, MPH, CIH, Manager, World Wide Facilities, General Motors Corporation

Many multinational companies are experiencing fast paced business growth and global expansion into developing markets and countries. This expansion challenges the traditional means of providing occupational health and safety (OHS) services to their employees. Within these countries there may be significant variations in the scope, content and effectiveness of employee safety and health standards and regulations. Professionals along with line management are challenged to fine new ways to communicate and apply internal standards and processes within these variable work environments.

In response, many companies have turned toward management system standards as a means to develop and deploy occupational health and safety

(OHS) processes in highly complex business environments. These management systems are generally modeled from the ISO 14001 framework. Although there is no international ISO standard for occupational health and safety, companies are demonstrating leadership in this area by developing and institutionalizing internal management systems as a way of integrating OHS solutions into business strategies and operations.

For those companies who are incorporating OHS concepts into new or existing management systems, “Controlling the Dragon” is an exceptional guidance and reference document. The concept of utilizing an integrated management system approach as a methodology to develop these systems is clearly the way to go. The book provides clear guidance and will challenge professionals to focus on the entire management system rather than the concentric task at hand. In addition, it provides management system coordinators and focal points with risk analysis concepts, operational control techniques and measurement tools necessary to ensure effective maintenance and development of quality management systems.

The book will also help companies identify significant aspects, objectives and targets which are essential in any quality management system. Clearly, Mr. Noble’s book is timely and will be a valuable tool to professionals for years to come.

—Mark Kline, *Regional Well-Being Manager, IBM Corp.*

The European Union continues to reflect — and in some cases, lead — the globalization of accepted corporate practices; benchmarks; and reflected accountabilities in relation to the management of health, safety, quality, and environment. Compliance with ISO 9001 and 14001 has gone beyond mere certification to become established values, whilst management systems in relation to health and safety have been an explicit legal requirement since 1992.

On the eve of a certified management standard for health and safety (in the United Kingdom, at least), Mike Noble’s book comes at a time when the impetus in Europe for a truly integrated system to prevent loss has never been greater. His book will fuel the debate and go beyond the mere academic — offering practical guidance and methodologies for those wishing to rise to the challenge.

As such, *Controlling the Dragon* is sure to become an invaluable source for practitioners and students alike at a time when industry is not only seeking to lend transparency to its corporate practices but also to ensure the prevention of accidents and to reduce loss and secure the environment for future generations.

—Huw Andrews, *Bsc(Hons), FIOSH RSP, Director, Health, Safety, and Environment, EEF South, United Kingdom*

About the Author

Mike Noble has 23 years of experience as an environmental health and safety risk manager and has been a consultant since 1989. His senior management experience includes international health and safety consulting with a global insurance company, and the startup of a public environmental consulting company. He has done a lot of work in operations management as well, including strategic planning, marketing and business development, product/service development, budget and personnel management, labor relations, training, and quality and project management.

Mr. Noble also has a great deal of technical experience—developing and teaching courses for Southern Illinois University, Liberty Mutual, and Liberty International Risk Services, as well as Mare Island Naval Shipyard, and the Department of Labor (OSHA). In addition, he wrote and directed the preparation of significant sections of the Naval Sea Systems Health & Safety Control Manual, which has been used at all Naval Shipyards since 1980. He has also taught at California State University, the University of California extension programs, and at various professional conferences and seminars, including several international congresses. Other publications have included articles on the environmental risks associated with real estate transactions and building safer jobs.

Mr. Noble has an MBA in Health Services Management from Golden Gate University, and both a BS in Biology and an MSPH in Environmental Health from the University of South Carolina. His credentials also include being an Associate Risk Manager, Certified Industrial Hygienist and Safety Professional, and a Registered Environmental Assessor. He has served on the boards for Liberty International Risk Services, a hospital, and three environmental companies. Formerly, he was the Director of International Consulting Services for Liberty International, and he is currently an officer with Science Applications

International Corporation (SAIC), and Division Manager in their San Francisco office.

Very active in his community, Mr. Noble has participated in Peace Builders, a youth violence prevention program. While in California, he was co-chair of the Solano County Cancer Prevention Program, and a member of the county's Health Promotion Committee. He was also instrumental in the HAS's efforts to create California's cigarette tax initiative. Mr. Noble can be reached at www.corporatewarriors.com/noble, or at noblem@saic.com.

Acknowledgments

There are many people to thank, but the one person I would like to acknowledge first is my illustrator Pauline Hauck. Pauline created drawings that gave a serious book a sense of lightness and fun. I sincerely appreciate her efforts and hope that those of you who see her work will contact her.

Pauline lives in the foothills of California with her husband and dog. She is a registered nurse by day and a cartoonist and illustrator the rest of the time. Her web site features examples of her work and she can be contacted there for additional information by going to <http://www.customcartoons.com>.

Over the course of my career many people have influenced me and have served as mentors. I would like to thank all of them, especially my former boss, the late Carol Tatum, who walked me through the systems safety approach used by the Navy's Nuclear Power and Radiation Control Programs. Much of my understanding of process control, quality management systems, and systems safety is the result of "lessons learned" while working for a nuclear shipyard. I am especially thankful to Tony Pattitucci and Ernie J. Scheyder who asked me to chair the shipyards Management Enhancement Team and visit all of the companies discussed in Tom Peter's book, *"In Search of Excellence."* The purpose of these visits was to learn about each company's quality improvement processes and management development programs.

The results of the research into these companies and of Deming, Juran, and Crosby's Quality Processes significantly impacted my perspective of Quality, Environmental Health and Safety management. The "lessons learned" and perspectives developed during those years has strongly influenced this book. In addition, I need to thank Bill Priess the Shipyards Production Engineer and Quality Management Czar. Bill is a great engineer and was a good mentor teaching me how to get things done given the bureaucracy and politics of a large

facility like the shipyard (more than 13,000 employees), and in implementing organization-wide programs that ultimately affected more than 75,000 employees.

I also need to thank Bob Paedon, a long-time friend and nuclear quality control manager at the shipyard and Rachel Dondero who was a valuable friend and mentor for human relation's issues and some of life's lessons. Last but not least I want to thank Harry Mann who required the Occupational Health and Safety Department to oversee the shipyard's environmental program, another significant and very influential experience that ultimately lead to my becoming a co-owner of an environmental management consulting company.

In addition I would like to thank my reviewers whose long hours of work and constructive criticism have been very valuable; those people included Joe Cascio, Vic Johnson, Mike Williams, Diana Kollin, Bob Wilson, Frank Mastroianni, Steve Levine, Kathy Seabrook, Mark Kline, Lloyd Brown, Jim Griffin, and Huw Andrews, and some of Wiley's reviewers, especially Mr. John Polhemus of Bayer Corporation.

I would especially like to thank Joe Cascio, Steve Levine, Kathy Seabrook, Vic Johnson, Bob Wilson, Frank Mastroianni, Jim Griffin, Huw Andrews, and Mark Kline for their contributions to the Foreword of this book. Their insights and contribution have been very helpful, and will assist most readers in better understanding the practical application of an Integrated Management System.

Gratitude is also owed to Patricia McDade, the founder of the Entrepreneurial Edge, and Bill Rodgers, my management coach while I participated in "The Edge". Their insights into life and business have contributed immeasurably to the writing of this book. My long-time friend Roxanne Fynboh and my former partner Dr. Bill Cornils also participated in "The Edge"; they have both been valuable "coaches" and great friends over the years. I wish them the best with their company California Industrial Hygiene Services.

An advance debt of gratitude is also owed to John Cook, President of the Environmental Careers Organization for offering to list the book on their web site. In addition a debt of gratitude is owed to my editor Jerilynn Caliendo, who has provided immeasurable help in having the book reviewed, edited, and published. I am looking forward to working with Wiley in the marketing of this book, and in future endeavors.

Last but not least I want to thank my wife, Brenda, who put up with me working weekends and nights on top of an already busy schedule to write this text. Without her patience, I would have stopped long before the first draft was finished.

Michael T. Noble
San Francisco, CA

Introduction

Webster's defines a master as "an artist, performer, or player of consummate skill. . . a great figure of the past. . . whose work serves as a model or ideal. . . to gain a thorough understanding. . . one that conquers or masters. . . one having control of an animal." Organizational Mastery is one of conquering and controlling the multi-headed dragon that exists in many organizations. It is about being the best and ensuring that your organization understands and controls process risk; and provides its internal and external customers with exactly what they need, or require. It demands that managers strive to be "peak performers" or "players of consummate skill", models who thoroughly understand and consistently delivers the customer's expectations.

Mastery also means having a mission, a sincere gut-level focus to be the best. I have a friend, Frank Mastroianni, who is a SrVP and Risk Service consultant at Marsh, Inc. Frank is a master not only in his career, but also as a Black Belt in karate. He is one of the elite, one of the best in this sport, and, given that he is still actively engaged in it after 30 years, you must assume that karate is one of his passions in life—an opportunity to be the best that he can be!

Organizational Mastery is also demonstrated in people like Jack Welch, General Electric's CEO, who is leading the Six Sigma commitment for GE and the Six Sigma "Black Belts", who are saving their companies hundreds of millions of dollars with a very advanced level of Statistical Process Control (SPC). We will talk more about SPC and Six Sigma in Chapter 7.

This book focuses on the process of taming the dragon, as if it were a pet, and controlling it so that it behaves in ways that are desired, expected, and predictable. The many heads like a the multi-headed dragon tend to fragment an organization, each trying to pull the system to serve its needs. Sometimes the different heads of the dragon, or of an organization do not know about or understand the needs

of the other heads. This fragmented approach to process control can be changed! To get started we simply need to get out of our respective “professional boxes”. Managers must learn to identify and better define the multiple root causes of process nonconformance to effectively design controls or to change procedures to mitigate process risk. The greatest level of effort must initially be applied to problem definition and gap analysis and risk assessments so that appropriate and prioritized controls and process changes can be effectively implemented. Like any other problem, or as any engineer will tell you, more than half of the “the battle” is won, once the issue is adequately defined or understood.

This book is about using the best of the various process management tools found in quality, environmental, and safety management for an Integrated Management System (IMS) approach to process risk management. QEH&S management systems can be more effectively managed if they are integrated into a single coherently managed system or process. We could discuss the advantages of various organizational structures, including matrix management. Although I believe that the matrix approach makes the most sense, how a company is currently organized will dictate the organizational structure for an IMS, therefore we will not spend much time discussing these options.

However, I believe that most organizations will benefit from establishing what I will refer to as a process enhancement team (PET). The PET is an iteration of process risk assessment groups. It includes department or work center team members, supported as necessary with other engineering or organizational participation as necessary (a Matrix approach to organization). Each department or work center will have its own PET, however, as necessary members of other departments will be required to temporarily support other work center PETs. This matrix-type support is necessary to help clarify customer (external and internal) requirements or to participate in the review/approval process for various control options, including setting schedules and determining the cost—benefit of control options. This process will require significant employee involvement. The responsibilities of a typical PET team could include the following.

- Defining and documenting internal and external customer needs
- Performing process risk assessments and reviewing existing loss or nonconformance data to start the process of identifying primary process risk factors and systems gaps
- Supporting QEH&S audit teams with their gap analysis
- Identifying and implementing prioritized process change, including the need for changes in or the scheduling of delivery for various supplies and services, tools, equipment, etc.
- Involving needed support departments and service providers in the risk assessment and processing enhancement effort
- Processing measurement and evaluation support

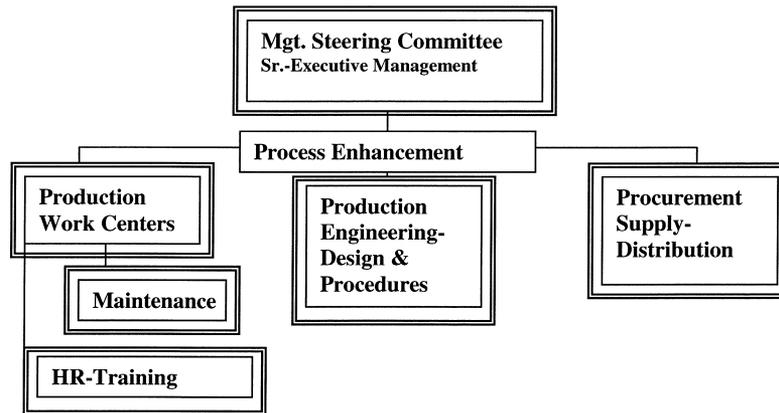


Figure 1 PET Organizational Chart-Model.

The PET is a grass roots structure similar to quality circles of the 1980s. They will oftentimes be responsible for performing qualitative risk assessments. Their charter is to ensure that there is full employee involvement in the assessment and risk ranking of work center processes and for recommending various corrective or process improvement actions, including behavioral safety or performance management systems. The PETs also play a very critical role in the development of critical process observation checklists and in conducting many of the routine job observations, including reinforcing desired behaviors and correcting or coaching to correct undesired performance.

Strong employee involvement is key to the success of these teams, and the overall QEH&S implementation process. If you believe that your employees are your most valuable resource, and that they are the facility experts regarding their jobs, and the barriers to peak performance and process quality, then why wouldn't you solicit their input in evaluating process risk and the development of process controls?

IMS's will be very attractive for global multi-facility companies. The IMS will standardize many procedures and will be much less expensive to implement, while ensuring greater consistency between countries and facilities implementing the integrated processes. This standard in turn will provide a higher level of comfort for corporate attorneys, risk managers, CEOs and their board of directors. Inconsistency will be the Achilles heel in any company's legal defense, especially inconsistencies in QEH&S process control and/or policy.

This book can be used as blueprint for an integrated QEH&S system. However, I believe most companies will find it more useful as a resource that identifies considerations and provides tools for enhancing or integrating existing systems. I believe that because of industry, corporate, national, or cultural reasons a specific model that fits all businesses is difficult to conceive of at best, and is certainly not the intent of this book. I would like my readers to adopt the concepts or tools we discuss and those that make the most sense to them. The bottom line is that I

see this book as an argument for integrating management systems and providing tools and resources, versus a fit-all management system.

The flow chart at the end of chapter one and the suggested actions at the end of subsequent chapters are included to help you with the design of your IMS. Chapters 3–9 and the appendices provide you with technical or managerial information or some examples of the tools available to help you evaluate and manage your organizations risk. This book is not intended to provide another suggested management system standard. I have simply tried to provide concepts, tools, and hopefully the encouragement that will assist you with integrating your management systems. Tools that will be discussed and recommended for use in the IMS include the following.

- Incident or nonconformance multiple root cause analysis
- Statistical process control (SPC)
- Risk assessments
- Systems safety: management oversight risk tree analysis (MORT), fault tree analysis, change analysis, and barrier analysis
- Risk mapping
- Process flow charting, including Ishikawa, to help define desired/expected process flow, known, or potential process deviations and risk
- Risk management, including risk transfer
- Critical task observations and job–task analysis: performance management or behavioral safety
- Audits
- Emergency planning
- Contingency planning
- Evaluating control alternatives using finance tools such as present value (PV) and future value (FV) of cash flow, return on investment (ROI), payback period, and cost–benefit analysis with tools such as Liberty Mutual’s savings equation, or the ORC Cost Benefit tool.
- QMS’s, including Deming’s, Juran’s, Crosby’s, and International Standards Organization (ISO) (Note that ISO 9000 and 14000 will soon be using the same basic structure. These systems also have much in common with Occupational Safety and Health Administration (OSHA) VPP, the new OSHA OH&S system standard, and a variety of standards around the world, including Australia’s Work Safe, and the United Kingdom’s standards for OH&S, including the draft 18001 standard, quality and environmental management systems.)

The PET concept requires active employee involvement and is critical for the successful implementation of the IMS. Without tapping the experience of this Stake Holder (your most valuable resource), the identification and ranking of risks and their associated controls will be very difficult. Each PET should be

trained to understand the technical concepts of an IMS, and the resources/tools identified above.

To ensure that I do not offend any of my readers I want to define a term that will be used repeatedly in the book: *substandard conditions*. In this text we will assume that substandard conditions are procedural nonconformances, deviations from the process that management believes is executed. It does not necessarily mean that your facility is antiquated or second-class in any way. Substandard conditions does not refer to sweat shop conditions; in fact very modern facilities can have substandard conditions as defined here. Substandard conditions oftentimes reflect a breakdown in communications as expressed in poorly designed or outdated procedures and inadequate training and communications from supervisors and management. Substandard conditions and incompatible goals create the work environment supervisors and employees must work in and are the root causes leading to undesired employee behavior, accidents, customer complaints, environmental liability, and rework.

This book is about integrity in the workplace. It's about eliminating blame and creating an environment that progressively removes substandard conditions and the environments that generate quality problems, rework, environmental liability, and injuries. It's about management responsibility and accountability and aims to show managers a way to enhance their work environments and employee/customer satisfaction, while improving the bottom-line. This book is for all of us who want to enjoy our work and realize our potential and the contributions we can make to our businesses and customers. It is intended to help managers integrate QEH&S management systems and critical work processes, thus allowing more effective management in today's environment of reduced resources.

In Chapter 1 of Demings's book *The New Economics for Industry, Government, Education*, Deming states, "In quality management, the manager's functional role is tightly defined. The job of the manager is to work on the system, to improve it with the worker's help." I have always seen this situation as a need for managers to treat employees as their internal customers, and therefore vigilantly try to identify and anticipate the needs of these customers so that the manager and the organization as a whole succeed.

Management must clearly understand the work process and what is required with regards to the resources needed in the existing system, including training and communications, materials, procedures, tools, equipment, facilities, and the maintenance of all of these. How the system is designed to support the appropriate application of these resources in an integrated QEH&S management system and is one of the key objectives of this book. Deming, in discussing his 14 points for management, refers to this system as principles for transformation for Western management. Here are Demings's 14 points.

1. Create constancy of purpose towards improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on mass inspection to achieve quality.

4. End the practice of awarding business based on price tag.
5. Improve constantly and forever the system of production and service.
6. Institute training on the job.
7. Institute leadership. (The goal of the supervisor should be to help people, with provision of procedures, tools, equipment, etc. to constantly improve the process for delivery of goods and services and to ensure that communications—especially process communications—are clear, accurate, and enhance the production process.)
8. Drive out fear.
9. Break down barriers between departments.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity.
11. Eliminate work standards.
12. Remove barriers that rob workers, management, and engineering of their right to pride of workmanship.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody to work to accomplish the transformation.

This book was not intended to present a thesis on ISO 14000, ISO 9000, or the draft OHSAS 18001. For a detailed information on these systems, obtain a copy of the standards and/or purchase one of the references to these systems such as Joe Casio's book on ISO 14000. My objective with this book is to provide the reader with a foundation for a quality management system (QMS) or an EH&S management system. I believe that this can be consistent with any of the ISO systems; TQM; the systems of Deming, Juran, or Crosby; the draft occupational health and safety management systems; or even the OSHA VPP or draft management system standards.

Many U.S. companies have chosen not to seek ISO certification but still implement a management system that is consistent with ISO requirements but not burdened with the documentation or administrative costs generated by some registrars. Therefore this book is more broadly written than most books that address specific management systems. The discussions provided here are intended to clearly illustrate how all of these systems have a common management and process engineering foundation. The key for success is to implement an IMS or to create an IMS by merging the missing pieces of QEH&S Management.

This book encourages managers to implement quality or environmental management systems and, to the extent possible, integrate these systems, including process safety. References to the various quality and environmental management systems, including ISO 9000 and ISO 14000, are simply to give the reader a framework to build an effective system that is consistent with processes used globally by their customers and vendors. Becoming ISO certified is a business decision that will not be discussed in this book. My overriding objective is to help you improve process quality while reducing EH&S risks.

However, I will encourage you to consider using these systems to establish strong process quality management. I also believe that if your primary focus is on improving performance, and not on certification and regulatory compliance, then the burden of documentation and regulatory conformance will be significantly reduced. Your system should first of all make sense from an operations and process improvement perspective and not be driven by concerns over your audit. In addition organizations can work with their information system (IS) departments to develop the record keeping and data management systems, policy, and procedure templates that will need to be shared between various elements of the organization. Some data and information management systems that are commercially available can significantly reduce the documentation burden associated with ISO certification, and they should be evaluated in light of the organization's business needs and existing systems.

A well-thought-out QMS that integrates EH&S will significantly improve process performance and reduce risk and the costly liabilities associated with process nonconformance over time, even if certification is not a priority. The decision to implement a certified management system should be a second priority and not the focus of the implementation effort. Key to improved performance is system design and tapping the resource that exists with the first-line supervisors and employees who perform the organization's daily critical tasks. If employees are your most valuable resource then they must be heavily involved in the QEHS process improvement system.

This book should help operations managers, quality engineers, risk managers, safety managers, industrial hygienists, and environmental engineers see the power of working together to improve process performance at all levels. The tools and concepts recommended here can become part of an overall decision-making strategy to help manage and mitigate risks, including some discussion of sharing risk or risk transfer.

Most of the tools discussed or provided here are not new. As an example, SPC has a 50-year history. Systems safety goes back to the 60s and 70s with the Department of Energy. Risk assessments and facilitated group processes for evaluating practices has also been used for various management improvement efforts, including safety and quality.

Performance management or behavioral safety is newer, but it has gained a lot of credibility and has been implemented in a wide range of business activities over the past 15 years. What is new or unique about this book is compilation of the various tools and systems discussed above to ensure that there is a more coherent and cost-effective approach to managing QEHS and EH&S.

Deming and Juran drew their experiences from World War II. The systems used by manufacturers supporting the war effort focused on statistical control of mass production to supply the military. Lives were at stake, the fate of the world was at stake, and quality-on time delivery of goods and services was critical. Deming and Juran then used these methods to help them with the post-war reconstruction of Japan. For some reason, American manufacturers believed that the post-war production of products did not require the same rigor as the military-industrial

output. This notion was probably attributed to some arrogance over having the only significant industrial infrastructure remaining in the world, and to a return of men to production jobs who were not familiar with these systems.

The boom years of post-war America focused on quantity, and taking advantage of increasing market demand. The Japanese, however, were starting over and had focused on developing products and the systems to deliver them, which balanced both quality and quantity.

Process management is becoming very important for companies not only in the United States, but both in Europe and in countries with developing economies. I am asking the reader to think about integrating QEH&S programs in their facilities. I believe this objective is possible by using ISO 9000/14000 as potential models to build the integrated system or management process.

Chapter 2 reinforces the arguments for IMS's and focuses on safety management, which until recently has not received the attention it deserves in the ISO management standard setting process. Currently there is a draft occupational health and safety management system standard OHSAS 18001, that most likely will become part of a future ISO standard, and even an integrated management system occupational health and safety standards, such as BS 8800 standard (IMS). It is interesting to note that in the United Kingdom, management systems have been required by standards such as BS 8800. Introduction to measurement and behavioral observations for quality and safety will be introduced, in several places in the book and discussed in some detail in Chapter 7. The discussion in this book is simply to show how these tools can powerfully improve job observations and performance measurement.

I repeatedly emphasize the roles of senior managers and supervisors and the need to establish policies, goals, and objectives, including frequent follow-up as part of the total process management process. Planning will be discussed as the foundation for designing and successfully implementing a total process management system. Clear roles and responsibilities, as well as a process for systematically reviewing process/resource inputs to the system such as the procurement procedures, training, maintenance, and procedural controls, must be established.

The concepts of multiple root cause analysis, risk management, risk mapping, process nonconformance and accident costs, and systems safety are introduced and discussed in several sections of this book. These concepts serve as tools to help prevent nonconformance and to learn from existing nonconformances. Processes have primary or critical process inputs (see Fig. 1) that, if substandard in any way, they will ultimately be the root cause of nonconformances and incidents.

It is our responsibility to evaluate all primary process inputs to ensure that they are adequate and that they do not become the root cause of an incident. We are also responsible for learning from our mistakes and evaluating process nonconformances and incidents to identify the multiple root causes of the process failure. These responsibilities must include taking appropriate actions to ensure that failure does not happen again, including sharing lessons learned

with appropriate managers and employees so that they can avoid recreating the incident.

Measurement and evaluation is discussed in Chapter 7 as critical elements of IMS. Audits, including initial gap-analysis assessments, managerial, technical, and regulatory, are discussed. On-going systems evaluation and performance improvement-reinforcement is encouraged by using tools such as performance management or behavioral safety or other critical task-process observations tools such as job-task analysis.

The necessary elements and implementation of an integrated total process management system include the following.

- Employee involvement
- Training
- Communications
- System documentation and document control
- Records
- Design control
- Purchasing
- Hazardous materials/waste management
- Management of contractors and vendors
- Emergency preparedness and contingency planning processes
- Use and maintenance of equipment, tools, and the facility

Operational control as discussed in this book demands emphasis on the use of procedures to control the work at the process resource input and design stages. Critical to understanding process improvement and incident prevention is understanding the management system and the elements of the system that are causing process nonconformance and incidents.

The concept of multiple root cause analysis and the tools for process nonconformance or incident investigations, including the need to document the total costs of nonconformance (direct and indirect costs), will be discussed in detail in Chapter 8. Until management understands the financial impact of substandard process design/execution and the benefits of process change communicated in financial terms such as “return on investment”, “payback period”, very little will be accomplished. Otherwise, “bandages” will be applied to the process enhancement or corrective/action effort.

Identifying the causes of process nonconformance and sharing lessons learned to correct/prevent a reoccurrence is one of the most important tools supervisors and managers will have on the path to continual improvement. If you know what went wrong and why without blaming employees you can improve the process and prevent a reoccurrence.

I also believe that audits, and the follow-up of corrective actions, will be critical to successfully implementing any management system. The appendices of this book contain various management and technical audits that can be edited

or merged as appropriate to start the development of your organization's audit tool. These tools are presented only as examples. I would encourage you to edit or merge them to more accurately reflect the needs of your existing or proposed management system. This recommendation is especially true of the check sheets provided in Appendix II, which only point out key considerations, without specific regulatory, facility, or corporate policy considerations.

We need to get away from stand-alone safety or environmental programs and policies and instead need to ask ourselves the following questions.

- What can we do to improve the process, reduce rework, breakage, and worker's compensation claims while increasing productivity; efficiency; profitability; and customer, management, and employee satisfaction?
- How can we involve employees and management in creating a process that saves money and increases profitability while reducing waste, rework, and losses due to accidents, as well as process nonconformance to requirements?

Because of my 25 years of experience as an EH&S manager, I have started this book with a discussion focusing on EH&S. However, this focus on the work process is only for illustration of the inefficiency created by the fragmentation of process management. I am also trying to create a challenge for managers who are struggling with quality and the increasing costs of injuries or environmental problems. What can you do to shift the existing process paradigms? How can the work process be simplified? How can we improve the process, reduce redundancy, and identify and eliminate QEHS risks? Are you willing to invest in defining critical process performance observations check sheets and job performance reinforcement, and corrective actions?

Two of the primary keys to improved performance are the system design and frequent job observations and reinforcement of expected or superior performance, and positive correction of substandard performance. Correction of substandard conditions with even interim controls must be a high priority. In addition we need to understand the positive or negative reinforcements and consequences that cause employees to deviate from management and process design expectations? Understanding these consequences can be instrumental in understanding some aspects of process design risk and the need for better product or production process design to QEHS performance.

I worked at a shipyard with more than 13,000 employees for nine years and observed that the key to the Navy nuclear programs' success was its managers' understanding of process management and effective use of audits. I think that most people who know anything about nuclear power will agree that the U.S. Navy's program under Admiral Rickover was and remains the best in the world. Many people however probably do not understand the level of personal control, through a network of auditors, and systems safety, that was exercised by Admiral Rickover.

This book consists of ideas and approaches that can work with separate systems or IMS's. However, I believe it is important to eliminate the fragmentation

of process control caused by separate environmental or safety programs. It oftentimes appears that disjointed process management systems contribute to supervisor overload and system failures.

Not long ago I was in China, discussing the Three Gorges Project with some associates and asked what it would mean to the Chinese people. At one point they described Shanghai as the head of the dragon with its heart in the Yangtze at the Three Gorges Dam project, and its body or tail stretching inland along the banks of the river. At some point this metaphor was born again as a way for me to describe businesses and operations management.

I see the head of the dragon as senior management, who must be committed to the process and must establish policy and provide the resources necessary to successfully implement a process of continuous improvement. The heart of the dragon represents the first-line managers and supervisors, especially those who have production or business development responsibility. However, many organizations have a dragon with multiple heads (various departments or systems managers), each working against itself. This disjunction in most instances is not malicious, but it may be a manifestation of management competition. Controlling the dragon and organizational mastery require the various heads to work together to identify and control risk, while creating value in each process.

Without a well-thought-out plan integrated across organizational lines with authority from the head of the dragon, process nonconformance and incidents will occur. The integrated plan or process must then be effectively translated into specific tasks by its heart, or supervisors. Without this factor, the body of the dragon tends to be neurologically or physically disconnected.

In organizations with this type of disconnection, the dragon's tail, or the organization, tends to thrash about uncontrolled in the marketplace, causing injury to itself, its customers, and other stakeholders. The goal of this book is to help management lead through its heart to control the dragon and to significantly increase the involvement of its real strength in the employees of the organization. To be truly successful you must also maximize the effectiveness of well-trained supervisors by providing them with the resources needed to perform their jobs safely, on time, and within budget.

Without good supervision the dragon has no value and no business. Inferior or late delivery of products and services, will also ultimately lead to its death. Like any heart it must be exercised, nurtured, and developed to ensure that the dragon remains healthy. The tail of the dragon, the people and the process used to produce products and services, includes all of the resources that are applied to the process employees/contractors, facilities, tools, and equipment.

Another problem in organizations is their tendency to focus on regulatory compliance versus process management. Some organizations have implemented a management system only to become frustrated with it or question its value as they focus on documentation versus process management. In other situations, they become lost in quantitative risk assessment data and can no longer see the forest through the trees. Simple common sense heads south for the winter!

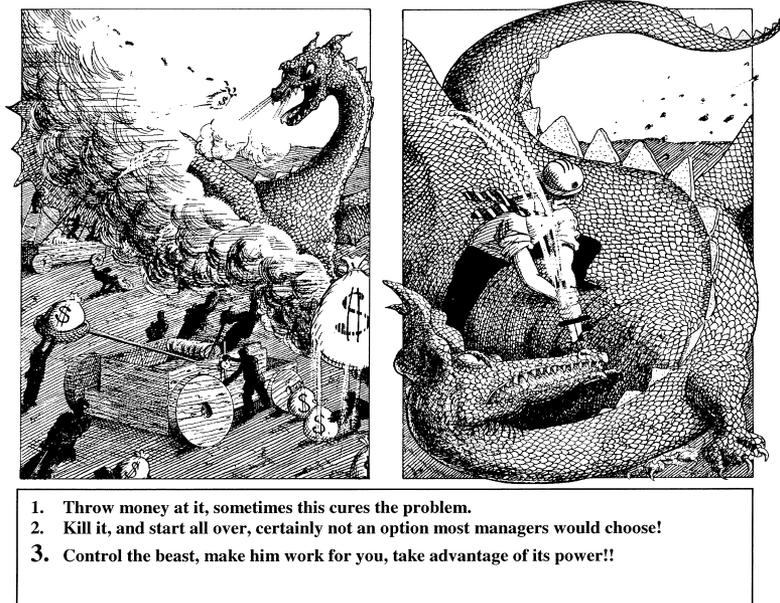


Figure 2 There are three ways to control an organizational dragon.

This assessment does not mean that you should ignore regulations or documentation. You must conform to both, however, regulatory and documentation conformance should be a byproduct of good process management and not the primary focus of the management system.

Over the past 15–20 years managers have been bombarded with a variety of management programs and processes, including ISO 9000 Quality Management Systems and ISO 14000 environmental management processes. In addition there has been a variety of safety systems (some legislated) and an assortment of quality or process management programs.

If you look to the European Union, and the United Kingdom in particular, you see regulatory bodies adopting the ISO framework for EH&S. This trend can be seen in other countries around the world such as New Zealand and Australia, and it clearly reflects a different approach to the prescriptive regulatory one historically taken by the U.S. Environmental Protection Agency (EPA) and OSHA. An example of a management system approach can also be seen in the draft OHSAS 18001 standard (Ref. 22).

Last year, the American Society for Quality's Audit Committee reported in its April newsletter that U.S. delegates of the Quality Technical Committee TC 176 and the Environmental Committee TC 207 have expressed interest in combining the management systems and respective audits.

A management system is intended to help facilities establish processes, procedures, and metrics that allow them to perform tasks right the first time, within budget, on time, and with no rework, redundant procedures, injuries, or

environmental liability. Companies may need technical experts to help them with specific technical issues around QEH&S, however integration of these systems is quite feasible.

IMS's will be critical to the success and competitive posture of companies in the future. Management must align its resources (people, tools/equipment, facilities and maintenance, procedures, materials, vendors/contractors, training, and supervision) to optimize QEH&S performance.

Oftentimes, programs or processes have their roots in the works of Deming (Deming, 1982) and Juran, or in systems safety, which originated with the Department of Energy (DOE) and National Aeronautics and Space Administration (NASA). For those unfamiliar with systems safety, this process is not focused simply on worker safety. Systems safety includes an assortment of risk assessment tools that help management identify and, to the extent possible, quantify potential process risks and to ensure operational readiness. This process could include evaluating business risks as well as the risk of environmental contamination or injury to employees or customers.

Another valuable tool for communicating risk to management is "Risk Mapping", developed by Microsoft. "Risk Mapping" is a way to summarize the frequency and severity of various risks, including the level of risk transfer and the impact of proposed controls for defined risks.

The key to all of these systems is enabling managers to tap the expertise of their internal customers (their employees) and to clearly define their existing work processes and associated process risk. It also means that management with employee involvement must identify tasks or steps in a process that by its execution has tended to make work less efficient or difficult to do safely. Management must also understand what influences employee behavior.

Many programs are designed to reward or recognize those who don't have injuries. More permanent programs focus on what people do (or don't do) that cause injuries, compromise quality, require rework etc. A total of 85% of safety and process problems can be resolved if the processes are well-designed and if routine job observations provide immediate reinforcement and feedback of desired behaviors, and immediate corrective action for nonconformance. The supervisor and trained employees are in an excellent position to coach and reinforce the desired behaviors to ensure total quality and EH&S control.

Generally nonconformance with requirements consists of behaviors influenced by such things as production quotas that don't allow procedural compliance, use of poorly designed tools or equipment, or tools that have been modified. If the system is designed properly and is operated within design specifications, then employee compliance with expected behaviors or standard operating procedures will be greatly enhanced.

If the management system is weak, numerous incidents of process nonconformance will occur, which will ultimately result in a serious accident, or process nonconformance, given the right combination of events and root causes. Keep in mind that root causes refer back to those primary process inputs such as communications, design, tools, materials, and so on, as illustrated in Figure 1. Inherent

in this statement is that changes to a process, including increases in production rates, should be evaluated to identify risks that might have been created by the change.

Unfortunately we have too often created confusion in the workplace by not consistently sticking to a chosen plan for process or quality improvement. We have jumped from Deming to Crosby's cost of quality(11), TQM, and/or reengineering. Some versions of these quality programs have been adopted internationally in ISO quality and environmental standards. As mentioned earlier, some countries have been adopting versions of ISO as a management system standard for EH&S.

The reason ISO has become so popular globally is that, just like common thread sizes on bolts, managers of multi-site or global operations have recognized that having multiple systems is dysfunctional. Also, the corporations may create additional liability by not consistently applying corporate policy. The biggest problem for managers is that, like specifying thread sizes on bolts to ensure consistency and sustained delivery of these products, common management measurements and language are needed. Too often we tend to adopt metrics and language to describe various programs that are not consistent, or we tend to fragment process management into artificial compartments such as quality, environmental, or occupational health and safety. Another reason management systems have become popular is because they are seen as a way to control the escalating costs of process nonconformance. Six Sigma, the newest and most rigorous of systems, has a goal of defect elimination, or no more than 3.4 defects per 1,000,000 opportunities.

Dramatic increases in medical and workman compensation costs, abuses, and, in some cases, outright frauds have caused employers, medical providers, and insurance carriers to look at what can be done to reduce costs. In 1997 occupational injuries alone cost \$127.7 billion in lost wages and productivity, administrative expenses, health care, and other costs, not including the cost of occupational illness. (National Safety Council report, "Accident Facts"). Medical costs alone were \$20.7 billion, and workers' compensations costs were \$43.5 billion. Each worker in the United States must produce an average of \$1,000 worth of goods and services to offset the cost of work-related injuries and illness. Every 5 seconds a worker is injured, and every 10 seconds a worker is temporarily or permanently disabled.

All accidents nationwide cost ~3% of the gross national product (GNP). When this loss is expressed in medical expenses, lost wages, insurance claims, production delays, and equipment downtime, it significantly reduces business productivity and profitability. A more costly problem that would often be related to the same management control issues is rework, which would easily more than double the injury losses. Similarly the United Kingdom estimates that accidents wipe out 5–10% of industrial trading profits annually (View Point, Corporate Cash Flow, April 1995).

Potentially more costly problems, which can often be related to the same management control issues, are quality or rework, and environmental liability

that can again easily more than double the losses due to workplace injuries. Indirect costs associated with incidents range from 4 to 10 times the direct costs of wage loss and medical cost, greatly increasing the significance of this type of process failure.

The problem oftentimes is attributed to a lack of understanding of process management, coupled with our tendency to compartmentalize process quality, safety, and environmental management. Who benefits by this fragmentation?—the line supervisor, production management, or the specialists who manage these departments? Too often these program managers consider these processes to be the center of their corporate universe, and their peers' goals to be less important, failing to take advantage of the opportunity to work together.

We need to back up and look at work processes from our internal customer's perspective, as well as the line supervisor's and work center employee's. As a senior manager or manager of a quality system or EH&S program ask yourself the following questions. What is the line manager or supervisor's primary mandate or concern? What is senior management holding the supervisor accountable for? At the end of the day is management accountable not only to its external customers and shareholders but also to its internal customers, supervisors, and community stakeholders?

It is management's job to understand the corporate objectives and the needs of its customers. It is also the responsibility of management to ensure that it remove all roadblocks from the paths of supervisors and employees. Continuous improvement should mean having a constant focus on making each task in the production process as simple and efficient as possible, by eliminating redundancy, and correcting facility process designs whenever they are identified.

True understanding and appreciation of their internal and external customers and the summation of incremental improvements over time are what sustain companies and their profit margins. "Sustained focus on these values and objectives" must be the management mantra for the new millennium. Many companies lack focus and have conflicting objectives, as is evident in redundant and multiple management systems for QEHS. The other problem contributing to lack of focus is when leaders delegate responsibility and are not actively involved in the process enhancement system. Too often it is believed that the EH&S manager or the quality manager can cover the same territory as hundreds of supervisors.

Why is it that QEHS programs oftentimes appear to be the responsibility of the quality or EH&S department or a distant corporate entity versus the production manager who controls the work process? Why is it that workplace process control instruction or designs oftentimes fail to include QEHS? Why aren't quality managers and EH&S working more closely together?

Quality and EH&S managers must also be able to document both the direct and indirect costs of process nonconformance. This step is essential if the risk or process manager is going to be in a position to favorably influence management regarding system or work process improvements or loss-control

efforts. In addition, the process managers must be prepared to present capital or system expenditure requests in terms that the operations and finance managers understand. A 1994 study by Liberty Risk Services in the United Kingdom found that 70% of the corporate decision-makers for health and safety had the title of finance director or above. Yet most of these managers do not have accurate data on the costs of accidents.

Does the concept of continuous improvement apply only to production rework? Why wouldn't you consider environmental damage or employee injuries a process failure? Quality failures often have safety and environmental implications. After all aren't our employees our most important cutting-edge resource, or do we see them as disposable and easily replaced? Through painful experience and financial consequences many companies have learned that environmental quality control is necessary to eliminate potential liabilities that can cause the financial failure of a company, not to mention potential criminal liability. In fairness to operations managers, too many safety or EH&S managers have not understood how to address process issues effectively, especially in financial terms.

These questions may seem sarcastic or even negative, but they are intended to highlight the dangerous attitudes exhibited by some managers and supervisors who don't understand process control. If any company in today's global market expects to be competitive it must be willing to consider integrating its quality and EH&S management systems. EH&S managers must also learn more about quality management and communicating to production and financial managers in terms that they understand. Changing metrics and reporting losses or risks in financial terms, or considering returns on investment when recommending process controls or process changes, is critical if we expect to bridge the gap between production, quality, and EH&S management.

More to note is why employees or supervisors who control these work processes are often the last ones to be contacted for review of work process designs or process controls? Employee and supervisor involvement in process enhancement risk assessments and critical job observations are essential if we expect to mitigate QEHS risk. After all, they are the ones who live with the work process, good or bad, and too often struggle with the results of management's failure to consult with them. One thing that all managers must be aware of is that in implementing any organizational change, even positive change will cause some system-personnel stress. Therefore, change management of the cultural and process changes must be an integral component of the planning and implementing process.

Realistically, how many of you or how many of your employees go to work with the idea of doing bad work, sabotaging the work process? Perhaps you decide today is the day I will create an environmental disaster for my company and community, or maybe I will mutilate myself, or make the supreme sacrifice in the name of the carelessness god, by killing myself at work?

What are we trying to do with an integrated QEH&S Management System?

Managers of most mature companies understand the need for a quality management process. Industrial managers and developers by now know the risk associated with mismanagement of hazardous materials and waste. The difficulty has been how do you do it, which process TQM, Deming, Juran, or Crosby. etc.

In many ways environmental issues appear to be the most difficult because of the technical complexity associated with re-mediation projects or the design of new chemical processes. Then there is occupational health and safety that many managers think is out of their control. They believe many injury claims are fraudulent but difficult to prove, or that the employee was careless. If they only had more conscientious employees the safety problem would go away! In reality 80–85% of the process failures, including injuries, are caused by process common cause, variations built into the process by the existing management system.

The typical company spends one week per employee to implement a TQM program. The biggest mistake is a failure to focus on a critical few issues, and too much emphasis is focused on documentation and regulatory compliance versus process and task management. The average PET has five people and their compensation averages \$50/hr. They will also utilize 250–750 hours to solve problems at a cost of \$7,500–\$22,500. The PET must be focused and working on prioritized projects, and the critical elements of work processes causing nonconformances. Parietos Principal appears to apply here.

One of the objectives of this book is to show managers that all of these processes are under their control, and that there is tremendous benefit to integrating the management process for controlling these risks. Using ISO 14001/9001, I hope to convince you that a common process management system QEH&S, integrated and built on ISO can be very powerful. The ISO standards and their various derivatives provide a framework consisting of a number of interconnected process management tools and services organized to integrate quality and EH&S management.

The ultimate goal is to reduce time to perform tasks and to create added efficiency while reducing costs, waste, and personnel injuries. A key tool in any QMS is its qualitative risk assessment system, and risk mapping process, both of which are discussed in more detail in Chapter 5. Quantitative risk assessments and detailed fault tree or systems analysis are needed, but in many instances they should be used only after passing through the sieve of the qualitative risk assessment. Qualitative risk assessments involve employees and other stakeholders and in most instances allows management to quickly identify, assess, and establish a plan to eliminate or control process risks.

William B. Smith, Vice President for Quality Assurance for Motorola, pointed out the value of employee involvement (e.g., quality circles, and process

enhancement teams or in processes such as the qualitative risk assessments). It should also be noted that, like the statistical quality control process used widely by the military-industrial complex during World War II, quality circles were also widely used; but like the quality improvement process it did not survive post-war industrialization in the United States but was reinvented in Japan. In Smith's speech to the National Private Truck Council, he stated:

In the Motorola experience it was found that 91% of problems were hidden from general management. The general manager was aware of only 4% of problems on the production floor. General supervision was only a little better off, being aware of 9% of the problems. The largest gap in the information flow appeared between the production supervisors and general supervision. Line supervision was credited with being aware of 74% of the problems. Not surprising, the workers were found to be aware of 100% of the problems.

Smith's statement is a compelling reason to ensure that your most valuable resource, your employees, are heavily involved in the QEH&S process.