

ManagingMe.Solutions Resource Catalog

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Professor Art Hill has written many popular tutorials and Excel tools for his students and consulting clients. This catalog presents many of these in the following four sections:

- Popular tutorials
- Advanced tutorials



- Popular Excel workbooks
- Advanced Excel workbook

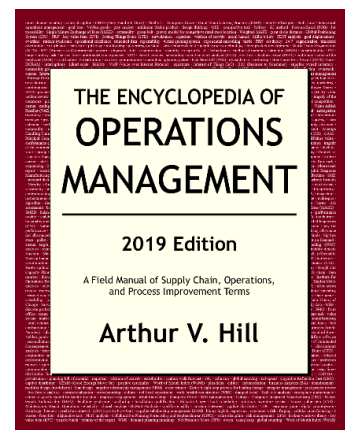


Many of these files are available for a small fee from www.managingme.solutions.

The file names for these papers and Excel workbooks are the same as the titles of the papers.

Professor Hill has also written the comprehensive “field manual” entitled the *Encyclopedia of Operations Management – 2019 Edition*. This book covers virtually all supply chain, operations, process improvement, quality, and service management topics. The printed version of this book is available from ManagingMe.Solutions (www.ManagingMe.Solutions). The Kindle (eBook) version is available from www.Amazon.com. Amazon is currently carrying only the much older 2012 print version.

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POPULAR TUTORIALS

Lean thinking

Title	Code	Description
5S	MM 59-04	This tutorial explains how a 5S program can improve a work environment to improve visibility, which in turn improves productivity, safety, cycle time, and quality. The paper provides a detailed description of each of five steps, the benefits of a 5S program, and how to implement a 5S program. The paper also provides an example for a crash cart in a clinic. The appendix presents a scorecard for a 5S audit. (10 pages)
A3 Problem Solving	MM 57-40	This tutorial reviews the standard Toyota Production System/lean methodology for creating a very short (2 page) project charter and project status reporting document. The paper describes the benefits of this important lean tool and provides examples and references. (7 pages)
Stand-Up Meetings	MM 60-14	This tutorial presents the benefits and risks of having a stand-up "tier review" meeting as a means of developing a lean culture. (5 pages)
The Eight Wastes	MM 59-01	This tutorial presents the eight wastes (Ohno's Seven Wastes plus one more) and then presents specific practices for eliminating each of them. The paper is written in a worksheet format to encourage people to apply the concepts to their organization. (12 pages)

Operations strategy

Title	Code	Description
Balanced Scorecards and Strategy Maps	MM 57-30	This tutorial argues for the use of (1) balanced scorecards to align organizations with the strategic objectives and (2) strategy maps to develop the "hypotheses" for how tactical actions will affect strategic outcomes. The paper presents practical approaches for creating both balanced scorecards and strategy maps. The paper presents many suggestions for improving both the standard Kaplan and Norton balanced scorecards and strategy maps. A number of examples are presented, including a time-based competition example. (12 pages)

Process improvement

Title	Code	Description
Benchmarking, Best Practices, and Leading Practices	MM 58-04	This tutorial provides a complete framework for understanding benchmarking, best practices, and leading practices and also how organizations can apply these principles to improve processes.
Causal Mapping	MM 58-23	It is impossible to solve a problem without a good understanding of its causes. Individuals, project teams, and organizations can use a causal map to (1) better understand a problem by "connecting the dots" between the causes and effects, (2) identify ways to solve the problem, (3) create a shared understanding of the problem and the best solution to that problem. This tutorial provides detailed information on



Title	Code	Description
		how to create and use causal maps. The paper compares a traditional Ishikawa (Fishbone, Cause & Effect) diagram with the more general causal map and argues that the more general causal map is easier to use and more flexible. The paper presents a number of best practices for causal mapping that go far beyond the teaching normally provided with the Fishbone Diagram. This tutorial ends with a one-page summary suitable for use as a handout. (18 pages)
Error Proofing	MM 57-41	This tutorial provides a framework and examples for understanding and applying both prevention and detection methods to improve both product and process design. The paper includes a number of examples and photos. (16 pages)
Failure Mode and Effects Analysis (FMEA)	MM 60-02	This tutorial describes how the Failure Mode and Effects Analysis (FMEA) can be used to prioritize risk mitigation efforts. The paper also presents several criticisms of FMEA and distinguishes between process FMEA and design FMEA (DFMEA). The companion Excel workbook FMEA.xls provides a simple tool for an analysis.
How to Conduct a Consulting Interview	MM 61-03	This tutorial provides advice on how to handle a consulting interview. The paper is organized as follows: (1) preparing for the interview, (2) conducting the interview, (3) ending the interview, and (4) activities after the interview.
How to Evaluate the Benefits of a Process Improvement Project	MM 61-04	This tutorial explains how to evaluate the hard financial benefits, soft financial benefits, objective non-financial benefits, and subjective non-financial benefits of a process improvement project – in both a project selection and project evaluation context. The paper also presents the benefit-effort grid as a means of evaluating potential projects.
How to Facilitate a Causal Mapping Workshop	MM 59-09	This tutorial provides practical and detailed guidelines for how to facilitate a causal mapping workshop. This is a companion paper to the paper entitled "Causal Mapping."
Mindmapping	MM 58-19	This tutorial explains how to use mindmaps to help generate new ideas, take course notes, provide structure to ideas, review ideas, make decisions, prioritize activities, communicate concepts, identify the work breakdown structure for a problem, and solve problems.
Overall Equipment Effectiveness (OEE)	MM 58-10	This tutorial explains the Overall Equipment Effectiveness (OEE) metric, which is considered by many to be a key tool for lean operations management. OEE is used extensively in Total Productivity Management (TPM) applications, particularly in large firms that have large capital intensive operations (e.g., 3M). This tutorial provides information on calculating OEE and provides a template (form) that can be used for this calculation. The paper also explains how to identify and manage the six big losses related to OEE, how to implement OEE, and how to avoid the dangers of OEE.



Title	Code	Description
Overview of Mapping Tools for Process Improvement	MM 58-24	This tutorial overviews and compares a wide variety of mapping tools that can be used to understand and improve a process. The mapping tools included in this tutorial include relational mapping tools (mindmaps, work breakdown structures, and organizational charts), time mapping tools (process maps, value stream maps, and project networks), and causal mapping tools. These include causal maps, Ishikawa (Fishbone, Cause & Effect) diagrams, strategy maps, impact wheels, root cause trees, issue trees, and goal trees. Closely related papers include "Mind Mapping," "Causal Mapping," "Strategy Mapping," "Process Mapping," and "Value Stream Mapping." These papers provide more detail on each of these mapping tools.
Process Improvement Checklist	MM 57-24	This tutorial presents an organized list of over fifty fundamental process improvement ideas that have been collected from Lean Sigma blackbelts, lean experts, and other sources over many years. This list is a very helpful approach for stimulating and generating ideas for a process improvement team and should be a part of the training in every process improvement program. (18 pages)
Process Improvement Tools Self-Assessment Survey	MM 58-11	This tutorial provides a comprehensive list of the skills that every lean sigma blackbelt (improvement expert) should have. The document is formatted so that people can score and evaluate themselves. This is a useful document for organizations to use to assess their level of maturity with respect to process improvement tools.
Process Mapping	MM 58-22	Process mapping is a powerful tool for understanding, documenting, communicating, and improving processes. Process mapping is also a powerful tool for training current and new employees on a process. The tutorial teaches individuals and teams best practices for process mapping. Best practices include starting with the "as-is" process before attempting to define the "should-be" process, having teams document their own process using Post-its on paper on a wall, identifying waits, handoffs, moments of truth, pain points, line of visibility, and using dots to identify and prioritize potential opportunities for improvement. The tutorial also shows how to combine the best ideas from flow charts and value stream maps in a process map. Professor Hill is fond of asserting that "all work is a process and all processes can be improved." This tutorial is the result of over twenty years of consulting and teaching using process mapping tools. This tutorial ends with a one-page summary suitable for use as a handout. (8 pages)
Risk Management	MM 63-03	This tutorial argues that risk management is a critical skill for all managers and should be used informally with smaller tasks and projects and formally with larger projects and initiatives. The best practice requires four steps: (1) identify potential adverse events, (2) propose risk mitigation projects, (3) prioritize risk mitigation projects, and (4) Execute risk mitigation projects. The paper argues further that project prioritization is better than the FMEA risk prioritization because some risks might be very expensive to mitigate, while others require little or nothing.



Title	Code	Description
How to Set Goals	MM 58-26	Research on goal setting has found that translating a few subconscious goals into written (explicit) goals provides direction and motivation for better outcomes for individuals, teams, and organizations. Individuals can use personal goals to direct their efforts and achieve greater success in their careers, health, and family. Teams and organizations can use shared goals to direct their efforts, set expectations, support reviews, and be more successful. Leaders and coaches can use goals to help individuals and teams direct their efforts and achieve greater success. This tutorial explains how to create "SMART" (Specific, Measurable, Aligned, Realistic, and Time specific) goals. This tutorial also presents a complete analysis of leading practices for setting goals. This tutorial ends with a one-page summary that is suitable for use as a handout.
Some thoughts on creating great survey instruments	MM 68-03	This is a short paper on how to create survey instruments for consulting projects. Some of the advice provided in this tutorial includes: Use proper terms, use hypothesis-driven research, start with interviews, write agree-disagree items, anchor your scales, define the middle point, provide a no opinion option, use 7-point items, try to use only unidimensional variables, keep your instrument short, pretest you instrument, shorten your items, use an on-line survey tool, try to measure non-response bias, include some demographic items, use statistics to analyze your data, interpret the results, and promise and maintain confidentiality.
Structured Brainstorming	MM 57-03	This tutorial explains how to lead a structured brainstorming session to leverage the wisdom, experience, and knowledge of a group of people to develop goals, define strategies, analyze problems, and find solutions. This type of structured brainstorming delivers high-quality results, avoids conflict, shows respect, builds culture, generates many independent ideas, organizes them, prioritizes them, documents them, and creates a shared understanding of the problems and solutions with a strong sense of ownership. This tutorial ends with a one-page summary suitable for use as a handout. (8 pages)
The RACI Chart	MM 59-02	The famous quote "If everyone is responsible then no one is responsible" highlights the importance of having clarity around roles and responsibilities. This tutorial explains how to use the RACI Chart for responsibility charting for process management, project teams, and workgroups. RACI is an acronym for Responsible, Accountable, Consulted, and Informed. The RACI Chart can help remove ambiguity in roles, which results in less blaming, waste, and redundancy and more capacity and productivity. This tutorial ends with a two-page summary suitable for use as a handout. (16 pages)



Project management

Title	Code	Description
How to Conduct a Post-Project Review	MM 63-01	This tutorial provides advice on how to conduct a post-project review (also known as an after action review, lessons learned review, or project post-mortem). The paper emphasizes the need for a blame-free environment and for the need for learning for individuals, project leaders, project sponsors, sponsoring organization, and the wider organization. Quotes at the beginning of the paper: <ul style="list-style-type: none"> • "Action without reflection is a miscarriage of learning." • "The bottleneck in most organizations today is the project management skill needed to move the needle on the organization's most important strategic goals."
Project Charters for Process Improvement Projects	MM 57-25	A tutorial that presents a practical and detailed approach for creating a project charter. It also compares three other approaches (Lean, Lean Sigma, and PMI) for creating a project charter.
Stakeholder Analysis	MM 57-37	A tutorial that provides a detailed methodology that project teams can use to identify, understand, and prioritize stakeholders in the course of managing a project. The paper provides practical guidelines for developing an engagement and communication strategies based on stakeholder power and passion.
How to Generate New Product Ideas	MM 70-01	This short tutorial focuses on the "fuzzy front end" of the new product development process. It suggests seven different methods for generating new product concepts: PULL METHODS: Market trends, demographics, ethnographics, and complaint behavior. PUSH METHODS: Products enabled by new technologies, products enabled by our distinctive capabilities, and products fueled by our passions.

Quality control

Title	Code	Description
Process Capability and Performance	MM 59-06	This tutorial discusses the importance of measuring process capability and performance and presents many measures including: PPM, DPMU, DPMO, process yield, rolled throughput yield, sigma level metric, process capability (C_p), process capability index (C_{pk}), process performance (P_p), and the process performance index (P_{pk}).

Supply chain management (inventory management, sourcing, and quality)

Title	Code	Description
Estimating Carrying Cost	MM 57-09	This tutorial provides a detailed explanation for how to estimate the carrying charge and carrying cost parameters for lotsizing purposes. (6 pages)
Estimating Ordering and Setup Costs	MM 57-10	This tutorial provides a detailed explanation for how to estimate order cost and setup cost for lotsizing purposes. (4 pages)
How to Reduce Setup Time and Cost	MM 57-16	This tutorial presents a number of practical ideas for how to reduce setup time and setup cost. The paper also discusses the benefits of reducing setup time and cost. (16 pages)



Title	Code	Description
Inventory Management	MM 57-17	This longer paper presents a complete discussion of both basic and advanced concepts for inventory management. The main section of the paper presents models for the economic order quantity and safety stock. The appendices explore a number of more advanced concepts. (16 pages)
Inventory Turnover	MM 57-18	A tutorial that discusses how to estimate inventory turnover and some common errors in using inventory turnover as a performance measure. (15 pages)
Lotsizing	MM 57-21	A tutorial that presents lotsizing models for both constant (time-invariant) and time-varying demand. For time-varying demand, the paper presents fixed order quantity (e.g., EOO), time supply (Lot-for-lot, Period Order Quantity), and dynamic lotsizing (LTC, PPQ, LUC, LPC, VVV) methods. The paper also discusses practical issues such as the models available in SAP and the importance of recognizing practical considerations such as the minimum order quantity, sequence-dependent setups, and shared setups. (9 pages)
Outsourcing	MM 59-03	This tutorial describes the various types of outsourcing and offshoring strategies and then compares the potential advantages and disadvantages of outsourcing. The paper also explains how to conduct both a strategic and economic analyses of an outsourcing decision. Lastly, the paper also discusses how to manage and control an outsourcing relationship.
Process Capability and Performance	MM 59-06	This tutorial discusses the importance of measuring process capability and performance and presents many measures including: PPM, DPMU, DPMO, process yield, rolled throughput yield, sigma level metric, process capability (C_p), process capability index (C_{pk}), process performance (P_p), and the process performance index (P_{pk}).
Service Performance Metrics	MM 57-28	This tutorial defines the service performance metrics for both manufacturing and service organizations. Service metrics in manufacturing include metrics for (1) make-to-stock products, (2) respond-to-order (make-to-order, assemble-to-order, etc.) products, and (3) pure services. The paper presents and evaluates all of the major metrics for each of these three business contexts. Examples are provided for each type of metric. The paper then explores measures of customer satisfaction such as the Net Promoter Score (NPS), the Customer Effort Score (CES), and the Word of Mouth Index (WoMI).
Sole Source, Single Source, or Multiple Source of Supply	MM 58-07	This tutorial compares the advantages and disadvantages of sole source, single source, and multiple source suppliers and develops a contingency model for helping managers decide which strategy is most appropriate for a particular purchased item. (8 pages)
Supplier Scorecards	MM 58-02	This tutorial explains the many benefits of using a supplier scorecard. The paper provides useful and practical information on how to setup and use a supplier scorecard system. (6 pages)
The Square Root Law for Warehouses	MM 58-21	This tutorial presents the well-known square root model for estimating the impact of adding or removing warehouses from a market. For example, doubling the number of warehouses should increase the total system inventory by about 41%. The



Title	Code	Description
		paper presents the math model and tables that can be used instead of the model. It also provides justification for the model for both safety stock and lotsize inventories. (4 pages)
Theory of Constraints	MM 57-32	This tutorial overviews the theory of constraints proposed by Goldratt. Some of this information is based on personal contact between the author and Dr. Goldratt.
Vendor Managed Inventory	MM 57-35	A tutorial that presents both the pros and cons of using vendor managed inventory. (4 pages)



ADVANCED TUTORIALS

Topic	Title	Code	Description
Forecasting and planning	Forecasting Lifetime Demand	MM 57-13	This tutorial explains how to use a geometric series to forecast the lifetime demand for a product (or component) that has declining demand. Models are presented for situations with and without a termination date. This model has been implemented at a number of firms. The companion Excel workbook "LIDA.xls" implements this model. (9 pages)
Forecasting and planning	Forecasting with Exponential Smoothing	MM 57-14	This tutorial explains the Winters' model for forecasting with exponential smoothing. The paper starts with simple (single) exponential smoothing, and then develops the double (with trend) and triple exponential (with trend and seasonality) smoothing models. The paper includes all of the equations for forecasting, demand filters, and tracking signals, which makes it easy to implement these equations in a forecasting system. (20 pages)
Inventory management and purchasing	ABC Classification Analysis	MM 57-01	A tutorial that presents a mathematical model for ABC classification analysis. (6 pages)
Inventory management and purchasing	Managing Slow-Moving Inventory	MM 57-22	A tutorial that presents a model of managing slow-moving inventory. This model requires both the carrying cost and shortage cost parameters. This is a companion paper to the Excel workbook Slowmove.xls. (15 pages)
Inventory management and purchasing	Safety Stock	MM 60-17	This tutorial develops mathematical models for determining safety stock for independent demand inventory systems. After carefully defining terms, the paper develops a complete taxonomy of inventory management systems, and clearly defines the relationships between safety stock, reorder point, and order-up-to (target) inventory policy parameters. The paper presents four methods for calculating safety stocks: (1) the equal time safety stock method, (2) the order cycle service level method, (3) the unit fill rate service level method, and (4) the economic safety stock method. The paper argues against using the equal time method and then develops mathematical models for the other three methods. The paper presents models for handling a wide variety of demand during leadtime distributions, including the normal, gamma, Poisson, binomial, negative binomial, Erlang, and lognormal. The paper is intended for MBA readers who have some mathematical background.



Topic	Title	Code	Description
Inventory management and purchasing	To Stock or Not to Stock: That is the Question	MM 57-34	A tutorial that addresses the important question, "should this item be stocked or not?" by developing a simple mathematical model. (6 pages)
Lean	Inventory is Evil	MM 58-14	Some senior executives challenge lean manufacturing "orthodoxy" and argue that "the cost of capital is so low right now that it no longer makes sense to reduce inventories." In response to this challenge, this tutorial identifies ten benefits of reducing inventory even when interest rates are low. (4 pages)
Lean	The M2 Worksheet	MM 60-18	This short paper presents a useful worksheet (form) for (1) managing meetings and (2) improving meetings. This worksheet can be used by managers in any context to improve their team productivity. This tool is particularly good for helping process improvement project manage their meetings. The worksheet (and the related meeting management process) is a good illustration of lean thinking and standard work in a meeting context. (5 pages)
Lean	The Smart Pull System	MM 57-29	This tutorial presents a periodic review/target inventory model called the smart pull system. This system has been implemented at Medtronic, Transoma Medical, and other firms to set target inventories for a pull system. (11 pages)
Lean	Value Stream Mapping	MM 58-25	The value stream map is a standard tool for implementing lean concepts. This tutorial explains how to create an effective value stream map to help managers better understand and improve processes. (6 pages)
Logistics/ Transportation	Location Theory	MM 57-20	A tutorial that presents a number of different location models for both the finite and discrete location models. Models include (1) the numeric-analytic model for the single facility infinite set location problem, (2) the Adaptive Allocation/Location model for the multiple facility infinite set location problem, (3) the Kepner-Tregoe Model for the finite set location problem, (4) the gravity model for finite set competitive store location problem, and (5) the p-median location problem. (13 pages)
Logistics/ Transportation	Traveling Salesperson Problem	MM 57-31	A tutorial that presents a number of mathematical models for the traveling salesperson problem and discusses heuristic methods for solving them. (5 pages)
Lotsizing	Multiple Item Resource Constrained Lotsizing Models	MM 58-16	This tutorial presents four different resource-constrained lotsizing models. Solution methodologies are also presented for each model. The paper emphasizes the use of Lagrangian multipliers to solve these types of



Topic	Title	Code	Description
			production and inventory planning problems. (10 pages)
Lotsizing	The Economic Lot Scheduling Problem	MM 57-08	A tutorial that presents a model for the economic lot scheduling problem. The economic lot scheduling problem (ELSP) is a type of lotsizing problem that involves finding the optimal (or near optimal) order size (or cycle length) in order to minimize the sum of the carrying and ordering (setup) costs for multiple items that share the same capacity (the "bottleneck"). Even though the problem has the word "scheduling" in its name, it is really a lotsizing problem rather than a scheduling problem. The demand for each item is assumed to be constant. (5 pages)
Lotsizing	The Newsvendor Problem	MM 57-23	A tutorial that explains the newsvendor problem in great depth. This tutorial describes a wide variety of problems that can be modeled with the newsvendor model, including finding the optimal quantity for buying seasonal products, for making a last buy, for setting the trunk stock level, for overbooking a flight, for setting a safety stock, etc. The paper develops both the discrete and continuous versions of the model and provides examples of both. This is a companion paper to the Newsvendor Model.xls Excel workbook. (24 pages)
Operations strategy	How to Create Values, Vision, and Missions Statements	MM 57-15	A tutorial that explains how to create values, mission, and vision statements. This tutorial contrasts these three different types of statements and provides practical guidance on how to create these statements. (8 pages)
Operations strategy	Process is Everything	MM 57-39	A tutorial that makes the argument that all human activities involve processes and that process management is at the heart of business strategy. The main thesis of this tutorial is that the process point of view is critical to success with strategic formulation and execution, organizational change and improvement, product development and marketing, and financial discipline. (7 pages)
Price optimization	Price optimization	MM 58-20	This tutorial develops a model that can be used to find the optimal price to maximize profit. The model assumes that the price-demand model is exponential and that the user can supply two points on this curve (p_1, D_1) and (p_2, D_2). Calculus is used to find the optimal price. The companion Excel workbook by the same name implements the mathematics for this. This model ignores competitive response to a price change. (4 pages)
Process improvement	Learning Models	MM 57-19	A tutorial that presents both volume-based learning (the learning curve) and time-based learning (the half-life curve). The paper also



Topic	Title	Code	Description
			discusses Moore's Law for time-based growth and the difficulty of estimating the parameters for these models. Extensive examples and graphs are used to illustrate the concepts. The paper discusses the difficult problem of estimating parameters for these models. The appendices derive the equations for all of the models presented in the paper. The companion Excel workbook "Learning Model.xls" implements these models. (12 pages)
Project management	Overview of the Minto Pyramid Principle	MM 58-09	This tutorial overviews the Minto Pyramid Principle, which is a structured approach to building a persuasive argument and presentation developed by Barbara Minto, a former McKinsey consultant (Minto 1987). The Minto Pyramid Principle has become the <i>de facto</i> standard for all major consulting firms worldwide. Minto's approach can improve almost any presentation and almost any form of persuasive speech.
Project management	The Project Closing Process	MM 59-07	This tutorial provides detailed guidelines for how to close out (finish) a project. Steps include (1) conduct a lessons-learned session, (2) complete the project closing report, (3) create the project archive, (4) finalize the project with the project completion notice, and (5) recognize achievements and celebrate.
Quality and statistics	Audit Sampling	MM 57-02	A tutorial that presents a hypergeometric probability distribution approach for audit sampling. The paper presents the methodology for setting up a stop and go sampling plan for an audit based on the hypergeometric distribution. This distribution is the most precise approach for auditing and results in the lowest recommended sample size. The companion Excel workbook "Audit Sampling.xls" implements the sampling model developed in this tutorial
Service operations	Queuing Theory	MM 57-38	This tutorial presents a clear and simple summary of queuing theory intended for the undergraduate business or MBA student. The paper presents the M/M/1 model, the M/M/s model, the PK formula, and an approximate G/G/s model. A number of graphs and examples are used to make the concepts as clear and as simple as possible. A description of the advantages and disadvantages of pooling is presented. Emphasis is placed on the intuition that can be derived from queuing models.
Service operations	Yield Management	MM 58-03	This tutorial defines yield management (also known as revenue management, perishable asset management, load management, and revenue enhancement) and explains practical



Topic	Title	Code	Description
			ways that firms can use yield management concepts to maximize revenue and profits.
Supply chain management	Seasonal Buying	MM 57-27	A tutorial that discusses how the newsvendor problem can be applied to handle seasonal buying for a retailer. (9 pages)
Theory of constraints	Drum-Buffer-Rope	MM 57-07	This tutorial presents Goldratt's drum-buffer-rope concepts. This is one of the main concepts of the Theory of Constraints.
Theory of constraints	Throughput Accounting	MM 57-33	This tutorial presents Goldratt's throughput accounting principles with an example.



POPULAR EXCEL WORKBOOKS

Process improvement

Title	Code	Description
Failure Modes and Effects Analysis (FMEA.xls)	MM EW 57-34	A simple Excel workbook "template" that supports a Failure Mode and Effects Analysis (FMEA).
Project Hopper (Project Hopper.xls)	MM EW 58-05	This Excel workbook helps organizations score project opportunities on the basis of benefit and effort, where both benefit and effort are multi-dimensional constructs defined by the users. The workbook also creates a graph that can be used to help the team identify the best projects. This workbook was designed to support the "project hopper" for a lean sigma program, but can be used for any type project selection activity.

Forecasting and planning

Title	Code	Description
Forecasting with Exponential Smoothing (Forecasting with exponential smoothing.xls)	MM EW 57-14	This Excel workbook implements the Winters' model for forecasting with exponential smoothing. This model finds the least squares fit for the alpha and beta parameters for the Winters' model. It also helps estimate the seasonal factors using a centered moving average approach. The model allows users to modify the parameters and view the statistical and graphical results. See the companion paper "Forecasting with Exponential Smoothing."
LIDA – Lifetime Inventory Demand Analysis (LIDA.xls)	MM EW 57-17	This Excel workbook forecasts the remaining lifetime demand using both a finite and an infinite geometric series model. Regression is used to estimate the parameters. Extensive graphs support the analysis. The companion paper entitled "Forecasting Lifetime Demand" explains the models implemented in this Excel workbook. The name "LIDA" stands for "Lifetime Inventory Demand Analysis."

Inventory management and purchasing

Title	Code	Description
ABC Classification Analysis (ABC classification analysis.xls)	MM EW 57-01	An Excel workbook that implements numerical methods in VBA to find the optimal alpha parameter to fit a distribution-by-value curve to empirical data.
Aggregate Inventory Analysis (Aggregate inventory analysis.xls)	MM EW 57-02	An Excel workbook that analyzes a set of items and finds the optimal order sizes (lotsizes) for each item based on item demand, item ordering (or setup) cost, and the inventory carrying charge (assumed to be constant across all items). The workbook compares the optimal and actual lotsizes and inventory investments for each item and compares the optimal and actual aggregate inventory for the entire set of items.
Safety Stock (Safety Stock.xlsm)	MM EW 57-30	This worksheet provides a complete tool for determining safety stocks and order quantities for independent demand inventory systems using both the unit fill rate and the shortage cost methods. Using the two methods to complement one another is a powerful idea. One method can be used to validate the results



Title	Code	Description
		of the other method, and the user can iterate to find a pair of consistent values. The worksheet finds the optimal safety stock for both continuous and periodic review systems and calculates the reorder point for continuous review and the target inventory for periodic review systems. The companion tutorial entitled "Safety Stock" provides all of the technical details needed to support this workbook.

Logistics/transportation

Title	Code	Description
The TSP Game	MM EW 69-01	An Excel workbook that demonstrates the traveling salesperson problem (TSP). Professor Art Hill created this "game" to illustrate the traveling salesperson problem (TSP). With this game, the player is given a map showing 10 locations. The user then has to try to find a better route (sequence) to reduce the total distance. The user is then given the optimal solution. This workbook uses a number of "heuristics" to find the near-optimal solution to the TSP. While these heuristics often find the optimal (minimum distance) route, we have no guarantee that these routes are in fact optimal. We only know that most of the time that they are "pretty good" -- and often are optimal. We also know that for a "Euclidian" TSP (a TSP based on x-y coordinates) like this one, that no arcs (lines) will cross in the optimal solution.

Lotsizing

Title	Code	Description
Economic Lot Scheduling Problem (ELSP.xls)	MM EW 57-12	An Excel workbook that solves the economic lot scheduling problem. This workbook uses VBA to implement a Newton search to find the shadow price needed to satisfy the capacity constraint. See the companion workbook entitled "The Economic Lot Scheduling Problem."
The Economic Order Quantity (EOQ.xls)	MM EW 57-13	An Excel workbook that implements the EOQ model for teaching purposes. This Excel workbook can also be used to estimate the setup cost over carrying charge ratio from historical data. The papers "Lotsizing Methods" and "Inventory Management" consider many of the same issues.
Lotsizing (Lotsizing.xls)	MM EW 57-18	An Excel workbook that implements several methods for lotsizing for time varying demand, including an efficient implementation of the Wagner-Whitin algorithm. See the companion paper entitled "Lotsizing Methods."
The Newsvendor Model (Newsvendor Model.xls)	MM EW 57-20	An Excel workbook that finds the optimal solution to the newsvendor problem. The workbook includes separate worksheets for the triangular, normal, gamma, and Poisson distributions for demand. Each worksheet allows for user-input parameters and shows (1) graphs for the demand distribution, (2) graph for the expected profit versus order quantity, and (3) optimal values (order quantity, expected profit, etc.). The user can also experiment with various order quantities and immediately see how the results change. See the companion paper entitled "The Newsvendor Problem."



Quality control

Title	Code	Description
Rolled Throughput Yield Calculator (Rolled Throughput Yield Calculator.xls)	MM EW 60-04	This Excel workbook is a simple and practical tool for computing both process yields and rolled throughput (first pass) yields for a process.



ADVANCED EXCEL WORKBOOKS

Topic	Title	Code	Description
Forecasting and planning	Bass Model (Bass model.xls)	MM EW 57-05	This Excel workbook implements the Bass model for product diffusion in order to predict the sales of a new product. The workbook provides an extensive explanation for how the model works and finds the optimal (least squares) fit given a few points on the product life cycle. More information on the Bass Model can be found in the Encyclopedia of Operations Management.
Forecasting and planning	Seasonal Factors (Seasonal factors.xls)	MM EW 57-33	This Excel workbook simultaneously finds the best estimates of the intercept and slope for a trend line and the seasonal factors for user-provided demand data.
Inventory management and purchasing	Slow Moving Inventory Model (Slowmove.xls)	MM EW 57-27	An Excel workbook that finds the optimal target inventory level for slow moving items assuming Poisson distributed demand and a one-for-one ordering policy. The user must specify both the shortage cost and the carrying cost parameters. See the companion paper entitled "Managing Slow-Moving Inventory."
Inventory management and purchasing	Safety Stock with Multiple Items (Safety Stock with Multiple Items.xls)	MM EW 62-02	This worksheet provides a complete tool for determining optimal order quantities and safety stocks for many items using the unit fill rate method for both continuous and periodic review systems. The workbook provides extensive analysis and comparison of the results. It is often possible to improve both inventory investment and service levels at the same time by reducing some safety stocks and increasing others.
Lean	Smart Pull System (Smart pull system.xls)	MM EW 57-28	An Excel workbook that can help firms set target inventories (and associated safety stocks) based on demand forecasts. This can be used as a tool to help implement a lean pull system. See the companion paper by the same name.
Logistics	AL - The Adaptive Location/ Allocation Optimization Tool (AL.xls)	MM EW 57-03	An Excel workbook that implements an advanced version of the numeric-analytic allocation location model for finding the optimal solution for a single facility and near-optimal solutions for multiple warehouses using an infinite set location approach. The workbook extends the traditional approach by implementing a great circle distance option with latitudes and longitudes. See the companion paper entitled "Location Theory."
Logistics	The Gravity Model (Gravity.xls)	MM EW 57-15	An Excel workbook for the gravity model for competitive retail store location. This workbook helps locate a new retail facility given the demographics of the region and the location of competing retailers. The "pull" of a retailer on



Topic	Title	Code	Description
			one customer region is directly proportional to the size of the store and inversely proportional to the distance (or travel time) squared. See the companion paper entitled "Location Theory."
Lotsizing	Multiple Item Newsvendor Problem (Multiple Item Newsvendor Problem.xls)	MM EW 58-04	This Excel workbook finds the optimal solution to the multiple item newsvendor problem, where the quantities purchased are limited by a budget constraint.
New product development	Check Digit (Check digit.xls)	MM EW 57-06	The last digit of many account numbers, identification numbers, and part numbers. The check digit is a useful for determining if the number is valid. This Excel workbook implements a popular check digit algorithm to verify that an account number such as a credit card number is clearly invalid. This procedure will work on nearly all credit card numbers.
Price optimization	Price Optimization (Price Optimization.xls)	MM EW 57-23	This Excel workbook fits an exponential price-demand curve of the form $D(p) = \alpha \cdot \exp(-\beta \cdot p)$ to two user-define points (p_1, D_1) and (p_2, D_2) , where p is the price and D is the demand in units. The parameters α and β for the price-demand curve are estimated by solving two equations simultaneously. Calculus is then used to find the price that optimizes total profit, given the unit cost. The optimal price, optimal demand, and optimal revenue are also reported. The price-demand and the price-profit curves are then drawn. The companion tutorial for this Excel workbook is entitled "Price Optimization."
Process improvement	Learning Models (Learning Models.xls)	MM EW 57-16	An Excel workbook for both the half-life and the learning curve. Finds the optimal learning parameters to minimize the sum of the squared errors. See the companion paper entitled "Learning Models."
Process improvement	Kepner-Tregoe	MM EW 65-01	This worksheet implements the Kepner-Tregoe model for determining weighted scores for alternatives. (This is often called a scoring matrix.) This workbook uses a paired comparisons method to determine the weights.
Project management	Project Schedule Template (Project schedule template.xls)	MM EW 57-32	This Excel workbook is an easy-to-use project scheduling tool that displays the start and end times for each task in a project. Large projects often require Microsoft Project or other dedicated project management software. However, most managers do not have easy access to Microsoft Project and do not have the time to learn how to use it. Most process improvement projects are small enough that they can be managed with this simple Excel-based scheduling tool.



Topic	Title	Code	Description
Quality and statistics	Audit Sampling (Audit sampling.xls)	MM EW 57-04	This is a sophisticated Excel workbook that implements a stop and go sampling plan for an audit based on the hypergeometric distribution. This distribution is the most precise approach for auditing and results in the lowest recommended sample size. Much of the VBA code needed for this process is included in the companion paper by the same title.
Quality and statistics	Sigma Level (Sigma level.xls)	MM EW 57-26	An Excel workbook that determines the sigma level for a process given the number of defects per million opportunities and the shift in the mean.
Service operations	Queuing Models (Queuing Models.xls)	MM EW 57-24	This Excel workbook includes four worksheets that provide four types of queuing analysis. The first worksheet allows the user to input a number of system input parameters and immediately see the steady state (long-term) results. The second worksheet shows the graphs for a range of servers. The third worksheet analyzes systems that have a target time in system and a target service level. The fourth and last worksheet provides an economic analysis of a queuing system that can be used when the user knows the cost for the customer time in the system and the cost for the capacity. All of the technical details for this Excel workbook can be found in the companion tutorial entitled "Queuing Theory."

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