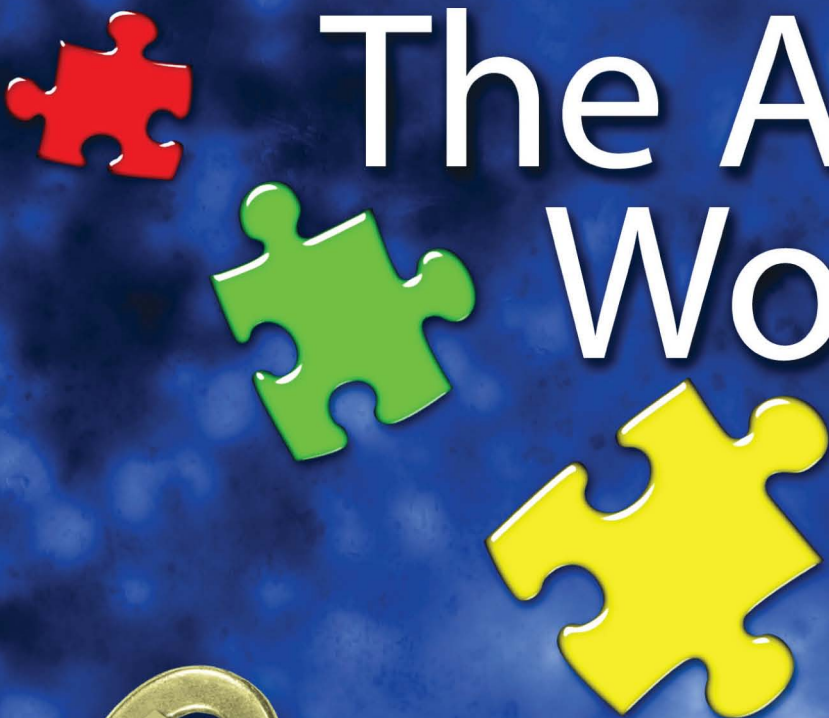




The A3 Workbook

Unlock Your
Problem-Solving
Mind



Daniel D. Matthews

The A3 Workbook

Unlock Your
Problem-Solving Mind

Daniel D. Matthews



CRC Press

Taylor & Francis Group

Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

A PRODUCTIVITY PRESS BOOK

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

© 2010 by Taylor & Francis Group, LLC
CRC Press is an imprint of Taylor & Francis Group, an Informa business

No claim to original U.S. Government works
Version Date: 20131009

International Standard Book Number-13: 978-1-4398-3490-9 (eBook - PDF)

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access www.copyright.com (<http://www.copyright.com/>) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Visit the Taylor & Francis Web site at
<http://www.taylorandfrancis.com>

and the CRC Press Web site at
<http://www.crcpress.com>

Contents

Preface.....	vii
Acknowledgments	ix
About the Author.....	xi
1 Introduction.....	1
The Origin of A3.....	1
A3 Formats	2
Folding the A3.....	4
How A3 Fits into Your Organization.....	4
2 Overview.....	7
A3 Problem-Solving Overview	7
A3 and the PDCA Cycle.....	8
Definition of a Problem	10
Types of Problems	10
How Problems Come to Us	12
3 Problem Situation	15
Introduction.....	15
Background	16
Standard.....	16
Production Standards Exercise.....	20
Office Standards Exercise	21
Current Situation	22
Example	23
Discrepancy.....	25
Example	25
Production Problem Statement Exercise.....	26
Office Problem Statement Exercise.....	27
Extent	28
Tank Weld Scenario	29
Example	30
Rationale	30
Example	31

4	Target.....	33
	The Difference between Targets and Goals	33
	Structure of an Effective Target	34
	Example	35
	Target Statement Exercise	35
5	Theme	39
	General Theme Categories	39
	Creating the Theme	40
	Theme Statement Exercise	41
6	Loud-&Clear Speaker	43
	Practice Case Study	43
7	Cause Analysis	49
	5-Why	49
	Cause Analysis Process	50
	Example	51
	Example	53
	Determining Root Cause	55
	Therefore Test	56
	Production 5-Why Exercise	58
	Office 5-Why Exercise	59
8	Countermeasures	61
	Selecting the “Right” Countermeasures	61
	Brainstorming Countermeasures	62
	Narrow Countermeasure List	65
	Evaluate Remaining Countermeasures	67
	Effectiveness	67
	Feasibility	68
	Impact	68
	Selecting Countermeasure(s)	72
	Example	76
9	Implementation.....	79
	The 3-Cs for Success	79
	Create the Plan	80
	List Required Steps	80
	Example	80
	Sequence Required Steps	81
	Communicate the Plan	83
	Carry out the Plan	83
	Assessment	84
	Assignment	84
	Accountability	84

10 Follow-up	87
Evaluating the Result.....	87
How to Check	88
When to Check	88
Recommended Actions	89
11 Putting It All Together	91
Dave's Fabrication Case Study: Part A.....	91
Dave's Fabrication Case Study: Part B.....	92
Dave's Fabrication Case Study: Part C.....	94
Dave's Fabrication Case Study: Part D	96
Dave's Fabrication Case Study: Part E	97
12 Improve Your A3's Effectiveness	99
Sequencing the Flow of an A3	99
Common A3 Visuals	100
Basic Equations	101
Line Graphs	102
Data Tables	103
Pareto Charts	104
Example	105
Pie Charts.....	107
Pictograms	107
Sketches and Drawings	107
Visuals Practice	108
Line Graph Exercise	109
Data Table Exercise	111
Pareto Chart Exercise	112
Pie Chart Exercise	114
Pictogram Exercise	115
Titan Case Part A: A3 with Visuals Practice.....	116
Titan Case Part B: A3 with Visuals Practice.....	118

APPENDICES

Appendix A: Production Standards Exercise Answers.....	121
Appendix B: Office Standards Exercise Answers.....	123
Appendix C: Production Problem Statement Exercise Answers	125
Appendix D: Office Problem Statement Exercise Answers	127
Appendix E: Target Statement Exercise Answers.....	129
Appendix F: Theme Statement Exercise Answers	131
Appendix G: Loud-&-Clear Answer	133

Appendix H: Production 5-Why Exercise Answers	135
Appendix I: Office 5-Why Exercise Answers.....	137
Appendix J: Line Graph Exercise Answer	139
Appendix K: Data Table Exercise Answer.....	141
Appendix L: Pareto Chart Exercise Answer	143
Appendix M: Pie Chart Exercise Answer	145
Appendix N: Pictogram Exercise Answer	147
Appendix O: Dave's Fabrication Blank A3	149
Appendix P: Dave's Fabrication A3 Answer	151
Appendix Q: Titan Blank A3.....	153
Appendix R: Titan A3 Answer	155
Appendix S: 5S Problem Report A3	157
Appendix T: Food Service Proposal A3.....	159
Appendix U: Maintenance Training Proposal A3.....	161
Appendix V: Blank Problem-Solving A3 Format	163
Index	165

Preface

My journey as an instructor began while serving in the United States Air Force in the early 1980s. After leaving the U.S. Air Force, I worked for 5 years as a contract instructor and developer at Toyota Motor Manufacturing Kentucky (TMMK). I worked with a small group of contract instructors and developers under David Verble's tutelage. We were charged with developing the course materials that would be used to teach the Toyota Problem-Solving process and the A3 approach to team members at every level in the organization.

After leaving TMMK, I worked for 9 years at Toyota Industrial Equipment Manufacturing (TIEM). While working at TIEM, I had many responsibilities but continued to develop my A3 Problem-Solving skills and the skills of other people.

I eventually went to work for the Manufacturing Extension Partnership (MEP) in Kentucky. I soon realized the power of the A3 Problem-Solving process as I worked with various manufacturers to develop Lean Manufacturing Practices within their organizations. I found that, by following the thought process standardized on the A3 Problem-Solving format, I could quickly and effectively help Kentucky manufacturers make numerous improvements in their processes.

Due to my experience with the Training Within Industry (TWI) curriculum, I was recruited by the Tennessee MEP to conduct Train-The-Trainer classes with their staff. While teaching Job Instruction at one of their clients, I met Todd Shadburn. Knowing of my experience with Toyota, Todd sent a brief e-mail asking me if I had any materials that could explain how to complete an A3.

My reply was simple: "You're in luck." I explained my role with A3 Problem Solving at Toyota in Georgetown. Todd asked me if I could meet with him and give him a quick overview. At the end of our meeting, his only comment was, "None of the books that I've read on A3 have explained the process in a way that is so easy to understand." He has since invited me back several times to teach A3 to team leaders, group leaders, and managers at his facility.

After my discussion with Todd, I realized that although there are some very good books on the market that discuss the A3, there was nothing that walked people block by block through the A3 format and how the problem-solving process fits in with each block. I also wanted to create a workbook that could be used at every level in the organization to develop the basic problem-solving skills that are required to make continuous improvements.

My hope is that this workbook will be used by companies to develop the problem-solving skills of their employees—leading not only to improved profit, quality, productivity, safety, and delivery, but also to a culture that understands the value of developing people at every level.

TWI job relations stresses utilizing people to the best of their abilities. By teaching A3 Problem Solving to those who actually accomplish the work, whether on the shop floor or in the office, organizations will be able to solve or reduce the severity of most problems.

The text in this workbook is structured to follow the layout of a basic Problem Solving A3 format. I wrote it in this format so that the reader could actually practice applying the skills described in each section. There are case studies that the readers will use to complete A3s, tips on how to improve the readability of A3s, examples of Problem Solving A3s, and a proposal A3.

An effective problem-solving process is a critical part of implementing efficient business practices. A problem-solving culture is a fundamental component of empowering employees to support business improvements. Both of these components, taken together, can help each and every organization make continuous improvements on the long journey to creating a more productive and profitable business.

Acknowledgments

There are too many people for me to recount who made this journey possible. It would be like listening to one of those award speeches that goes on and on. However, I would like to thank a few key people who directly contributed to making this workbook a reality.

I need to thank David Verble for including me on the team that developed and taught A3 Problem Solving at Toyota Motor Manufacturing Kentucky (TMMK). Later he took me under his wing as he branched out into Practical Problem Solving. Because of David's mentoring I was able to leave TMMK and take a permanent position at Toyota Industrial Equipment Manufacturing (TIEM). I spent almost 10 years at TIEM applying David's teachings and insight. I can never thank David enough for what he did for me and for my career.

For providing me with insight into the Japanese way of conducting business and the use of Namiwashi, I would like to thank Mr. Imaeda and Mr. Mizuno, my Japanese coordinators at TMMK and TIEM.

I would like to thank Todd Shadburn and Keith Groves, Jack Parsons, Brent Renfroe, and Lynn Witten Godsey for their support.

A special thanks goes to my wife Mart, good friend James R. Johnson, and my dad David for reading my manuscript and providing me with valuable feedback. Finally, I would like to thank my family for their support over the years.

Supplementary Resources Disclaimer

Additional resources were previously made available for this title on CD. However, as CD has become a less accessible format, all resources have been moved to a more convenient online download option.

You can find these resources available here: www.routledge.com/9781439834893

Please note: Where this title mentions the associated disc, please use the downloadable resources instead.

About the Author

Included in **Daniel Matthews'** 30-year career is more than 14 years of supervisory and management experience with Toyota Motor Manufacturing and Toyota Industrial Equipment Manufacturing. He is skilled as a trainer, coach, and implementer of Lean Manufacturing, having trained hundreds of associates in the methods of the Toyota Production System (TPS).

During his time with Toyota, Daniel became an experienced Training Within Industry (TWI) instructor. The TWI program is widely recognized as the foundation for Lean Manufacturing.

Daniel has helped both leaders and associates build the skills they need to support a Lean culture, including problem solving, team building, facilitation, coaching, communication, conflict management, and leadership both in the classroom and on the shop floor.

Daniel's skills as a TWI and A3 Problem Solving instructor have led to speaking engagements in the printing, automotive, and general manufacturing industries.

Daniel graduated summa cum laude from Indiana Wesleyan University with a degree in business administration where he was a two-time recipient of the Outstanding Business Professional Award.

Chapter 1

Introduction

The Origin of A3

What is an A3 format? First and foremost, A3 is a format developed by Toyota for telling the story of improvement. The A3 has two basic functions, one as a method for making proposals and the other as a means of reporting on the approved actions as outlined in the A3 proposal.

In actuality, the A3 format earns its name from the International Organization for Standardization's (ISO) designation for paper measuring 297 by 420 millimeters. This is the paper size that has become the standard by which Toyota communicates continuous improvement projects. The A3 paper size used at Toyota Motor Corporation in Japan measures 297 by 420 millimeters (or 11.793 by 16.535 inches). This paper standard is used in just about every country in the world other than the United States. In the United States, paper size is based on the American National Standards Institute (ANSI) paper standard (Table 1.1 compares ANSI and ISO paper sizes).

ANSI B (11 by 17 inches) is the closest match to the ISO A3 paper size and therefore is commonly referred to as A3 by Lean practitioners and those familiar with Toyota's A3 format. Because ANSI B Problem Solving does not roll off the tongue as eloquently as A3 Problem Solving, I will continue to use the term "A3" throughout this book. At Toyota in North America, the Japanese coordinators continue to use ISO A3 paper. ISO A3 paper provides an additional 6 square inches of space for telling the story of improvement. The goal is for you to be able to communicate your proposal or problem on a single sheet of paper. ANSI B paper and the A3 Problem Solving process will make it possible for you to achieve this goal.

The idea behind the A3 is simple: communicate your proposed idea on a single sheet of paper—no more and no less. In a Lean organization where everyone has multiple functions, there is little time for reading reams of data to understand a particular problem or situation. The A3 effectively condenses large amounts of

Table 1.1 ANSI and ISO Paper Sizes

<i>INCHES</i>			
<i>ANSI Sizes</i>		<i>ISO Sizes</i>	
ANSI A	8.5 × 11	8.3 × 11.7	A4
ANSI B	11 × 17	11.7 × 16.5	A3
ANSI C	17 × 22	16.5 × 23.4	A2
ANSI D	22 × 34	23.4 × 33.1	A1
ANSI E	34 × 44	33.1 × 46.8	A0

data into an easy-to-read and understand format. By keeping it simple, you are less likely to lose the attention of the reader and possibly their support.

Although you do not need to create an A3 for every situation, it is a good idea to use the format on a regular basis. The more you use it, the more it will become a natural part of how you approach problem situations. In your daily work, you will encounter many situations requiring action. Not all situations will require the creation of an A3, but the thought process can be used at any time.

There are several documented benefits to using the A3 Problem-Solving approach, as summarized below:

- Provides a methodical approach to problem solving
- Provides a succinct format for presenting or reporting facts to others
- Documents a trail that others can follow and use to understand the problem solver's actions and results
- Provides a common language and method within an organization
- Creates a culture conducive to sustaining Lean Manufacturing concepts
- Provides a foundation and lays the groundwork for future change

A3 Formats

As discussed earlier, A3 is a format created by Toyota for telling the story of improvement. The A3 has two basic functions: first as a method for making proposals, and second as a means of reporting on the approved actions as outlined in the proposal.

By condensing the essential information to fit on one page, the A3 format makes it easier for anyone in the company to read and understand what the author is proposing or reporting. The A3 methodology is also used to mentor subordinates on how to become problem solvers, not problem bringers.

The A3 Proposal Format is used when a Team Member requires management approval to make a change or to head off any anticipated problem. The blocks of

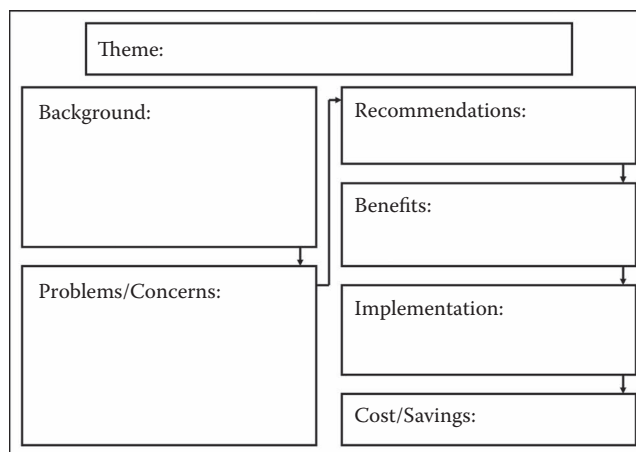


Figure 1.1 Possible A3 proposal format.

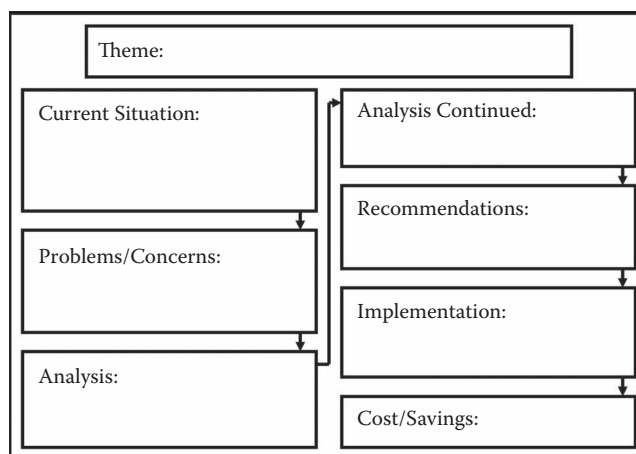


Figure 1.2 Possible A3 proposal format.

the proposal format can have many different headings; Figures 1.1 and 1.2 represent two possible configurations for an A3 Proposal. Appendices T and U are examples of completed A3 Proposal Formats that can be used for future reference.

The A3 Problem Report is used when a Team Member requires management approval for implementation of countermeasures to eliminate an existing problem. The A3 Problem Proposal/Report Format is both a proposal and a report. Initially it is a proposal that is presented to management and must be approved before implementation can begin. It becomes a report when the owner begins to see results from the countermeasures and reports those results to management. Once the Problem Report is mastered, creating other A3 forms becomes much easier; Figure 1.3 is the Problem Report Format. Appendix S is an example of a completed A3 Problem Report Format and Appendix V is a blank A3 Problem Format that can be reproduced.

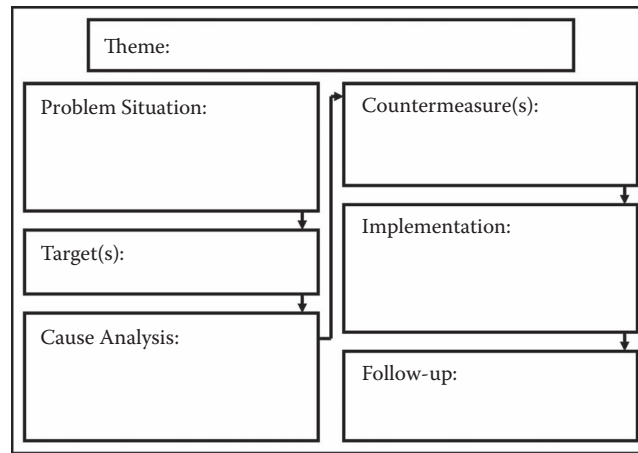


Figure 1.3 A3 problem report format.

Folding the A3

Because the standard A3 and ANSI B paper is larger than the paper used for day-to-day writing and reporting, it was found difficult to file and incorporate into report binders. For this reason, Toyota adopted a specific way (standard) for folding the A3. By folding the A3 in half from right to left, you now have a sheet of paper in its folded state that is 8.5 by 11 inches. The opening will be on the left side if folded properly. Then, by taking the top edge on the left side and folding it evenly back to the right, you have a crease on the right side.

By folding the A3 in this accordion-like manner, you are able to file it more easily. In addition, you are able to place it in report binders that contain supporting information for the A3. With the top edge facing to the right, you have a natural tab that can be grasped and pulled, thus making it easier to open and view the contents of the A3. Figure 1.4 depicts how to fold an A3.

How A3 Fits into Your Organization

The purpose of this A3 workbook is to provide anyone at any level within an organization with the tools needed to be an effective problem solver. More and more, managers are realizing that they must develop their entire workforce in order to help their organization achieve its goals and objectives.

In a meeting with a manager from an automaker, the topic of problem-solving tools, in particular Six Sigma, came up. He told me about a study conducted by one of his Original Equipment Manufacturers (OEMs) regarding the types of problems they experienced. The problems were categorized in the following three ways:

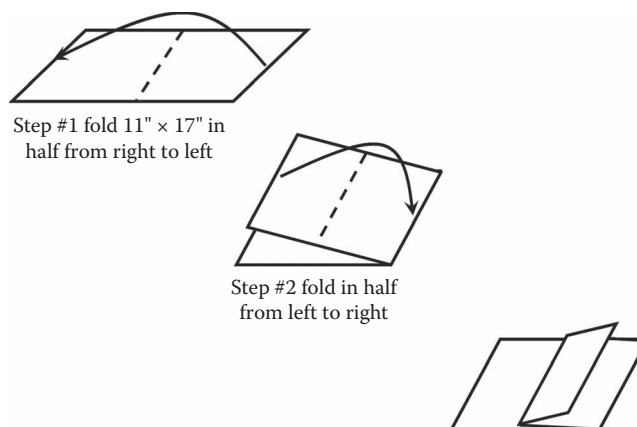


Figure 1.4 How to fold an A3.

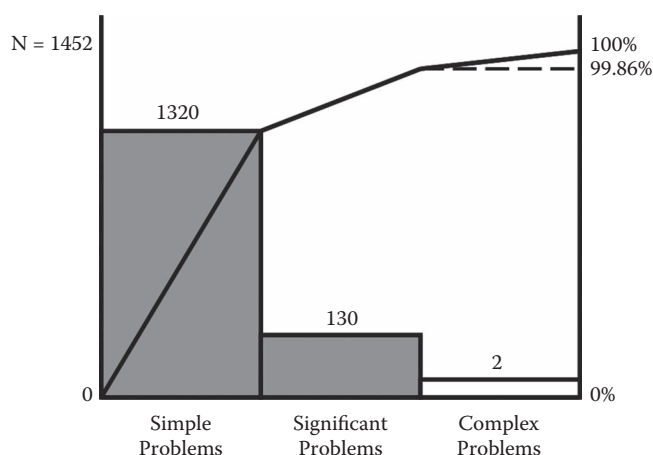


Figure 1.5 Pareto of problem categories.

1. Simple (90.91%): everyday problems that require basic problem-solving skills
2. Significant (8.95%): major problems that require supervisor or management buy-in and approval before implementation
3. Complex (0.14%): problems that may require more complicated methods such as Six Sigma

Based on the study, 99.86% of problems experienced at the OEM were easily handled at the tactical or Team Member/Team Leader level; Figure 1.5 is a Pareto chart showing the three problem categories. The problem is that most organizations do not develop these basic problem-solving skills throughout their company. At Toyota, we taught problem solving in conjunction with the A3 to all departments and all levels. The A3 Problem-Solving process is one that is time efficient, can be driven down to the process level with little training, and has a high effectiveness after writing just a few A3s.