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# Air Force Procurement Workforce Transformation

Lessons from the Commercial Sector

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John Ausink, Laura H. Baldwin, Christopher Paul

Prepared for the United States Air Force

Approved for public release, distribution unlimited



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## Preface

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Ongoing RAND Project AIR FORCE research is supporting the U.S. Air Force's efforts to change the way it purchases goods and services to improve performance and reduce costs. There is a great deal of interest in adopting proven commercial practices such as using cross-functional teams (called commodity councils) to develop corporate-wide strategies for purchasing categories of commodities. The Air Force has begun a procurement transformation effort, focusing on implementation of commodity councils and development of strategies for selected types of commodities. A key tenet of the transformation effort is workforce development.

This report summarizes RAND Corporation support for the Air Force's procurement workforce transformation efforts. The purpose of this research is to provide preliminary analyses to aid the Air Force with some of the human-capital-related aspects of its procurement transformation efforts. In this document, we draw on insights from commercial sector experiences with implementation of commodity councils and new purchasing and supply management strategies for procurement of goods and services. We describe skills that Air Force procurement personnel will need for effective participation in commodity councils and make an initial assessment of new skills that will need to be developed, discuss selected commercial practices on training for purchasing and supply management professionals, and recommend a portfolio of performance metrics the Air Force could use to track the progress of and refine its procurement workforce transformation efforts.

This research is part of a broader study entitled “Supporting Air Force Procurement Transformation and Laying the Groundwork for Services Acquisition Reform,” sponsored by the Air Force Deputy Assistant Secretary for Contracting (SAF/AQC) and conducted within the Resource Management Program of RAND Project AIR FORCE.

Other RAND Project AIR FORCE research is supporting the Air Force Materiel Command’s purchasing and supply management demonstration efforts within its Air Logistics Centers, as well as the restructuring of the command’s headquarters organizations around the principles of purchasing and supply management.

This document should be of interest to all federal agency personnel concerned with significant changes in workforce activities and skills, particularly changes associated with implementation of purchasing and supply management activities.

For the last decade, RAND Project AIR FORCE has been helping the Air Force reshape its sourcing policies and practices. The reader may also be interested in the following related RAND Corporation reports (which are available on the web, see [www.rand.org/Abstracts](http://www.rand.org/Abstracts)):

- *Using a Spend Analysis to Help Identify Prospective Air Force Purchasing and Supply Initiatives: Summary of Selected Findings*, Nancy Y. Moore, Cynthia Cook, Charles Lindenblatt, and Clifford Grammich, DB-434-AF, 2004.
- *Measuring Changes in Service Costs to Meet the Requirements of the 2002 National Defense Authorization Act*, Chad Shirley, John Ausink, and Laura H. Baldwin, MR-1821-AF, 2004.
- *Defining Needs and Managing Performance of Installation Support Contracts: Perspectives from the Commercial Sector*, Laura H. Baldwin and Sarah Hunter, MR-1812-AF, 2004.
- *Implementing Performance-Based Services Acquisition (PBSA): Perspectives from an Air Logistics Center and a Product Center*, John Ausink, Laura H. Baldwin, Sarah Hunter, and Chad Shirley, DB-388-AF, 2002.

- *Implementing Best Purchasing and Supply Management Practices: Lessons from Innovative Commercial Firms*, Nancy Y. Moore, Laura H. Baldwin, Frank Camm, and Cynthia R. Cook, DB-334-AF, 2002.
- *Federal Contract Bundling: A Framework for Making and Justifying Decisions for Purchased Services*, Laura H. Baldwin, Frank Camm, and Nancy Y. Moore, MR-1224-AF, 2001.
- *Performance-Based Contracting in the Air Force: A Report on Experiences in the Field*, John Ausink, Frank Camm, and Charles Cannon, DB-342-AF, 2001.
- *Strategic Sourcing: Measuring and Managing Performance*, Laura H. Baldwin, Frank Camm, and Nancy Y. Moore, DB-287-AF, 2000.
- *Incentives to Undertake Sourcing Studies in the Air Force*, Laura H. Baldwin, Frank Camm, Edward G. Keating, and Ellen M. Pint, DB-240-AF, 1998.
- *Strategic Sourcing: Theory and Evidence from Economics and Business Management*, Ellen M. Pint and Laura H. Baldwin, MR-865-AF, 1997.

## **RAND Project AIR FORCE**

RAND Project AIR FORCE (PAF), a division of the RAND Corporation, is the U.S. Air Force's federally funded research and development center for studies and analyses. PAF provides the Air Force with independent analyses of policy alternatives affecting the development, employment, combat readiness, and support of current and future aerospace forces. Research is conducted in four programs: Aerospace Force Development; Manpower, Personnel, and Training; Resource Management; and Strategy and Doctrine.

Additional information about PAF is available on our web site at <http://www.rand.org/paf>.



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## Summary

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### Air Force Procurement Transformation

The Air Force is in the process of significantly changing the way it purchases goods and services, with the goals of reducing costs and increasing performance to better support its missions. During spring 2002, SAF/AQC developed a Procurement Transformation Strategy that outlines a roadmap for changing the Air Force's procurement policies, processes, personnel, and related technologies to meet the changing needs of a transforming Air Force. A procurement transformation division (SAF/AQCA) was created to lead these implementation efforts, and the new division highlighted two related areas for particular emphasis: (1) implementation of cross-functional teams (commodity councils) to develop strategies for individual commodity groups and (2) procurement workforce development to support implementation. These efforts involve designing a commodity council approach for the Air Force, analyzing data to identify appropriate commodity groups, identifying skills needed for council members to effectively participate in council activities, analyzing current workforce skills and training and identifying any gaps, and developing a plan to grow skills that are lacking.

PAF was asked to conduct three analyses to assist with these efforts:

- Review ongoing research, industry publications, and other available sources on the transformation of *commercial* purchasing and supply management practices and organizations to identify the

skill set needed by Air Force procurement personnel to successfully implement commodity councils. Then conduct a preliminary evaluation of current Air Force procurement skills to identify any gaps.

- To help the Air Force efficiently and effectively address any identified training needs, gather information about how commercial firms provide purchasing and supply management training, as well as concrete examples of training programs and publicly available courses.
- To help ensure that workforce transformation efforts are successful, develop a portfolio of performance metrics that will facilitate evaluation of progress and refinement of implementation plans as needed.

This report describes our findings and recommendations based on these analyses.

## **Research Approach**

This research draws from a variety of private sector, Air Force, and Department of Defense sources. We reviewed a sample of the literature on accepted purchasing and supply management practices, interviewed commercial sector purchasing professionals, held discussions with Air Force acquisition and training professionals, and reviewed training curricula available to Air Force acquisition personnel. Based on these sources, our analysis reaches the following conclusions with attendant recommendations.

## **Commodity Councils Require a Wide Range of Skills**

We find that commodity council membership requires a wide range of skills (see Chapter Two), including use of computers, teaming/interpersonal skills, business skills such as creative problem solv-

ing, core purchasing and supply management skills such as cost analysis, analytical and technical skills such as statistical analysis, and contracting skills (see pp. 14–15).

Based on our preliminary assessment of available training, it appears that additional training, as well as increased access to selected existing Air Force Institute of Technology (AFIT) graduate courses, will be needed to grow the full set of skills required for Air Force commodity council members (see pp. 17–20).

Specifically, we recommend that the Air Force further refine the list of skills required for commodity council members (found in Appendix B), based on the experiences of its prototype commodity council. Once skill needs are comprehensively identified, a detailed evaluation of the goals and content of the new Defense Acquisition University (DAU) and AFIT curricula will be required to identify any new types of training needed to build those skills (see p. 19). Opportunities to attend these new or improved courses will need to be increased as the commodity council approach becomes widespread.

As an alternative to developing additional “in-house” training, there are many existing course offerings that are utilized and endorsed by well-respected commercial sector purchasing and supply management organizations that the Air Force could consider (see pp. 19–20).

## **There Is No Single Answer to Procurement Training**

Our literature review and interviews (discussed in Chapter Three) suggest that commercial firms have also struggled to grow purchasing and supply management organizations that contain the needed mix of skills and expertise.

We find that while there is no single right way to implement training, there are some common characteristics. Successful training programs tend to be multifunctional, involving personnel with diverse backgrounds that are relevant to new practices (see p. 22). Different firms’ training programs are organized differently, some relying on structured classroom or web-based learning to instill a basic understanding of a broad range of concepts, while others use more-

applied forms of learning such as formal on-the-job training and mentoring programs to develop more-sophisticated capabilities and high levels of expertise (see pp. 82–84). Finally, we note that different types of training are appropriate for developing different levels of expertise (see pp. 22–23).

All of our findings from the literature and in current business practice are consonant with two central themes (p. 22): First, training must prepare purchasing and supply management personnel for the realities of the current and continuously evolving environment in which they work; as such, training and training program development are always ongoing. Second, training should reflect the fact that a traditional “functional” perspective is less useful in today’s business environment, which rewards broadened perspectives; training that is cross-functional and emphasizes process management is ideal to support an integrated approach to procurement.

This overall perspective suggests that procurement training should be offered to a wider range of personnel than those traditionally considered core procurement personnel and that training programs should have tiers of instruction provided through multiple modes and approaches that depend on the desired level of mastery of a given topic and the starting level of competence demonstrated by individual students (pp. 30–31).

## **Effective Metrics Link Practices to Outcomes**

Metrics facilitate evaluation of workforce development progress and aid in the identification of areas for further improvement. In Chapter Four, we identify a hierarchy of five levels of interests to monitor with appropriate metrics (pp. 34–35): Air Force outcomes associated with mission performance (Level One), contracting performance and cost outcomes (Level Two), application outcomes associated with performance of desired purchasing and supply management activities (Level Three), individual learning outcomes associated with mastery of desired skills (Level Four), and training outcomes (Level Five). This framework explicitly links training to mastery of desired skills, to

appropriate implementation of desired purchasing and supply management activities, to improved outcomes of purchased goods and services, and to the effectiveness and efficiency of the procurement organization itself. We identify and recommend metrics for all levels except Air Force/mission level outcomes, which are affected by a host of factors other than contract performance.

In each case, metrics should be revisited over time to ensure that they are providing needed information and that they remain aligned with organizational objectives. In addition, the cost of implementing individual metrics should be assessed relative to the value of the information provided (pp. 49–50).



## Acknowledgments

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We would like to thank Judy Lesso in the RAND library who was instrumental in helping with the literature review for this report. Our RAND colleagues Justin Adams, Frank Camm, Mary Chenoweth, Eric Eide, Nancy Moore, Nancy Nicosia, and Bob Roll provided helpful discussions and comments on an early draft of this document.

We would also like to thank the three private sector purchasing professionals who helped us understand how they organize purchasing and supply management training and how they use performance metrics to manage their purchasing and supply management activities and organizations. Assurances of anonymity prevent us from identifying them here.

Many Air Force personnel assisted us in this research. We would like to thank Lt Col Tom Gaylord, Deb Middleton, Dorothy Priest, and Lt Pam Woods of the Air Force's new Information Technology Commodity Council for sharing their views on skills needed for future Air Force commodity councils. Barry Bertie provided information about AFIT's short courses.

Our Air Force points of contact in SAF/AQCA, Dan Bowman, Vince McDade, Lt Col Tim Reed, Maj David Reese, Maj Gloria Porter, and Capt Jennifer Grant, helped us better understand the Air Force's procurement transformation efforts and how our research could best support those efforts. John Caporal and Dianne Holmes, SAF/AQCX, helped us understand related internal SAF/AQC efforts to provide a baseline for current contracting workforce skills.

In addition, Lyle Eesley and Debbie Bartlett of DAU provided valuable information about DAU's new contracting curriculum.

We thank ManMohan S. Sodhi and Sheila Murray for their helpful reviews of an early draft of this document. This document benefited greatly from their suggestions.

Finally, we thank our administrative assistants, Maria Falvo and Mary DeBold, for their document support.

# Abbreviations and Acronyms

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AFIT	Air Force Institute of Technology
AFMC	Air Force Materiel Command
APDP	Acquisition Professional Development Program
APICS	American Production and Inventory Control Society
APP	Accredited Purchasing Practitioner
ASTD	America Society for Training and Development
CAPS	Center for Advanced Purchasing Studies
CFETP	Career Field Education and Training Plan
CPIM	Certified in Production and Inventory Management
CPM	Certified Purchasing Manager
DAU	Defense Acquisition University
DoD	Department of Defense
ISM	Institute for Supply Management
MRP	Materials Requirements Planning
NAPM	National Association of Purchasing Management
OJT	On-the-Job Training
SAF/AQC	Air Force Deputy Assistant Secretary for Contracting
SCM	Supply Chain Management
UTC	United Technologies Corporation



# Introduction

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## Background

The Air Force is in the process of significantly changing the way it purchases goods and services, with the goals of reducing costs and increasing performance to better support its missions. Current efforts date back to the mid to late 1990s, when the Air Force was under pressure to reduce spending to make room in the budget for investments in new weapon systems, force structure, and personnel. Because purchased goods and services are a significant and growing portion of the Air Force's budget, the Air Force Deputy Assistant Secretary for Contracting (SAF/AQC) asked RAND Project AIR FORCE (PAF) to examine the purchasing and supply management practices of firms that have demonstrated success in this area (as well as implementation considerations) and then develop recommendations for new practices that could be applied within the Air Force context, taking into account federal acquisition regulations and other considerations, such as socioeconomic goals, to which the Air Force must adhere.

PAF research supported the Air Force through two related multiyear efforts. One examined the narrower subject of improving the performance and cost of purchased services (Baldwin, Camm, and Moore, 2000; Ausink, Camm, and Cannon, 2001; Baldwin, Camm, and Moore, 2001; Ausink et al., 2002; Baldwin and Hunter, 2004; and Shirley, Ausink, and Baldwin, 2004). The other effort focused on the broader issues associated with corporate-wide purchasing and

supply management strategies. The research described in this document is an extension of this latter work.

Moore et al. (2002) documents the findings of an extensive literature review and numerous in-depth interviews with well-respected commercial sector purchasing and supply management professionals. This study found that more and more commercial firms are taking a more strategic, goal-oriented approach to purchasing goods and services. Key tenets of such an approach are

- developing strategies and measurable goals for purchasing categories of goods and services that are explicitly linked to corporate objectives
- identifying and providing resources to a high-level executive who will assume responsibility for development and implementation of a strategic purchasing and supply management program, including generating support among key stakeholder organizations
- using incentives to align actions of individuals involved in purchasing and supply management activities with goals.

Moore et al.'s (2002) findings suggest that commercial firms are seeking to simplify less important transactions, focusing efforts on larger, more risky, more strategic (relating to core activities) purchases. They are creating multi-tier cross-functional purchasing and supply management organizations, with top-tier centralized organizations responsible for important, complex purchasing strategies and strategic relationships with providers. These organizations include personnel with diverse knowledge and skills associated with internal requirements for purchased goods and services, contract development and management, industry trends, cost analysis, and process reengineering.

To ensure successful implementation of significant changes in purchasing and supply management practices, firms are undertaking formal implementation programs that reflect the principles of change management. Firms prepare for change by conveying why the new practices are important, visibly and continually supporting the change

at the leadership level, clearly conveying the vision for the change, and creating an action plan with resources and a plan for tracking progress. Firms support change by continuously communicating the goals and status of change efforts, providing training necessary for those involved in the changes, aligning incentives with goals, and providing resources. In executing changes, firms test and validate new concepts prior to full implementation, monitor progress, and refine plans as needed based on experiences to date.

Many of the study's recommendations for the Air Force focus on these implementation considerations, including the need to overcome the Air Force's strong, functionally oriented culture in order to encourage and support close cooperation among all the key stakeholders for different categories of purchased goods and services (commodity groups), the importance of having measurable goals for improvements in performance and cost and in tracking performance, and the need for training for all participants in new purchasing and supply management strategies.

Subsequent interviews with well-respected purchasing and supply management professionals and literature reviews indicated that many firms are further refining the multi-tier organizations discussed above, forming cross-functional teams, called commodity councils, to structure corporate purchasing and supply management strategies for individual commodity groups.

As a result of these findings, the Air Force began two separate but coordinated efforts to implement strategic purchasing and supply management practices. PAF has supported, and continues to support, implementation of each of these efforts. The Air Force Materiel Command (AFMC) is implementing what it calls purchasing and supply chain management demonstration projects at each of its Air Logistics Centers. PAF has performed data analyses, recommended organizational changes, and helped to structure and provide training to affected personnel (Leftwich et al., 2004; Moore et al., 2004).

During spring 2002, SAF/AQC developed a Procurement Transformation Strategy that outlines a roadmap for changing the Air

Force's procurement policies, processes, personnel, and related technologies to meet the changing needs of a transforming Air Force (U.S. Air Force Deputy Assistant Secretary for Contracting, 2002, p.2). The transformation "vision" is as follows:

The Air Force contracting community will become "Mission-focused, multiple-skilled business professionals following radically re-engineered processes leveraged by technology to mirror world class businesses." The skill mix for the transformed contracting workforce will change from the current skills in DoD [Department of Defense] procurement process expertise to a new set of skills in market knowledge, commodity strategies, supplier relationship management, and e-business savvy. Customers and their needs will be the unrelenting focus of all our efforts. Contracting policy will empower contracting professionals to make fast and effective decisions. Improved communications up, down, and across the Air Force will enable contracting personnel to satisfy customer needs with best value business propositions in terms of quality, timeliness, and price. The deliberate cross-feeding of new and innovative procedures/strategies among contracting professionals Air Force-wide will enhance mission accomplishment and enrich the contracting workforce (U.S. Air Force Deputy Assistant Secretary for Contracting, 2002, p. 3).

A procurement transformation division (SAF/AQCA) was created to lead these implementation efforts, and the new division highlighted two related areas for particular emphasis: (1) implementation of cross-functional teams (commodity councils) to develop strategies for individual commodity groups and (2) procurement workforce development to support implementation. These efforts involve designing a commodity council approach for the Air Force (U.S. Air Force, 2003), analyzing data to identify appropriate commodity groups, identifying skills needed for council members to effectively participate in council activities, analyzing current workforce skills and identifying any gaps in skills, and developing a plan to grow skills that are lacking.

PAF was asked to conduct three analyses to assist with these efforts:<sup>1</sup>

- Review ongoing research, industry publications, and other available sources on the transformation of *commercial* purchasing and supply management practices and organizations to identify the skill set needed by Air Force procurement personnel to successfully implement commodity councils. Then conduct a preliminary evaluation of current Air Force procurement skills to identify any gaps.
- To help the Air Force efficiently and effectively address any identified training needs, gather information about how commercial firms provide purchasing and supply management training, as well as concrete examples of training programs and publicly available courses.
- To help ensure that workforce transformation efforts are successful, develop a portfolio of performance metrics that will facilitate evaluation of progress and refinement of implementation plans as needed.

This report describes our findings from these analyses.

## Research Approach

Our findings and recommendations are based on a variety of private sector, Air Force, and Department of Defense (DoD) sources. We reviewed a sample of the business literature on accepted purchasing and supply management practices to identify commodity council activities and skills, examples of purchasing and supply management training programs, and metrics used by purchasing and supply management organizations. We conducted in-depth interviews with three well-respected commercial sector purchasing professionals regarding

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<sup>1</sup> We referred to these analyses as “preliminary” in the Preface because of the short timelines for their completion.

their assessments of valuable skills, their firms' workforce development programs, and the metrics they use to manage their purchasing and supply management activities.<sup>2</sup> We also conducted interviews with members of the Air Force's new Information Technology Commodity Council to learn which skills they are finding valuable for their efforts and their assessments of current training gaps. Additionally, we reviewed curricula and had discussions with personnel from the Defense Acquisition University (DAU) and the Air Force Institute of Technology (AFIT) to learn about the training currently available to Air Force personnel and plans to revise these curricula.

## Preview of Findings

Our review of commercial sector commodity council activities and skills indicated that commodity council membership requires a wide range of skills, including use of computers, teaming/interpersonal skills, business skills such as creative problem solving, core purchasing and supply management skills such as cost analysis, analytical and technical skills such as statistical analysis, and contracting skills. Our preliminary review of DAU's and AFIT's curricula indicates that they currently cover a number of these needed skills; however, there are fewer, if any, opportunities to learn some of the more-sophisticated skills associated with the new purchasing and supply management practices the Air Force is implementing. It appears that additional training, as well as increased access to selected existing AFIT courses, will be needed to grow the full set of skills needed for Air Force commodity council members.

Our literature review and interviews suggest that commercial firms have also struggled to grow purchasing and supply management organizations that contain the needed mix of skills and expertise. Sample training programs show that although there is no single right way to implement training, there are some common characteristics.

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<sup>2</sup> Because of assurances of anonymity, we are unable to identify these professionals or their firms.

Training programs tend to be multifunctional, involving personnel with diverse backgrounds that are relevant to new practices. Different types of training are appropriate for developing different levels of expertise. Some firms rely on structured classroom or web-based learning to instill a basic understanding of a broad range of concepts. Others use more-applied forms of learning such as formal on-the-job training (OJT) and mentoring programs to develop more-sophisticated capabilities and high levels of expertise. Some firms value professional certifications, such as the Institute for Supply Management's (ISM's) Certified Purchasing Manager (CPM) exam, not so much for the credential itself but as a demonstration of baseline competency upon which personnel can continue to build.

Finally, to assist the Air Force as it implements procurement workforce development initiatives, we developed a framework of metrics to track progress and refine efforts over time. This framework explicitly links training to mastery of desired skills, to appropriate implementation of desired purchasing and supply management activities, to improved outcomes of purchased goods and services, and to the effectiveness and efficiency of the procurement organization itself.

## **Organization of the Report**

The remainder of this report is divided into four chapters. Chapter Two addresses the question of skills needed by Air Force procurement professionals in order to implement commodity councils. This chapter describes a set of *activities* that will be accomplished by commodity councils, the *skills* required to accomplish the activities, and our preliminary assessment of those skills that need more emphasis in Air Force training and professional development programs.

To develop and retain the needed skills, the Air Force may need to modify how it trains its procurement professionals; Chapter Three reviews selected lessons from the commercial sector on this subject. This chapter presents guiding principles for purchasing and supply management training programs and several examples of training programs from industry.

Chapter Four presents a framework of performance metrics the Air Force could use to facilitate evaluation of its workforce transformation efforts. It begins by describing a five-level hierarchical framework that links Air Force outcomes of mission performance to training outcomes and then proposes metrics for measuring progress at each outcome level.

Chapter Five summarizes our findings and proposes future directions for related research.

The appendices present more-detailed discussions and lists pertaining to the chapters' text, including commodity council activities; skills for commodity council activities; mapping of activities to specific skills; the DAU and AFIT training assessment approach; a defense procurement "competency" list for the 21st century acquisition workforce; and training methods, training resources, and organizations that offer training.

## **An Analysis of Activities and Skills for the Air Force’s Future Procurement Workforce**

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As noted above, the Air Force is moving toward using a commodity council approach, modeled after commercial sector practices, to manage selected categories of purchased goods and services. Air Force contracting officers will be key members of the new councils. SAF/AQC asked PAF to examine commercial sector commodity council practices and experiences to construct a preliminary list of skills required for council members to be able to participate effectively, and then to conduct an initial assessment of current skills within the Air Force procurement workforce to identify any new skills that will need to be developed.

In our analyses, we sought to distinguish between, but link, what commodity council members do (activities) and what they need to know in order to do it (skills). In this chapter, we first describe commercial approaches to commodity councils and the types of purchasing and supply management activities performed by them. We then discuss a general set of skills relevant to those activities, and thus commodity council members.<sup>1</sup> Finally, we provide our initial assessment of whether those skills are currently supported by training available to Air Force procurement personnel, noting new skill areas for which we were unable to identify a source of training.<sup>2</sup>

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<sup>1</sup> Appendix C contains tables that “map” skills to activities to illustrate which skills are required for different activities.

<sup>2</sup> Appendix D describes how we assessed current education and training opportunities. Appendix E contains a list of acquisition workforce “competencies” developed by the Director

## Information Sources

We drew on a wide range of private sector sources for this assessment, including selected portions of the business literature on purchasing and supply management, interviews with three well-respected commercial sector purchasing and supply management executives, and materials describing the substantive areas covered by ISM's CPM exam, which is viewed by many practitioners as the most comprehensive professional certification for purchasing and supply management professionals.

We also drew upon Air Force and DoD sources. We conducted interviews with members of the Air Force's new Information Technology Commodity Council, reviewed a recent list of competency areas for defense procurement professionals, and reviewed curricula from and interviewed personnel associated with DAU and AFIT procurement-related training programs.

## Commodity Councils and Their Activities

In our literature review and discussions with commercial purchasing and supply management professionals, we learned that cross-functional teams called commodity councils are now being used to develop strategies for managing firm-wide procurement of commodity groups.<sup>3</sup> In developing its strategy, the goal of a council is to help maximize the firm's competitive advantage by extracting the maximum value for the commodity from its suppliers.<sup>4</sup>

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of Defense Procurement in the Office of the Under Secretary of Defense for Acquisition and Technology that was used in our assessment.

<sup>3</sup> See for example Richter (2003) and Duffy and Flynn (2003).

<sup>4</sup> While the goal of a council is to provide a firm-wide approach to purchasing the commodity, we learned from the literature and an ISM conference that some firms, such as American Airlines and Microsoft, do not mandate that everyone adhere to procurement strategies (MacLean, 2002; Avery, 2003). That is, sometimes units can purchase outside the company-wide strategy. In these cases, however, cost and quality performance in obtaining the commodity outside the corporate strategy should be closely monitored.

The membership of a typical commodity council includes a variety of experts and key stakeholders in the company. It is important to include representatives from different user groups because requirements for the commodity may differ by function, administrative division in the company, and geographic location.<sup>5</sup> Experts in purchasing/acquisition are obvious choices for membership on the council; however, while the commercial firm representatives we interviewed include purchasing experts on commodity councils, we found that the purchasing experts were often not given the leadership role on the council. Experts in the particular service industry itself were often chosen to chair the council instead because of their knowledge of industry trends, cost drivers, and the supply base. For example, one firm we visited had experienced difficulty managing its travel services. The firm hired a well-known travel industry expert to lead a commodity council and help purchasing managers develop a purchasing strategy that would lead to continuous improvement in provision of the service. Finance and legal experts are other likely candidates for commodity council membership (Avery, 2003).

The business and industry literature we reviewed on purchasing and supply management practices does not distinguish between types of council members when discussing commodity council activities (or skills). Firms are moving away from traditional, functionally oriented career fields by developing personnel with much broader backgrounds and ranges of experiences.<sup>6</sup> Thus, we have not attempted to link activities with specific types of council members.

As we learned more about the types of activities required of purchasing and supply management professionals in commercial firms,

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<sup>5</sup> See also Duffy and Flynn (2003) and MacLean (2002). Avery (2003) reports that 95 percent of respondents to a recent *Purchasing Magazine* survey include user groups in the strategy development process.

<sup>6</sup> In fact, we were unable to even identify the equivalent of an Air Force contracting officer for these firms. In addition, our conversations with members of the Air Force's new Information Technology Commodity Council indicated that, even if we were able to do so, highlighting a subset of skills that was especially pertinent for Air Force contracting officers was not a useful exercise: Contracting officers, like other members of the council, are expected to contribute to a wide variety of strategic activities.

we found that commodity council activities fall naturally into two broad categories: (1) strategic activities associated with *designing* the optimal sourcing strategy for the commodity group and (2) *implementation* activities to execute purchases based on the optimal strategy. Detailed lists of these activities are contained in Appendix A, but we describe many of the major activities here.

Purchasing and supply management strategies have many dimensions. In designing the optimal strategy for a class of commodities, firms seek to standardize their requirements across users where possible, because this can lead to greater consistency in performance and improved cost control (Avery, 1999). The nature of the chosen sourcing strategy will be affected by the buying organization's objectives, e.g., to minimize costs or to purchase at the best price and highest quality while maintaining flexibility and responsiveness on the part of the supplier. The types of solicitations (e.g., specificity of the statement of need and number of proposals sought), the level of competition (e.g., sole source, few, or many competitors), the length of the contracts, the structure of any performance incentives, and other terms and conditions can potentially be modified to the buying firm's advantage.

We found that "rationalizing" the number of suppliers is an important part of a firm's long-term strategy (MacLean, 2002). This means determining the "right" number of suppliers for the company and could mean trying to decrease *or* increase how many suppliers provide a given good or service. A company with too many suppliers for a given good or service might not have sufficient leverage over any individual supplier to reduce costs or increase performance.<sup>7</sup> On the other hand, a company with too few suppliers of a good or service could be at risk if suppliers do not feel competitive pressure to innovate and improve or if suppliers have difficulty fulfilling their commitments. The "right" number of suppliers will depend on the importance of the good or service to the firm and the risks inherent in the interruption of its provision.

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<sup>7</sup> It is also difficult to form strategic relationships and undertake supplier development activities with a large supply base.

Another element of purchasing and supply management strategies is working with suppliers to reduce total costs (not necessarily supplier profits), with an increased focus by buyers on supplier development as part of an effort to forge long-term relationships for their mutual benefit.

Developing such multifaceted purchasing strategies requires intensive research, the nature of which will be influenced by the characteristics of the commodities being purchased. When Gene Richter was the chief purchasing officer of IBM, buyers in his organization were required to produce a written procurement strategy for each service category that included an analysis of the worldwide market in order to learn as much as possible about available suppliers, locations of service providers, and their strengths and weaknesses. The written strategy also included an analysis of the strengths and weaknesses of current and anticipated suppliers and a forecast of future trends (Richter, 2003). American Airlines buyers incorporate market research into their formal commodity strategies as well (MacLean, 2002).<sup>8</sup>

Research on internal demand is also important. The level of demand, the diversity of needs at one location or across units at different locations, and the consequences of poor performance or quality must all be understood before a strategy can be developed.<sup>9</sup> One of our interviewees emphasized that commodity characteristics are also important. For example, if a good or service is going to be purchased only once, the chosen strategy might be different from the approach used if the firm is a frequent purchaser.

For the Air Force (and other federal agencies), acquisition regulations, policies, and other considerations will affect decisions as well. Socioeconomic goals, requirements for competition, and rules for buyer-supplier interactions must all be taken into account when designing optimal sourcing strategies.

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<sup>8</sup> In a 1999 article, Susan Avery describes Brunswick Corporation's market research and strategy documentation process.

<sup>9</sup> Brunswick Corporation formally surveys all key users to define internal demand for purchased services (Avery, 1999).

Activities associated with implementing a purchasing and supply management strategy for specific purchases would include determining specific customers' needs, preparing and issuing solicitations, conducting negotiations, and awarding and administering the contract(s).

## Skills Needed for Commodity Council Members

As expected, given the breadth of the commodity council activities discussed above and detailed in Appendix A, we found that commercial sector commodity council members represent a wide range of skills. In deriving our list of skills for Air Force commodity council members, we constructed an initial list based on the business literature, our commercial sector interviews, and the CPM exam. We also sought feedback from members of the Air Force's new Information Technology Commodity Council, based on experiences from the first few months of the council's existence. We then assessed the completeness of our list by matching skills to the commodity council activities discussed above.<sup>10</sup> Appendix B contains the entire list of skills we derived. We summarize them here.

We found that commodity council skills could logically be organized into six categories. Three categories are directly related to the commodity council activities described above: core purchasing and supply management skills, analytical and technical skills, and contracting skills (including skills related to unique aspects of contracting within the federal government). Other skills cited as important for commodity council members are more general. There were many references to the need for computer skills, teaming and other interpersonal skills, and basic business skills, which are necessary for success in many different professions.

Within each category, we further divided skills into *general* skills that we believe are relevant to virtually all commodity council activi-

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<sup>10</sup> See Appendix C for a description of the matching process and results.

ties and *specific* skills that we associate only with subsets of commodity council activities. For example, general computer skills include use of business tools such as word processing, spreadsheets, and e-commerce programs; while specific computer skills include programming and database capabilities. By definition, we designated all contracting skills as being specific to contract-related activities.

## **Sufficiency of Current Air Force and DoD Training for Commodity Council Skills**

Many of the commodity council activities included in Appendix A represent significant changes from the way the Air Force has approached purchasing in the past. Thus, it is likely that current training opportunities do not cover all of the skills needed by future commodity council members. In addition, some types of skills found in the current workforce (for example, negotiation and cost analysis) may need to be developed to greater levels of sophistication. The ultimate goal for this portion of our research is to identify any additional training (i.e., beyond current offerings) needed to develop and retain the skills that procurement personnel require to participate effectively in the Air Force's commodity councils.

Currently, the two primary sources of professional training for Air Force procurement professionals are DAU and AFIT. The curricula are now being reviewed and updated at both of these institutions. In the discussion below, we provide a *preliminary* assessment of how closely aligned the current curricula are to the new responsibilities of Air Force personnel serving on commodity councils. We view this discussion as a starting point for identifying broad categories of skills that require more emphasis in future courses in order for the Air Force to take advantage of the potential benefits of implementing commodity councils.

### **DAU Curriculum**

In August 2001, Defense Procurement Director Deidre Lee sent a memorandum to the president of DAU regarding "competencies" for

the 21st century acquisition workforce. The memo included a list of more than 100 skill areas in the categories of policy and processes, knowledge of contracting fundamentals, general professional business attributes, and the business environment (see Appendix E for the complete list). DAU used this list as a starting point to examine its contracting course offerings. While a DAU “crosswalk” of the competencies and course offerings determined that most skills were taught in some form within DAU’s contracting curriculum, Ms. Lee’s memo led to the current initiative to modernize the curriculum for contracting courses.

In addition to contracting courses, DAU offers a number of courses in other substantive area “tracks” that appear to be applicable to Air Force commodity council members. These tracks include acquisition, auditing, logistics, and program management, among others.

### **AFIT Curriculum**

AFIT has two separate divisions that offer (or could offer) courses relevant to developing commodity council skills: the School of Systems and Logistics and the Graduate School of Engineering and Management.

The School of Systems and Logistics offers short courses for continuing professional education. There is a three-day purchasing and supply chain management short course that covers a wide range of topics, many of which are relevant to commodity council activities. The goals of this short course are to introduce personnel from many different career fields (including contracting officers, technical functional experts, and program managers) to a broad range of concepts associated with “best” commercial purchasing and supply management practices.<sup>11</sup>

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<sup>11</sup> Topics include determination of requirements, spend analyses, market research, supplier management, alignment of the sourcing process to the organization’s strategic goals, and strategic supply base management. Given the breadth of topics and short duration of the course, instructors focus on providing “top-level” information about these concepts, with some details about components of practices. For example, for supply base rationalization, instructors discuss several approaches, including reduction of the number of contracts, the

The AFIT graduate school offers a master's degree through its relatively new Graduate Strategic Purchasing Program. This program offers an opportunity for in-depth treatment of covered topics. There are two tracks: a 12-month track for course work and thesis and an 18-month track that also includes a tour with industry.

## Assessment of Current Training

For our training assessment, we compared the commodity council activities (Appendix A) and skills (Appendix B) with the “competencies” identified by the Defense Procurement memo (Appendix E). This process involved activity-by-activity and skill-by-skill comparisons with the list of competencies.<sup>12</sup> We supplemented our assessments by speaking with DAU personnel involved in the contracting curriculum modernization process. Since the curriculum is still under revision, a more detailed study of future DAU course syllabi and discussions with DAU instructors will be required to accurately determine skills that remain uncovered.

We also spoke with AFIT personnel associated with the short course and the strategic purchasing program to understand which topics are covered in those offerings. We then compared the list of skills with these topics (as we understood them) to derive an initial assessment of needed skills that are not covered in current training.

As a caveat, our project resources did not allow us to explore the level of sophistication of skills resulting from current and planned AFIT and DAU training opportunities. For example, the level of negotiation skills required to realize a good price on an inexpensive commodity bought in bulk for which there are many capable suppliers is quite different from that required to negotiate a contract for a complex service with multiple dimensions of performance that can be

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use of longer-term contracts, and selection of key suppliers. However, the course is unable to address the details of how one would actually perform these activities. In addition, it is not clear to us that some of the more strategic analyses listed in Table A.2 are addressed at all.

<sup>12</sup> Appendix D describes the process in more detail.

provided only by a small number of firms. This is clearly a fruitful area for future research, as we discuss in the final chapter of this report.

Our initial review of DAU and AFIT curricula indicated that some of the skills for commodity council members described in the previous section do not appear to be addressed by DAU courses. Among them are computer skills, some teaming and interpersonal skills, and a few of what we have labeled basic business skills. However, many of these skills are difficult to teach in a classroom; so their absence in published curricula is understandable. Some teaming and interpersonal skills, for example, are probably most effectively developed by working with a mentor or learning by observing a supervisor. One would expect that other general skills, such as basic computer and math skills, would not be taught in a training course, but rather acquired through recruitment of individuals with the appropriate background.

More important, several core purchasing and supply management skills such as forecasting, strategic thinking, optimal inventory management, benchmarking, and knowledge of latest technology are not explicitly mentioned in course descriptions. DAU personnel indicated that their updated contracting curriculum will provide a better foundation for developing some of these skills, but they do not currently plan to implement the types of in-depth training that will ultimately be required to develop real expertise in these areas. Since DAU serves civilian and military personnel from all services as well as nonmilitary organizations, it may not be reasonable to expect its course offerings to meet all of the specific needs of the Air Force, particularly if the Air Force is moving ahead of the other services in terms of its purchasing and supply management practices. Perhaps DAU courses are best viewed as providing a foundation for more-specific training that is needed for Air Force commodity council personnel.<sup>13</sup>

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<sup>13</sup> However, if the commodity council approach becomes more widespread within the DoD, it is likely that DAU's curriculum will be further adjusted to better support the needed skills.

Courses in AFIT's strategic purchasing program appear to address some of the missing skills, particularly for core purchasing and supply management practices. For example, the course on strategic purchasing and supply chain management (course number CMGT 526) emphasizes the strategic role that purchasing plays in the context of supply chain management and teaches students how commercial practices can be implemented in the Air Force.<sup>14</sup> The "capstone" course for the program stresses sourcing analyses, forecasting, and strategic planning, as students prepare to take the CPM examination.

We recommend that the Air Force further refine the list of skills required for commodity council members, found in Appendix B, based on the experiences of its Information Technology Commodity Council, once the council has more experience developing new sourcing strategies. Then a detailed evaluation of the goals and content of the new DAU and AFIT curricula will be required to identify any new types of training needed to build those skills.

The AFIT graduate program looks extremely promising; however, participation in the 18-month program is currently limited to about seven contracting officers per year, based on past and current demand for this level of expertise. Opportunities to attend these courses, either in residence or through distance learning, will need to be increased as the commodity council approach becomes widespread. One option to increase the availability of training is for AFIT to develop "traveling" short course versions of its graduate courses that explore a narrow set of topics in-depth. This would allow expert instructors to visit many organizations whose personnel require new skills. As an alternative to developing additional "in-house" training, there are many existing course offerings that are utilized and endorsed by well-respected commercial sector purchasing and supply manage-

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<sup>14</sup> Other courses of potential interest are management and behavior in organizations (ORSC 542), entrepreneurship in supply chain management (CMGT 527), project management (SMGT 546), cost management (AMGT 510), maintenance and production management (LOGM 569), acquisition strategy (SMGT 647), advanced cost analysis (COST 669), and applied statistics I and II, (STAT 525 and 535).

ment organizations. These are discussed in detail in Chapter Three and Appendix F.

As a final note, our conversations with DAU and AFIT personnel raised an important issue about the structure and requirements of Acquisition Professional Development Program (APDP) certifications. The Department of Defense began the APDP to establish experience, education, and training standards for specific acquisition workforce position categories and career fields; provide certification guidelines for acquisition workforce members; and clarify career paths for the acquisition workforce. Each functional area (such as contracting) is divided into three levels: basic or entry (level I), intermediate or journeyman (level II), and advanced or senior (level III). Individual military services establish the education and training standards required for each level (Department of Defense, 1995, paragraph C1.1.2). DAU recognizes the importance of more “cross-training” (for example among contracting, acquisition, and logistics personnel); however, the *availability* of training is based on certification requirements for different career fields. For example, currently a contracting professional must take CON210 (government contract law—a course that must be taken in residence at DAU) to complete the requirements for APDP level II. An acquisition officer who does not need to take CON210 for APDP level II but would like to take it for career broadening can do so only if the course has “extra” slots—that is, contracting professionals have priority for the course.<sup>15</sup> In addition, the AFIT Graduate Strategic Purchasing Program courses are not currently recognized as “equivalents” for APDP certification purposes. To enable and encourage more people to train across functions and develop the more sophisticated skills required by strategic commodity council activities, it will likely be necessary to reconsider the structure and requirements of APDP certifications.

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<sup>15</sup> DAU is attempting to address this issue in two ways. First, it is modifying some curricula to require more elective courses in cross-functional areas. Second, it is working to make more courses available on the Internet in order to make it easier for individuals to take cross-functional training in this form.

## **Commercial Sector Training for Purchasing and Supply Management Professionals**

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The identification of activities and skills required for members of commodity councils and the recognition that current training opportunities do not support development of some of those skills raise the question of how the Air Force can address these training needs. This chapter discusses broad issues related to this question, based on a review of selected literature on procurement training (and on training in general) and interviews with three well-respected private sector purchasing and supply management professionals.<sup>1</sup> We first review some of the important principles for purchasing and supply management training in general and then provide illustrative examples of purchasing and supply management training programs in industry. Training programs at five firms are detailed.<sup>2</sup>

### **Guiding Principles for Purchasing and Supply Management Training Programs**

The general consensus among private sector purchasing professionals is that purchasing and supply management training is necessary, but that training is difficult to organize. Many firms seem to struggle with training issues, and there does not appear to be a single right answer

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<sup>1</sup> Assurances of anonymity prevent us from identifying these individuals or their firms.

<sup>2</sup> Appendix F identifies and describes core “building blocks” or elements that go into a training program for purchasing and supply management and then discusses several different existing resources for instruction, both in industry and in academic settings.

or approach (Porter, 1998; Finn, 2000; Carr and Smeltzer, 2000). Nevertheless, there does seem to be agreement that purchasing and supply management training should reflect the following themes:

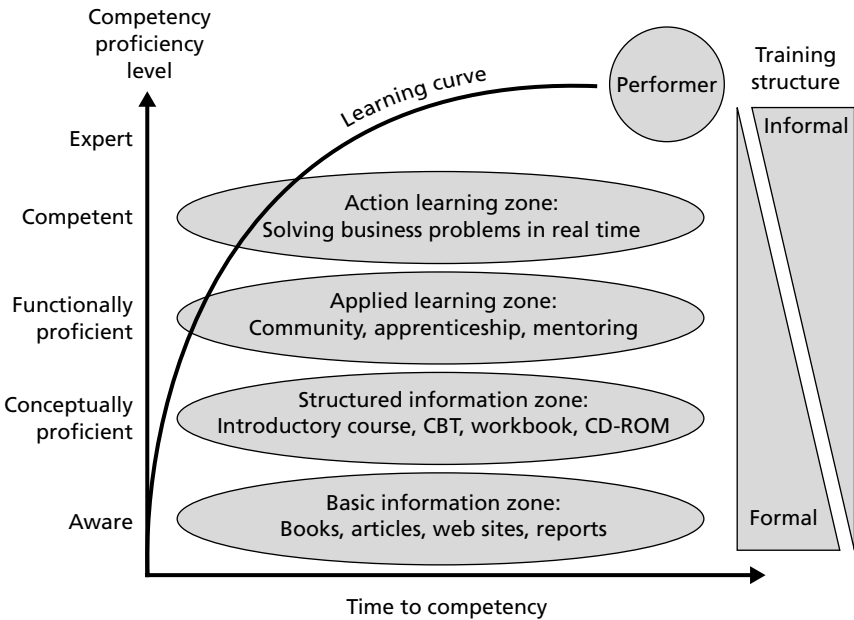
- Training should prepare purchasing and supply management personnel for the realities of the current and continuously evolving environment in which they work.
- Training should reflect the fact that a traditional “functional” perspective is less useful in today’s business environment, which rewards broadened perspectives. Training that is cross-functional and emphasizes process management is ideal to support an integrated approach to creating value for the organization (Closs and Stank, 1999).

O’Driscoll (2003) provides a very general framework for relating desired results to types of training and required timelines. This framework, illustrated in Figure 3.1, compares the desired proficiency level for a skill to the time required to achieve that level and uses the comparison to categorize the type of learning and the appropriate form of instruction.

In O’Driscoll’s framework, basic awareness and conceptual mastery can be provided fairly easily through formal and structured learning in a variety of media, including reading lists and self-paced course work. Functional mastery and higher levels of expertise, on the other hand, are gained through increasingly less-formal means, such as mentoring, and require active application of learned material as part of the learning process. This overall perspective suggests that a training program should have tiers of instruction that depend on the desired level of mastery of a given topic and the starting level of competence demonstrated by individual students.

These factors highlight the importance of an assessment of training needs prior to development of specific training programs. Green (2001) asserts that the components of a training program should be based on the needs analysis and that training must be

**Figure 3.1**  
**O’Driscoll’s (2003) Architecture Plan**



SOURCE: Adapted from Figure 1 (which illustrates a high-level learning architecture) in O’Driscoll (2003).

NOTE: CBT is computer-based training.

RAND MG214-3.1

evaluated after implementation to ensure those needs are met. White (2001) notes the need for validating the effectiveness of instructional materials through pilot testing with students in a realistic training environment.

We now consider several specific training programs that illustrate these themes. The discussions below are drawn from the business literature, which contains information (although fewer details than we would like) about procurement training programs that are considered to be effective, and our interviews with three well-respected purchasing professionals from two large firms.

## Examples from the Literature

### SmithKline Beecham

Finn (2000) describes SmithKline Beecham's (now GlaxoSmith-Kline) innovative purchasing learning and development program. SmithKline Beecham was motivated to transform its purchasing workforce when the company realized that purchasing played a key role in its organization and there was a need to develop staff skills to support that role. In considering how to accomplish that goal, SmithKline Beecham recognized that in-house training was necessary because it was hard to hire fully trained procurement personnel. "The existing workforce lacked the right skills and experience for these new ways of working, and the purchasing department was faced with either a mass exodus and recruitment, or retraining" (Finn, 2000, p. 44).

In response, SmithKline Beecham developed a comprehensive supply management training program. "The first step was to develop a comprehensive competency framework in an organization with several management layers stripped out" (Finn, 2000, p. 44). After streamlining its organization and deploying competency based tools to determine skill needs, SmithKline Beecham prepared to launch its program.

New technology was an essential part of the program, enabling learning to be delivered globally. A career-planning tool was launched on the Internet and components of the curriculum were set to follow. Other methods included face-to-face training, both in-house and external, on-the-job development, and "development zones." These "development zones" were personal computers in a work area with a variety of CD-ROM self-training materials. SmithKline Beecham decided that it would be advantageous to use a wide variety of multimedia tools, with a wide variety of goals: These would "provide competency assessment tools, individualized learning maps for participants' specific roles and online training activities that they can carry out at their desks" (Finn, 2000, p. 47).

SmithKline Beecham's approach embodies the concept of performing a skills needs analysis prior to designing training, and its chosen training tools are appropriate for O'Driscoll's "conceptually proficient" level of competency.

### **Harley-Davidson**

Orange and Robinson (1999) discuss the role of certifications in the training of Harley-Davidson's buyer/planner staff. In making the conversion to the current buyer/planner system, the company chose certifications from the American Production and Inventory Control Society (APICS) and the National Association of Purchasing Management (NAPM, now called ISM) as key components of its training program because they represent the industry standard in the field of purchasing and supply management. "We have great respect for NAPM's continuing certification process, as it helps to keep the skills from losing value, and we hope to see APICS adopt a similar program" (Orange and Robinson, 1999, p. 34). However, the company views the skills necessary for certification as constituting the *minimum* level of competency allowable in the department, and individuals in the department are expected to continue to grow and learn after achieving certification.

Harley-Davidson offers a great deal of support for pursuit of certifications, including all costs associated with classes, materials, and seminars that are related to the desired certification modules. Further, certification exams are paid for up until the second failure on any one module. The company feels that the responsibility for success needs to be shared in some respects. In addition, the company provides numerous sources of preparation including APICS' Certified in Production and Inventory Management (CPIM) exam in-house study sessions, CPIM review courses, self-study courses through the local technical college, and the use of DATACHEM Software's test simulation tool.<sup>3</sup>

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<sup>3</sup> See Appendix F for more information on the CPIM exam.

As a final way to support certification and training, Harley-Davidson advocates the use of mentorship:

We would highly recommend a mentor coach, preferably certified, be identified for each individual going through this process. Our people have responded to individual coaching and suggestions on how to prepare for the exams and, more importantly, how to apply the knowledge. If we had it to do over again, we would make formal assignments and require discussions on progress on a more frequent basis than normal performance reviews occur (Orange and Robinson, 1999, p. 38).

Mentoring programs like those used by Harley-Davidson correspond to achieving functional proficiency within O'Driscoll's framework.

### **United Technologies Corporation**

Porter (1998) describes the efforts of United Technologies Corporation (UTC) to train its supply managers after a decision to make supply management a core competency for the company. To make this happen, UTC instituted a significant training process. It is a large program, with an initial target of educating 1,000 persons for an average of five days each. Training is extended to persons outside of procurement, including commodity team leaders, sourcing group teams, executives, senior purchasing advisory board members, purchasing departments, supplier development personnel, and anyone else who might be involved in or affected by sourcing decisions. Staff receive elements of training appropriate to their role in, or desired awareness of, the procurement process.

Core courses in the training process include

- a four-day course in strategic sourcing
- a three-day course on the company's supplier rationalization process
- two days of training in cost analysis and management
- three days of negotiation training
- courses in benchmarking and in ethics.

Their training program also contains other education elements including: ISM's CPM and other certifications, skills assessments, development of a proprietary supply management handbook, leadership training, and other integration activities.

UTC's training activities include a mix of proprietary and "off-the-shelf" training. For example, for cost analysis and management, they use ISM's CD-ROM-based self-training, but for supplier selection training, they performed a benchmarking study and used it to develop proprietary training. UTC's approach embodies the themes of cross-functional training and an integrated approach to creating value for a corporation.

## **Examples from Interviews**

To supplement and validate the findings from our literature review, we interviewed three well-respected purchasing and supply management executives of two private sector firms. Although we promised confidentiality in the interviews, we can share our findings without identifying the sources.

### **Firm A**

"Firm A" implemented major changes in its purchasing and supply management practices, organization, and workforce. The firm's leadership values and emphasizes training as a key part of the change management process. Its purchasing and supply management organization employs approximately 4,000 people. The organization's leadership asserts that training is the most effective way to upgrade large numbers of people, and it is the best way to develop "a common language." There is a full-time administrator who manages the organization's training program.

For both training and recruiting purposes, this firm developed strategic relationships with several universities with top purchasing and supply management programs including Michigan State, Arizona State, San Diego State, Pennsylvania State, and Howard, as well as

the University of Birmingham in the UK. The firm uses university professors to design and conduct its training.

This firm does not use web-based training; rather, all personnel receive classroom training. The trainer (a university professor) goes from site to site to provide instruction. Because of the size of the purchasing organization, moving the professor around, rather than the students, is more cost-effective. For each new course, the firm's purchasing and supply management leaders attend the initial offerings to ensure that the course will indeed accomplish the desired goals.

At Firm A, training is iterative. Personnel take courses on similar topics over time; however, the concepts taught become more and more advanced. For example, for cost analysis, the first course teaches basic cost accounting. The next covers cost accounting for specific items, and the last course brings buyers and suppliers together to learn how to work in unison to decrease costs. The goal is to reduce costs on both sides without reducing suppliers' margins.

This firm also encourages cross training through rotational assignments so that personnel broaden their expertise across commodity groups and geographic areas. Personnel identified to have the potential to grow into high-level managers are specifically targeted for this kind of experience. These personnel also are assigned mentors, who provide some OJT and career development advice. Firm A's approach is an excellent example of the changes in types of training required for individuals to gain higher levels of expertise as they move along O'Driscoll's "learning curve."

Interestingly, the leadership of this firm's purchasing and supply management organization does *not* value CPM certification as an indicator of mastery of the desired skills, or mastery of even a minimum level of skills.

## **Firm B**

Firm B recently separated from a larger parent company and is refocusing its goals and mission, including how it manages its supply base. Firm B is quite large, and its purchasing and supply management organization employs about 2,000 people.

Workforce development is one of the key elements of the purchasing and supply management organization's strategic plan. It had to commit to changing the entire workforce, because of the significant changes in its approach to purchasing and supply management. Firm B's workforce development program includes several steps:

1. Define the necessary competencies.
2. Evaluate individuals against those competencies (i.e., perform a formal needs analysis).
3. Prescribe a tailored training program to meet those competency targets.

Competencies were developed based on information from the Center for Advanced Purchasing Studies (CAPS),<sup>4</sup> benchmarking, and brainstorming based on the organization's goals and business plan. Each person in the organization and his or her supervisor fills out an assessment form to determine gaps in the individual's skills. These assessments are used to develop and prioritize individual training plans.

In contrast with Firm A, this firm encourages CPM training and values CPM certification as an indicator of desirable skills. While Firm B sees value in web-based and classroom training, it believes the most effective form of training is OJT with a subject-matter expert, or master. CD-ROM and web-based training are thought to be good tools for basic training on general issues. Consistent with O'Driscoll's learning curve, classroom and OJT with a master are necessary for deeper learning and developing more-sophisticated skills.

In their new system, purchasing and supply management professionals need intimate knowledge of the products they buy and the things that drive the *cost* of those products, not just the *price*. Buyers

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<sup>4</sup> According to its web site (<http://www.capsresearch.org/>), "CAPS Research is a non-profit, independent research organization co-sponsored by Arizona State University W. P. Carey School of Business and the Institute for Supply Management. CAPS Research contributes competitive advantage to organizations by delivering leading-edge research globally to support continuous change and breakthrough performance improvement in strategic sourcing and supply."

need to be commodity experts. They hired experts for the areas they wanted to build, e.g., industry experts and supplier development engineers. These experts provide OJT to others.

## Synthesis of Findings

As we noted at the beginning of this chapter, many organizations are struggling with how to train their acquisition personnel, and there is no single “right answer” to providing new skills. However, our literature review has identified accepted practices in *who* receives training, the *assessment* of skills development needs, and *how* that training is provided.

It is clear that a broad perspective is important not only for today’s acquisition professionals, but also for people throughout the supply chain. The extension by many firms of training to employees outside of the procurement department (including suppliers, in some cases) improves the breadth of understanding of the supply base and the procurement process and reflects the multifunctional nature of purchasing and supply management processes.

Skills or competency levels of all affected people must be evaluated before designing purchasing and supply management training; so ways to determine personnel competency are needed. As we have seen, one way to do so is to make use of available certification programs for personnel to demonstrate the achievement of a minimum level of competency. This allows a company to measure its workforce against a recognized standard without the expense of developing its own evaluation instruments. For skills beyond minimum levels or skills unique to individual companies, well-respected organizations make use of “competency assessment” tools to develop individualized learning plans for employees and to evaluate the training progress of those employees.

The integrated use of multiple approaches and modes of training is necessary to achieve the desired results in a training program. The size of the target audience, the level of competency required, and time and budget constraints all affect the approach to training. What-

ever the mode of training, though, companies that have successfully implemented new training programs have made use of mentors and OJT with experts to facilitate both learning and the application of newly learned material in the workplace.



## Metrics for Air Force Procurement Workforce Transformation

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In this chapter, we shift our focus away from the commercial sector to the Air Force. SAF/AQC has developed a roadmap for changing the Air Force's procurement system to meet the changing needs of the Air Force. As we saw in Chapters Two and Three, full and effective implementation of the roadmap will require Air Force procurement professionals to develop new and broader skills than they have had to develop in the past. In this chapter, we outline a framework of metrics for procurement workforce transformation that will allow SAF/AQC to track its workforce transformation efforts and refine implementation plans as necessary. Our recommendations are based on insights from selected parts of the literature on performance metrics and our knowledge of the Air Force.

We first lay out a framework for workforce transformation metrics, linking procurement training to skills for the future procurement workforce, skills to procurement activities, activities to contracting outcomes, and contracting outcomes to the ability of the Air Force to execute its mission. We then discuss metrics for different levels of the framework, with recommendations for appropriate metrics and suggestions for implementation.

## Metrics Framework

Our framework is based on the following assumptions:

- Through training, procurement personnel acquire desired purchasing and supply management skills.
- Mastery of those skills allows procurement personnel to perform desired commodity council activities.
- Successful execution of new commodity council activities leads to more effective contracting outcomes, including better performance and cost outcomes for purchased goods and services and more effective and efficient procurement organizations.
- Better contracting outcomes lead to more satisfied customers and better execution of the Air Force's mission.

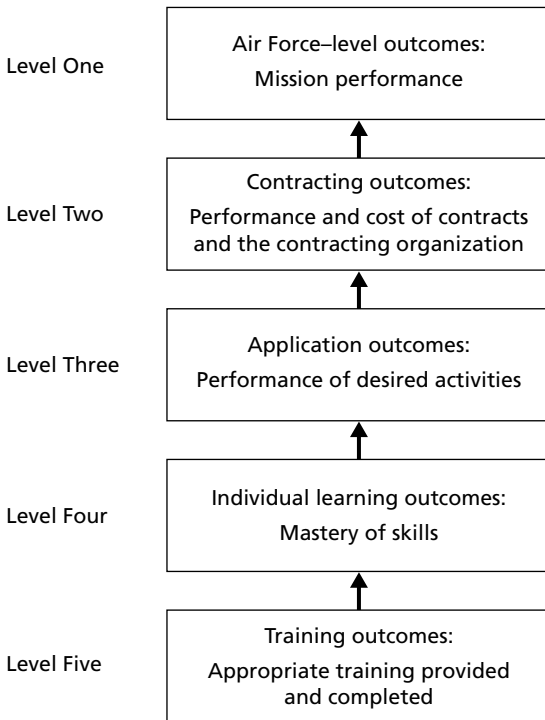
Clearly, many factors other than the skills and activities of Air Force procurement professionals affect contracting outcomes. We allude to some of these in the discussions below. However, in this chapter, we are concerned only with the causal relationships outlined above. These relationships suggest a hierarchy of outcomes for workforce transformation, as shown in Figure 4.1.<sup>1</sup>

The Air Force already uses a number of metrics to measure its ability to execute its missions, including unit readiness scores and weapon-system mission-capability rates. Because contracting activities and contracting outcomes directly affect mission performance, transformation metrics must be aligned with the Air Force's ultimate war-fighting objectives. However, in practice, mission performance (i.e., Level One) is affected by too broad a range of factors for metrics at this level to be directly useful to SAF/AQC. Therefore, we do not address metrics for Level One here; rather, our focus is on Levels Two through Five.

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<sup>1</sup> This hierarchy is consistent with Kirkpatrick's (1959) seminal work on a framework for training evaluation: (1) the learner's attitude toward training, (2) the learning process, (3) behavioral changes due to learning, and (4) effects of those behavioral changes.

**Figure 4.1**  
**Hierarchy of Outcomes for Air Force Procurement Workforce Transformation**



RAND MG214-4.1

We begin with contracting outcomes and work our way down to training outcomes.

## Metrics for Level Two: Contracting Outcomes

First, we examine the contract-level outcomes for purchased goods and services. In the short run, we are interested in how well Air Force customer needs are met in terms of the performance and cost of purchased goods and services. In the longer run, we are also interested in how the Air Force is viewed by industry as a customer. If the Air

Force is viewed as a poor customer, it may be unable to attract and retain the most capable suppliers. As a result, performance and cost will likely suffer.

Second, we examine the effectiveness and efficiency of the contracting organization itself.

### **Contract-Level Outcomes**

**Performance of Purchased Goods and Services.** Performance measures for an individual contract should reflect the priorities of the customer. For example, when purchasing spare parts, a depot- or base-level repair facility may emphasize timeliness of delivery and the percentage of the order that is free of defects. Regarding groundskeeping services, for example, a base commander may care about the length and color of the grass, the neatness of the shrubs and flowerbeds, and the responsiveness of the provider.

However, measures at Level Two of the procurement workforce transformation framework should be general enough to reflect contract performance or quality across the wide range of goods and services the Air Force procures. Customer satisfaction measures provide a general way to capture how well Air Force procurement is meeting the needs of Air Force customers.

Overall, customer satisfaction has two components that are useful for workforce transformation efforts: customer satisfaction with the procured product (e.g., quality or responsiveness) and customer satisfaction with the procurement process (e.g., timeliness or ease of the process). Each of these is influenced by actions of procurement personnel.

Prior to assessing customer satisfaction, Air Force procurement will need to identify relevant customer organizations across the Air Force. It may be helpful to seek feedback from Air Force leadership to identify these groups. When assessing satisfaction with a product procured to support an installation, customers may include base commanders, technical experts who help define requirements and assess contractor performance, and base occupants who benefit from the product. When assessing satisfaction with the procurement process, the number of relevant customers will be smaller.

Surveys can be used to measure customer satisfaction. Responses may be characterized by a numeric scale (e.g., ratings from one to ten) or by open-ended comments and suggestions. Recent RAND research suggests that firms have varying philosophies about conducting internal customer satisfaction surveys (Baldwin, Camm, and Moore, 2000; Baldwin and Hunter, 2004). Firms differ in the frequency of surveys, the percentage of customers surveyed, and the types of surveys used. The Air Force may want to conduct customer satisfaction surveys every six months, randomly selecting representatives from approximately 25–50 percent of customer organizations for each survey (so that all customer organizations are surveyed once every year or two). Web-based surveys are becoming increasingly popular and simplify data collection and entry; they can also significantly reduce the costs of conducting a survey. Surveys can be performed by consultants or by Air Force procurement personnel.

Survey response rates are always a concern; so it would be wise to seek feedback from customers on any proposed approach prior to implementation. The ease of making detailed comments in web-based surveys may help increase the willingness of people to participate in them. We interviewed one commercial firm that increased its response rates by offering an incentive for participating: All respondents were entered in a raffle with a chance to win a small gift.

**Cost of Purchased Goods and Services.** There are many different ways to think about cost outcomes at the contract level. Monczka, Trent, and Handfield (2002) describes this class of measures as evaluating how effectively an organization spends its purchase dollars.

An obvious measure is the change in cost associated with categories of goods or services from one time period to the next. However, such measures may be less informative than desired because of changes in the nature of purchases or exogenous market changes that can affect an organization's ability to reduce costs over time. For example, increased demand (relative to supply) for certain inputs can increase prices and lead to cost increases over time, e.g., programming services in the 1990s. Alternatively, advances in technology or increased competition in an industry can dramatically reduce prices over time (e.g., desktop/laptop computers).

Many other approaches to measuring cost outcomes found in the commercial sector are also applicable within the Air Force context. Some of the most popular measures are as follows.<sup>2</sup>

Actual versus planned cost measures examine the difference between what an organization planned to spend on products and the realized cost. These measures may be expressed as differences in cost (actual cost minus planned cost) or as ratios (actual cost divided by planned cost). This information can be rolled up into aggregate measures by weighting results by the quantity or percentage of overall expenditures associated with specific categories of goods or services. However, when using this measure, it is necessary to have an independent review process to ensure that planned spending projections are sound and not artificially inflated to enhance measured success.

Actual price versus market index measures provide information about how an organization's prices compare to overall prices found in the broader marketplace. Index-based measures examine the percentage change in the prices paid over a time period relative to the change in the relevant published market index over the same time period.<sup>3</sup> Thus, they would be most useful for purchases that are not unique to the Department of Defense. As with the previous measure, indices must be chosen appropriately to avoid distortions in measured results.

Cost comparisons across divisions—e.g., major commands, bases, Air Logistics Centers, and Product Centers—would allow the Air Force to compare purchase costs for similar products. These measures can also help identify common purchases across the Air Force that can be used to structure better procurement strategies. When constructing this measure, it is important to control for any regional cost differences not attributable to purchasing strategies.

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<sup>2</sup> See Monczka, Trent, and Handfield (2002) for more detailed discussions of these measures and for examples of others. Most of their discussions are in the context of full costs, which would include price as well as any other related expenditures, e.g., delivery, storage, and management costs. However, where full costs are not known, prices can be substituted.

<sup>3</sup> See also Richter (2003).

Data for cost metrics would need to come from the Air Force's contracting data systems. See Moore et al. (2004) for a discussion of these.

**Desirability of the Air Force As a Customer.** Commercial firms are increasingly aware of the effects that their actions have on the willingness of well-respected suppliers to do business with them. Good reputations do not necessarily imply that customers are “push-overs” when it comes to dealing with suppliers. Rather, suppliers value customers who strive to reward good suppliers with reasonable profits and increased business, utilize sound procurement practices, and exhibit ethical behavior. Gene Richter, one of the purchasing profession's most respected professionals, noted that one of the ten “best” commercial practices is to “[s]urvey suppliers, through a third party, and have them rank you vs. your competitors. Try to become their best customer (not their easiest). Listen and respond to their criticisms and suggestions” (Richter, 2003).<sup>4</sup>

We recommend that the Air Force periodically gather information on supplier satisfaction with the Air Force as a customer. Such information is a leading indicator of the Air Force's ability to access those suppliers that can provide the best support to the mission. This information is especially important for suppliers of “commercial” goods and services, which have many other potential customers, but also for defense contractors. Supplier satisfaction can be assessed directly through formal surveys or through periodic conversations with individuals in various parts of the supplier organizations.

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<sup>4</sup> Two of the purchasing professionals we interviewed indicated that their firms survey their key suppliers to assess how they are viewed as customers relative to their competitors. In addition to an overall assessment of supplier satisfaction, buying firms may be interested in feedback on their performance in important dimensions such as fairness and communication, as well as the performance of different parts of the buying firm's organization, e.g., direct service users or contract managers. Rather than surveying the supplier as a monolithic entity, one firm tailors its survey components to different parts of the supplier's organization. All units within the supplier that interact with the purchasing firm are targeted by some component of the survey. For example, both the engineering department and the sales department at the supplier receive some component of the survey. The components are essential in diagnosing the source of potential problems with supplier relations.

Surveys can be conducted in-house by the buying organization or by a third party. Anonymous surveys may elicit more-honest responses, particularly for suppliers of “commercial” goods and services, for which there are likely multiple suppliers with which the Air Force does business.

Supplier surveys can be costly for both the buying organization and suppliers. One commercial firm we interviewed indicated that their survey cost approximately \$200,000 to construct and implement. These surveys can be very time-consuming for buyers and suppliers as well. To minimize the financial and time costs, the Air Force may want to conduct supplier surveys only annually or biennially. One option is to rotate the group of suppliers surveyed each time. For example, one firm surveys half of its suppliers each year; the other half of the supply base is surveyed the following year. This rotation allows them to collect an annual measure of supplier satisfaction while burdening individual suppliers only biennially.<sup>5</sup>

### **Effectiveness and Efficiency of the Contracting Organization**

There are many examples of inward-looking, process-oriented metrics that some purchasing organizations track, e.g., cost per purchase order, reduction in numbers of suppliers, and number of e-business transactions. However, more useful measures are those that track how the purchasing organization contributes to broader organizational objectives (Monczka, Trent, and Handfield, 2002; Monczka and Morgan, 2000).

For example, one purchasing professional’s organization tracks the “payback” to the firm for investments in the purchasing organization. This organization tracks achieved savings versus the purchasing organization’s budget and savings resulting from specific investments. Investments in summer intern programs, for example, or efforts to hire personnel that bring new capabilities to the organization are assessed according to the resulting cost savings.

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<sup>5</sup> One firm we interviewed employs an ombudsman to field complaints made against the firm by suppliers. Anonymous complaints are encouraged in order to assure the supplier that there will be no retribution.

These types of measures could be very useful to the Air Force procurement community, which has historically struggled to find resources to make investments in new initiatives. Savings could be estimated based on information from Air Force contracts databases; however, compiling an estimate of the cost of the purchasing organization may be quite challenging. Perhaps this could be approximated with the cost of personnel, since personnel costs are clearly the primary cost driver.

Table 4.1 summarizes recommended metrics for Level Two of our framework, plus information about potential data sources.

**Table 4.1**  
**Summary of Recommended Metrics and Potential Data Sources for Level Two, Contracting Outcomes**

<b>Metrics</b>	<b>Method/Data Source</b>
Performance of purchased goods and services <ul style="list-style-type: none"> <li>• Customer satisfaction with the procured product</li> <li>• Customer satisfaction with the procurement process</li> </ul>	Customer surveys
Cost of purchased goods and services <ul style="list-style-type: none"> <li>• Actual vs. planned cost</li> <li>• Actual price vs. market index</li> <li>• Cost comparisons across divisions</li> </ul>	Air Force contracts data systems Industry indices
Desirability of the Air Force as a customer <ul style="list-style-type: none"> <li>• Supplier satisfaction</li> </ul>	Supplier surveys
Effectiveness and efficiency of the contracting organization <ul style="list-style-type: none"> <li>• Savings vs. the purchasing organization's budget</li> <li>• Savings resulting from investments in the purchasing organization</li> </ul>	Air Force contracts data systems Personnel data systems

## **Metrics for Level Three: Application Outcomes**

In Chapter Two, we discussed commodity council activities the Air Force is preparing to implement. These include performing “spend”

and “requirements” analyses; performing market research; conducting supply base and other risk analyses; and optimally tailoring the acquisition strategy, contract terms and conditions, and the performance management plan to meet the needs of the buying organization. These activities are thought to lead to better contracting outcomes in terms of performance and cost of the purchased goods and services and greater supplier satisfaction with the customer. As a result, they directly affect the outcome measures discussed in the previous section.

If contract outcomes are below expectations, it could be because procurement personnel are not performing desired purchasing and supply management activities or are not implementing them correctly. There could be other causes as well, including failure by suppliers, miscommunication of needs by customers, or even inappropriate expectations by customers.<sup>6</sup> However, we do not address the other potential causes here. We are concerned with potential problems only with the performance of procurement personnel. Specifically, we discuss strategies to determine whether procurement personnel are performing purchasing and supply management activities appropriately.

### **Implementation of Purchasing and Supply Management Activities**

Metrics for purchasing and supply management activities are challenging. To be informative, they must capture both the performance of specific activities and their quality and/or appropriateness. Simply tracking whether a procurement professional performed an activity does not provide procurement leadership with sufficient information to determine why contract outcome goals were or were not met. There may be situations in which certain activities are inappropriate, and there are different ways to “perform” an activity that result in different qualities of outcomes. For example, when performing market research, one could simply open the phone book to identify local suppliers and make phone calls from the office. Alternatively, one

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<sup>6</sup> Wang (2003) notes that many factors other than the success of training affect higher-level organizational outputs. This complicates the evaluation of the direct effects/benefits of training programs.

could do intensive research drawing upon respected trade journals, participate in trade conferences, and make site visits to prospective suppliers' customers. The fact that these very different approaches to implementing the desired activity are appropriate in different circumstances or for different products or services complicates measurement further still.

For this level of the framework, a single metric recommends itself: percentage of procurements for which an activity was appropriate and was performed correctly. Ideally, this metric should be supported by data from two sources: (1) self-reports provided by procurement professionals responsible for implementation and (2) periodic evaluations performed by independent experts to validate whether the activities were performed in the desired way and under appropriate circumstances.

The self-reports would provide a baseline of procurement professionals' perceptions of their implementation of activities. This would involve filling out a form for a particular procurement indicating which of the desired activities were performed and an explanation for any omitted activities. Questions should require descriptive answers where possible, rather than simply taking the form of a checklist. For example, rather than simply asking "Did you perform market research?" the form could include follow-on questions about which methods of market research were used. Although the Air Force might initially want to gather this information for virtually all procurements, over time contracts could be selected based on size, types of goods or services purchased, or other criteria, depending on particular areas of interest. To get the most accurate data from procurement professionals, the form should be clear and easy to fill out, personnel should receive training on how to fill it out, and Air Force leadership should convey why the form is important and how the data will be used.

Ideally, the validation process would involve one or more independent experts well versed in commercial practices who examine the details of selected procurements across the Air Force to evaluate whether activities were performed appropriately, as indicated in the self-reports. Using the same experts to evaluate all selected procure-

ments would standardize the evaluation process so that all procurements are judged against the same criteria.<sup>7</sup> The evaluation process would be most helpful if performed in a constructive, nonconfrontational way. As discussed in the previous chapter, commercial sector professionals indicate that this type of on-the-job interaction with experts can be an effective training tool, in addition to being a validation tool.

A less costly, but second-best method of performing evaluations of self-reports would involve assessments made by procurement professionals' supervisors. However, even if these supervisors are true experts themselves, their assessments would not be as independent or as uniform as those provided by a single group of experts looking across the Air Force.

As the appropriate implementation of desired activities increases, the self-reports and evaluations could decrease in frequency; however, we anticipate that sourcing approaches will continue to evolve, perpetuating a need to track and evaluate procurement activities across the Air Force.

Table 4.2 summarizes recommended metrics for Level Three of our framework, plus information about potential data sources.

**Table 4.2**  
**Summary of Recommended Metrics and Potential Data Sources for Level Three, Application Outcomes**

Metrics	Method/Data Source
Implementation of commodity council activities <ul style="list-style-type: none"> <li>• Percentage of procurements for which an activity was appropriate and was performed correctly</li> </ul>	Self-reporting via a new Air Force form Periodic evaluation by independent experts

<sup>7</sup> If the range of Air Force purchases is so broad that it is not reasonable to expect a single group to be able to evaluate all selected procurements, purchases could be divided into broad categories such as systems versus operational purchases.

## Metrics for Level Four: Individual Learning Outcomes

In the framework discussed at the beginning of this chapter, we assume that if procurement personnel are not implementing desired activities in the appropriate manner, it is because they do not understand the activities and/or the application of them.<sup>8</sup> We now discuss metrics that can be used to determine whether individuals have mastered the skills they need to appropriately implement desired activities.

To track mastery of skills among those in the workforce who require the skills, we recommend the following metric: percentage of those in the workforce who have mastered the desired skills. The challenge, then, is determining and certifying “mastery.” If mastery is not effectively measured, then this metric breaks down. Below, we discuss two approaches to measuring mastery: standardized testing and subjective evaluation.

### Standardized Testing

Standardized testing is the most objective and independent measure of mastery of desired skills. Two key considerations are the cost of development and ensuring that the test both covers the appropriate material and is easy to implement on a large scale.<sup>9</sup> Care must be taken to ensure that any testing that occurs at the completion of training is not simply a rubber stamp of training attendance, which is not an indication of mastery.

As discussed in the previous chapter, existing professional certification tests—such as ISM’s CPM and Accredited Purchasing Practitioner (APP) exams—are highly valued by many commercial sector purchasing organizations. As an example of the importance that some commercial organizations place on such certifications, the J.C. Pen-

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<sup>8</sup> Incentives play a role as well in encouraging mastery of skills and appropriate use of desired practices. We revisit this issue in Chapter Five as a potential extension of this research.

<sup>9</sup> Another issue associated with standardized testing is that it can be culturally biased and tends to reward cognitive skills and innate ability over training and noncognitive skills. See for example, McDonnell, McLaughlin, and Morison (1997) and Heubert and Hauser (1999).

ney Company increases the base pay of its buyers by \$1,000 when they receive the entry level APP certification, and by another \$1,000 when they advance to a CPM certification (Hanson, 2002).<sup>10</sup>

We saw in Chapter Three that the AFIT Graduate Strategic Purchasing Program recently began using the CPM exam as its capstone event. If needed, this exam could be tailored to specific Air Force requirements. In addition, there are a variety of consultants who can help structure appropriate tests. For example, when Apple Computer wanted to improve its “strategic sourcing,” it worked with a company called Strategic Procurement Solutions to develop a curriculum and testing/certification for Apple’s procurement professionals (Blevins, 2002).

### **Subjective Evaluation**

As an alternative to standardized tests, mastery of skills can be assessed through evaluations of personnel performance. This can occur through the processes described in the previous section for validating self-reports on the performance of desired activities. While these assessments are more subjective than standardized tests, they can be more easily tailored to exactly the types of skills that are of most interest to the Air Force.

A group of independent, recognized procurement experts could evaluate the skills mastery of individuals or groups (e.g., commodity teams) through assessments of written work samples that document the goals for particular procurement activities; the processes, methodologies, and practices used; and the outcomes. Having the same set of experts conduct independent evaluations across the procurement workforce would provide a degree of standardization that should produce reliable measures of mastery.

Alternatively, certification of skills mastery could be based on assessments of supervisors who observe personnel as they perform their jobs. This method would not be as standardized, expert, or independent as the evaluations discussed above. However, it would be less

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<sup>10</sup> See Appendix F for more details about these and other certification programs.

costly and relatively easy and quick to implement—especially for the enlisted workforce, which already uses an OJT approach for Career Field Education and Training Plan (CFETP) requirements. This process could be improved through strict guidelines for evaluations and audits of the certification process itself. The United States Postal Service used professional consultants to assist in developing such an approach to measure mastery of skills (Strange, 2002).<sup>11</sup>

Table 4.3 summarizes recommended metrics for Level Four of our framework, plus information about potential data sources.

**Table 4.3**  
**Summary of Recommended Metrics and Potential Data Sources for Level Four, Individual Learning Outcomes**

Metrics	Method/Data Source
Percentage of the workforce who have mastered the desired skills	Standardized testing Subjective evaluation

## Metrics for Level Five: Training Outcomes

If the Level Four metric of skills mastery is below target, there are two potential reasons: (1) the training is not resulting in mastery and/or (2) the workforce still needs to receive the training. These suggest two categories of training metrics: those that measure the quality of training and those that measure the provision of training.

### Training Quality

The quality of training can be measured either indirectly or directly. *Indirect* metrics are easier to implement. These include the percentage of those who have been through training who have achieved mastery

<sup>11</sup> United States Postal Service employees and their supervisors create “individual development plans,” and managers use subjective rankings to monitor performance in several competency areas.

in those skills and the average number of times “trained” employees attempt to pass the mastery evaluation before passing.

Although *direct* measures are more challenging to implement, they may also contribute to the ongoing process of choosing the “right” skills to train. We propose two metrics for direct measurement of training quality. First, the Air Force could seek evaluations of the relevance and sufficiency of training from students and their supervisors. Such evaluations could be based on student “exit surveys” just after course completion and/or follow-up surveys of students and their supervisors conducted some time after students have returned to their jobs (perhaps six months to a year later). Focus group discussions could be used to supplement or substitute for surveys. Riley et al. (2003) notes that survey questionnaires or discussion topics should include opportunities to make suggestions for improvements, such as additional topics, to make the training more relevant and useful.

Second, the Air Force could use an approach similar to the university accreditation process to directly evaluate training quality. Such an approach would include independent evaluation of the curriculum by recognized experts who are external to the Air Force (and thus have no vested interest in the training program) and who are extremely knowledgeable about commercial practices for purchasing and supply management, as well as evaluation via group and individual interactions with faculty and students.

As a caveat, both indirect metrics and the student evaluation metric have the potential to confuse quality of training with student quality or quality of student effort. High-quality training opportunities not faithfully pursued by trainees or pursued by underqualified individuals could result in poor levels of mastery or poor student assessments of the relevancy and sufficiency of the training. The accreditation process can be used to overcome this challenge.<sup>12</sup>

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<sup>12</sup> In addition, value-added models can be used to control for a student’s previous level of achievement when evaluating the effects of educational systems. See for example, McCaffrey et al. (2003).

## Provision of Training

Metrics for provision of training track the implementation schedule for personnel who require specific skills. We recommend two metrics for this: percentage of the workforce who have received training (e.g., this may be measured in hours of training received) and percentage of the workforce still untrained who are scheduled for training in the next  $x$ -month time frame.

Table 4.4 summarizes recommended metrics for Level Five of our framework, plus information about potential data sources.

## Overarching Considerations

Because calculating and reviewing metrics is not costless, the Air Force will likely want to choose subsets of metrics for categories where there are several options, e.g., cost of purchased goods and services.

As a final note, commercial sector experience indicates that no set of metrics is perfect or stable, no matter how carefully it is chosen. Metrics should be reevaluated over time to ensure that they do indeed

**Table 4.4**  
**Summary of Recommended Metrics and Potential Data Sources for Level Five, Training Outcomes**

Metrics	Method/Data Source
Quality of training <ul style="list-style-type: none"> <li>Percentage of those who have been trained who achieved mastery</li> <li>Average number of attempts to achieve mastery</li> <li>Supervisor and/or student evaluations of the relevance and sufficiency of training</li> <li>Course accreditation</li> </ul>	Training records  Supervisor and/or student surveys Accreditation process
Provision of training <ul style="list-style-type: none"> <li>Percentage of the workforce who have received training</li> <li>Percentage of the workforce still untrained who are scheduled for training in the next <math>x</math>-month time frame</li> </ul>	Personnel records  Training schedules

accomplish the intended purposes and that they remain aligned with organizational objectives (Monczka, Trent, and Handfield, 2002). So the metrics proposed here can be thought of as a starting point.

## Summary and Directions for Future Research

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### Summary

In this research, we sought to accomplish three goals: first, to identify the skill set needed by Air Force procurement personnel to successfully implement commodity councils and to make a preliminary evaluation of skills that are not currently supported by Air Force training or professional development; second, to gather information about commercial practices for providing purchasing and supply management training, as well as concrete examples of training programs and well-respected publicly available courses; and third, in order to ensure that workforce transformation efforts are successful, to develop a portfolio of performance metrics that will facilitate evaluation of these efforts and refinement of implementation plans.

We found that commercial sector commodity councils perform a wide range of activities and analyses associated with developing sourcing strategies for classes of goods and services and then tailoring those strategies for application to specific purchases. These activities require a broad set of skills related to using computers for sourcing activities, working effectively with colleagues, making good business decisions, implementing core purchasing and supply management activities, performing data and other technical analyses, and creating and managing contracts. Our examination of DAU and AFIT curricula (which are currently being revised) available to Air Force procurement personnel indicates that while many needed commodity council skills appear to be addressed somewhere in the DAU or AFIT curriculum (although it is unclear whether they result in the needed

level of expertise), some important ones are not—or are not available to large numbers of procurement professionals. This is particularly true for the more sophisticated skills associated with new purchasing and supply management activities. The apparent gaps in training are not unexpected because the Air Force is seeking to implement far-reaching changes in the way it manages its purchased goods and services. An integrated training plan is needed to ensure that all affected personnel get access to the training they need in a timely way.

Our review of training practices suggests that this training can be effectively organized in a variety of ways: formal classroom training, informal learning centers, or OJT. Furthermore, effective training can be provided by external providers or developed in-house. Accepted practices for the training of acquisition personnel include training a broad selection of personnel whose work relates in any way to the acquisition process; use of assessment tools to evaluate and quantify the training status and progress of personnel; and training that incorporates or allows mixed modes of training, given that different modes are appropriate to different skills, to different levels of mastery of those skills, and to different individuals' preferred mode of learning.

Finally, we developed a hierarchical metrics framework the Air Force can use to monitor and refine implementation of Air Force workforce development initiatives. This framework consists of relatively simple (though not necessarily simple to implement) measures that link the acquisition of new skills to contracting outcomes. Measures of implementation of practices and mastery of skills are particularly challenging. The Air Force may wish to utilize experts in desired commodity council activities to provide standardized, objective assessments.

## **Topics for Future Research**

In the introduction to this report, we noted that our analyses should be viewed as a first step toward identifying the Air Force's implementation needs as it begins to organize its purchasing and supply man-

agement activities around the commercial model of commodity councils. We conclude here with a discussion of ways to extend our work to further support Air Force procurement transformation efforts.<sup>1</sup>

First, the Air Force buys a wide range of goods and services, from office supplies, to contract airlift, to third-party aircraft maintenance, to sophisticated weapon systems. These purchases vary in many ways, including the complexity of the goods or services bought, the Air Force's requirements for them, and the supply base (see for example, Kaplan and Sawhney, 2000). In this report, we do not attempt to address these distinctions; rather we describe a *general* commodity council approach that the Air Force can build upon and tailor to specific needs associated with the commodities of interest. Future work should explore how differences in the characteristics of commodities affect the desired sourcing strategy, the needed types and levels of experience of procurement personnel, and the level of sophistication of purchasing and supply management skills.

Second, the Air Force is seeking to more closely emulate the commercial model of growing more well-rounded purchasing and supply management personnel, rather than maintaining a workforce primarily consisting of narrow specialists. However, even with broader career paths, it clearly is not optimal for everyone to develop the exact same skill set. For example, not everyone needs to know the legal details of writing contracts and obligating funds for the federal government, and not everyone needs to understand the technical details of how certain commodities are produced. In our analyses, we sought a comprehensive set of skills needed for commodity council activities rather than trying to differentiate among skills needed for different types of personnel—with the exception of the contracting-related skills. Future research should consider differences among types of personnel and tailor needed skills and training to them.

Third, with respect to the metrics framework discussed in Chapter Four, selection of specific metrics will likely depend, at least in

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<sup>1</sup> We thank ManMohan Sodhi, of the City University of London, and Nancy Moore and Sheila Murray, of RAND, for their helpful suggestions and ideas for extensions of this work.

part, on the ease of calculating the metrics, the cost of maintaining any required databases, and the value of the information for decisions. We proposed existing data sources for the recommended metrics; future research should explore the cost/benefit trade-offs among them.

Finally, incentives (or lack thereof) play important roles throughout the procurement transformation process. If aligned correctly, they should reinforce the goals of commodity councils, encourage the use of desired practices, and encourage mastery of desired skills. Unfortunately, military and federal government civilian personnel rules place limitations on the types of incentives that can be used, as compared with those found in the commercial sector. This is a fruitful avenue for future research as well.

## Detailed Lists of Commodity Council Activities

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This appendix contains detailed lists of activities for Air Force commodity councils based on our literature review and interviews. Tables A.1 through A.3 contain activities associated with three dimensions of constructing optimal sourcing strategies. Table A.4 contains activities associated with implementation of the optimal sourcing strategy for specific purchases.

Source references are included after activities as follows.

- The alphabetical codes in parentheses after each activity denote articles and other sources. A citation key follows each table, and the reference section of this document contains full citations.
- Numerical codes in parentheses correspond to “tasks” identified in the documentation for the ISM CPM exam. For example, the activity “gather market intelligence” is followed by the numbers 315 and 316. Task 316 addressed in the exam is to “provide data on current and future market conditions to management, sales management, and/or user departments,” an obvious task associated with market intelligence. A description of the CPM certification and detailed outlines of the topics covered in the exam for each task number can be found at <http://www.ism.ws/Certification/CPMExamSpecsGenFormat.cfm> (as of May 2004).

**Table A.1**  
**Activities Associated with Laying the Groundwork, by Commodity Class**

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Determine organizational objectives for sourcing activities, e.g., reduce total ownership cost, increase responsiveness, increase flexibility, etc. (101)

Construct baseline for current demand/requirements across the Air Force/DoD

- Purchased goods and services, their cost (preferably total ownership cost) and performance, internal stakeholders, suppliers (207) (A)

Construct baseline for current practices across the Air Force/DoD

- Current improvement initiatives, contract vehicles, and lessons learned (A)

Gather market intelligence (315, 316) (G)

- Supply base (G)
  - Degree of competition and concentration (N)
  - Leading providers (G)
- Roles of small businesses (216)
- Capabilities and capacities (P)
- Size of the market relative to Air Force/DoD demand
  - Customer base of important suppliers
- Industry trends (e.g., consolidations and technological change)
- Industry cost structure and pricing trends
- Product cost drivers (M, P)
- Commercial “best” practices for sourcing (e.g., size of bundle, contract terms and conditions, and performance management)
- Performance standards and benchmarks (207)
- Material management options

Forecast future Air Force/DoD demand/requirements, including performance/quality and quantity (312, 313, 314) (G)

- Based on past demand and future mission plans
- Based on market intelligence, cost/performance trade-offs, etc. (N)

Understand relevant policies, procedures, and other constraints on sourcing practices—e.g., Air Force policy, Federal Acquisition Regulations (including regulations on interactions with suppliers), socioeconomic goals, etc. (101)

Continuously monitor and update information as needed (A, G)

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NOTES: (A) = U.S. Air Force Headquarters (2002), (B) = Carr & Smeltzer (2000), (C) = Francis (2000a), (D) = Francis (2000b), (E) = Fitzgerald (1999), (F) = Gammelgaard & Larson (2001), (G) = Guinipero & Percy (2000), (H) = Myers (1999), (I) = Roberts (2002), (J) = Beleya (2000), (K) = Kolchin & Giunipero (1993), (L) = Kannan & Tan (2002), (M) = Morgan (2001), (N) = Steele & Court (1996), (O) = Trent (2001), (P) = interviews with well respected commercial sector purchasing professionals.

**Table A.2**  
**Activities Associated with Conducting Analyses**

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Conduct supply positioning analyses: segmenting spending by cost and supply risk/vulnerability exposure (N)

- Vulnerability includes supply availability, customer quality requirements (vs. typical requirements in industry), and safety/environmental reliability (N)

Conduct supplier preference analyses: the market from the supplier's point of view (N)

- How the supplier segments the customer base (N)
  - Attractiveness of doing business with the customer (including the cost of doing business) (N)
  - Supplier's perceived competitive position with the customer (N)
  - Value of the customer's business to the supplier (N)
- How the supplier will react to given circumstances (N)

Conduct in-depth vulnerability analyses and management—examining the entire supply chain to identify future possible problems (N)

- Map the supply chain (N)
- Assess supply-demand balance, raw materials availability, and cost trends; rate of technological innovation; complexity of the market; financial position, behavior, and attitude of the supplier; and production, shipping, and distribution methods (N, P)
- Assess/quantify risk: probability of event occurring, duration, effects (expected value analysis) (N)
- Assess alternatives: suppliers, inventory, work with supplier to reduce risk (N)
  - Conduct cost/benefit analyses (104)

Conduct analyses of product/service cost drivers—how to reduce total cost (M, P, G)

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NOTE: See notes for Table A.1.

**Table A.3**  
**Activities Associated with Sourcing Strategy Recommendations**

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Determine whether to lease or buy (302)

Identify the best financing approach for purchases (303)

Determine the appropriate level of standardization (i.e., standardize requirements vs. allow flexibility to meet diverse needs) (308) (G)

- Determine the most appropriate buying office(s) (A)

Determine the optimal scope/scale of any bundle

Perform materials requirements planning (MRP) (C)

Determine the best supply base strategies (212) (M, G)

- Number of contracts and size of the supply base (G)
- Supply base development strategies (310) (P)
  - Reverse marketing—creating a new supply capability (N)
- Use of small businesses (216)
  - Types of activities and goals (A)
- External marketing—making the Air Force an attractive customer (N)
  - Procurement marketing considerations include length of contract, payment terms and timeliness, willingness to participate in the supplier's other marketing efforts, complexity of working with the customer, growth opportunities, and trustworthiness (N)

Determine the best type of relationships with suppliers, including supplier integration (212) (N, G)

Determine the optimal length of agreements

Create solicitation strategies (106)

- Specifying requirements (G)
  - Including material control, storage and transportation (modes, frequencies, and who pays)
- Getting the word out to well-respected suppliers (107, 109)
- Mode of solicitation

Determine the appropriate source selection criteria (108) (P)

Choose negotiation strategies (201, 202) (P, D, F, K, B)

- Including possible use of reverse auctions

Select the best contract types, terms, and conditions, including incentives (113)

**Table A.3—continued**


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Determine the most effective supplier development/improvement approaches (309)  
(M, P)

- Quality assurance processes—including defining the process; defining the measurement system, an improvement methodology, and an action plan; measuring results; benchmarking; and evaluation follow-up (309)
- Supplier improvement, including problem solving, project management, error proofing, process validation, process monitoring, process control, process flow diagramming, auditing, containment of problems, layered audits, ability to read blueprints, change management (P)
- Supplier development, including flow manufacturing system design, material movement, operational availability, quality, workplace organization, lean and value stream mapping, creating and supporting continuous flow, level scheduling (P)
- Affirmative vendor improvement program for long-term improvement (N, O)

Select the appropriate performance measuring/monitoring approaches (112)

- Metrics and goals (e.g., “best in class” benchmarks)
- Buyer/provider communication and reviews
- Inspections vs. monitoring the provider’s quality assurance processes

Ensure that recommendations are consistent with relevant policies, procedures, and other constraints on sourcing activities

Construct an implementation strategy and plan (A)

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NOTE: See notes for Table A.1.

**Table A.4**  
**Sourcing Implementation Activities**

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Understand specific sourcing objectives and budget constraints

Determine customer needs for the particular sourcing activity (208, 209) (G)

- Understand industry standards and benchmarks

Specify customer needs for the particular sourcing activity (208, 209) (G)

- Write statement of work/objectives

Tailor sourcing strategy to customer needs (208, 209)

- Includes contract scope, source selection criteria, type of contract, terms and conditions, length, incentives, material management, and performance management approach (106)
- Incorporate risk assessment
- Use performance-based practices where appropriate

Prepare solicitation

Execute solicitation

- Locate and select potential sources (107)

Analyze bids for best value

- Assess strengths (including past performance), limitations, and risk (110)
- Conduct supplier/customer visits (111)
- Evaluate supplier processes and quality assurance programs (O)

Conduct negotiations (201, 202) (P, D, F, K, B)

Select source (110, 111, 112)

Prepare and issue contract (113)

Administer contract and monitor performance (115)

- Maintain records
- Resolve performance, cost, and payment problems between customer and supplier (117, 118)

Coordinate, review, and respond to supplier inquiries, protests, and appeals (215)

Review and revise procurement practices for compliance with rules and regulations, ethics, etc. (119)

Close out contract (115)

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NOTE: See notes for Table A.1.

## Detailed List of Skills for Commodity Council Activities

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Table B.1 contains a detailed list of skills required to accomplish the commodity council activities outlined in Appendix A. Skills are divided into six categories. For each, we have further designated skills as either “general”—applicable to all commodity council activities—or “specific”—applicable to only a subset of activities. As in Appendix A, the table includes source references.

**Table B.1**  
**Skills Needed for Commodity Council Activities**

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### Computer-Related Skills

#### General

Use of a computer for business-related activities (203, 205) (C, G, K)

- Including basic computer tools such as word processing and spreadsheet programs (N, F), the Internet (P), and related software (F)

Understanding and use of e-commerce tools (203, 408) (could be broadened to include tools that are associated with specific activities) (C)

#### Specific

Database development and maintenance (F)

IT systems development (F)

Computer programming (F)

### Teaming and Other Interpersonal Skills

#### General

Effective participation in cross-functional team environment (209) (I, E, G10, B, F\*)

- Including teaming across internal Air Force organizational boundaries and across agency boundaries, e.g., with the Defense Logistics Agency or other services

Showing due respect for colleagues (H)

**Table B.1—continued**

Integrity (P, J)

- Ethical awareness (F)

Tactfulness in dealing with others (G, K)

Listening (F\*)

Patience (B)

Ability to be flexible (B)

Accountability and maturity (P)

Following through on commitments (H)

Offering constructive feedback (H)

Interpersonal communication—verbal (F\*, B, I, G10, P, J, L, K)

- With internal and supplier personnel (G)
- Sharing information (H)

Relationship building (208) (P)

- Organizational culture awareness (F)
- Internal—working with customers/other functions (B, K, N)
  - Understand other departments (B)
  - Cross-functional awareness (F\*)

Influence and persuasion—internal and external (G10, K)

### Specific

Leadership abilities (G, F\*, K)

Conflict resolution/management (118, 206, 405) (P, H, F, K)

Relationship building (212) (P)

- External—working with suppliers (B), e.g., early involvement of suppliers in design and development (N) and forming strategic relationships with suppliers (L)
  - Understanding cultural differences (global suppliers) (J)

### **Business Skills**

#### General

Understanding general business (K)

Ability to see the big picture (F\*)

Project management (P, F, B)

- Coordinating skills (B)
- Organizational skills—paperwork (B)
- Planning (K)
- Detail oriented (B)

Ability to follow up (B)

Organization/time management—placing priority on strategic activities (G, P, F, K)

- Prioritizing (F\*)
- Time management (F\*, B)

Ability to multitask (B)

Written communication skills (P, G, F)

- Technical business writing (B)

Presentation skills (F, B)

Creativity and creative problem solving (206) (I, P, G, F\*, B, K)

Ability to make good business decisions (G10, P, F\*, K)

Willingness and desire to learn new things—inquisitiveness (C, G, F, K)

**Table B.1—continued**


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Passion for excellence (P)  
 Ambition (F)  
 Motivation (F\*)  
 Self-discipline (F\*)  
 Confidence (F\*)  
 Stress management (B)

Specific

Metrics: choosing and using information appropriately  
 Entrepreneurship (e.g., being proactive) (I, P, B), ability and willingness to take appropriate risks (G)  
 Process improvement (208) (P)
 

- Including process validation, monitoring, auditing, control, flow diagram, (P), problem solving, and conflict resolution (G)
- Getting to the root cause of a problem (B)
- Quality management skills (B)

 Managing change—coordination role (G10, F\*, K)  
 Foreign language skills (F)  
 Sales and marketing (N, I, F)

**Core Purchasing and Supply Management Skills**General

Customer focus (G10, K)  
 Supply base awareness (F\*)  
 Understanding basic business strategies, i.e., thinking like a supplier (somewhat from N)
 

- Implications of degrees of competition and strategies for overcoming unfavorable market positions

Specific

Forecasting skills (B)  
 Knowledge of the industry and business conditions—needed to construct strategies and conduct negotiations (G10, F)  
 Strategic thinking—developing purchasing strategies (G)  
 Value analysis—studying every element of cost to ensure that the good or service fulfills the buyer's need at the lowest total cost (310) (O)
 

- Cost analysis skills (B, G)
- Understanding the difference between total ownership cost and price (O)
  - Activity-based costing
- Supplier cost targeting (G)
- Blueprint reading (G, B, P)
- Understanding tool capability and tool life (B)
- Understanding manufacturing processes and terminology (B)
- Understanding materials (e.g., plastics) (B)

 Understanding how to perform MRP (B)  
 Understanding continuous inventory review system (B)  
 Benchmarking  
 Knowledge of latest technology (F)

**Table B.1—continued****Analytical and Technical Skills**General

Analytical thinking and critical reasoning (P, G10, F\*, B, K)  
 Computational/math skills (G, B)  
 Technical skills (G)

Specific

Quantitative methods (F)  
 Statistical analysis (F)  
 Knowledge of new analytical tools and techniques (F)  
 Drafting, computer aided design, and other computer skills (B)

**Contracting Skills**Specific

Contracting laws, regulations, and policies (113, 114, 115)  
 Socioeconomic requirements (102, 216)  
 Acquisition methods and appropriate applications (301, 302)  
 Pricing arrangements (213)  
 Contract financing (303)  
 Methods of payment (107, 117)  
 Documenting the acquisition strategy and source selection plan (101)  
 Preparing and conducting solicitations (106, 107, 108)  
 Fielding inquiries and Freedom of Information Act requests (215)  
 Receiving and analyzing proposals and bids (110)  
 Evaluating nonprice factors (110, 112)  
 Negotiation skills (201, 202) (G10)  
 Writing and modifying contracts (113)  
 Documenting and using past performance (112)  
 Allowable costs (111)  
 Evaluating invoices (118, 212)  
 Price and fee adjustments (117)  
 Terminating a contract (117)  
 Closing out a contract (115)

NOTES: (A) = U.S. Air Force Headquarters (2002), (B) = Carr & Smeltzer (2000), (C) = Francis (2000a), (D) = Francis (2000b), (E) = Fitzgerald (1999), (F) = Gammelgaard & Larson (2001) ("F\*" means that the skill was identified as a "highly important skill area" based on a survey of Council of Logistics Management members with "supply chain" in their title), (G) = Guinipero & Percy (2000) (G10 means this skill was determined to be among the top ten most important skills based on a survey of purchasing professionals identified from NAPM conferences or CAPS roundtables), (H) = Myers (1999), (I) = Roberts (2002), (J) = Beleya (2000), (K) = Kolchin & Giunipero (1993), (L) = Kannan & Tan (2002), (M) = Morgan (2001), (N) = Steele & Court (1996), (O) = Trent (2001), (P) = interviews with commercial sector purchasing professionals.

## Mapping of Activities to Specific Skills

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Appendix A listed activities that must be accomplished by members of commodity councils. Appendix B listed categories of skills necessary for the activities, dividing them into *general* skills relevant to all commodity council activities (and members) and *specific* skills that are associated with subsets of activities. In this appendix, we perform our own assessment of how specific skills “map” to the commodity council activities.

In the tables below, the first column contains commodity council activities in the same order that they are listed in Tables A.1–A.4 in Appendix A. The second column lists the *specific* skills associated with those activities. (*General* skills are associated with all activities.) There is a one-to-one correspondence between bullets found in both columns. That is, the activity found in the first bullet of the first column of a table is associated with the specific skills found in the first bullet of the second column of that table, and so forth.

**Table C.1**  
**Activities and Skills for Laying the Groundwork, by Commodity Class**

Activities	Associated Specific Skills
• Determine organizational objectives for sourcing activities	• Leadership and conflict resolution/management
• Construct baseline for current demand	• Metrics and computational/math skills
• Construct baseline for current practices across the Air Force/DoD	• General skills only
• Gather market intelligence	• External relationship building, metrics, foreign language(s), knowledge of industry and business conditions, benchmarking, knowledge of latest technologies, MRP, and continuous inventory review
• Forecast future demands/requirements	• Forecasting
• Understand relevant policies, procedures, and other constraints on sourcing practices	• Conflict resolution/management, contracting laws, regulations, policies, and socioeconomic requirements
• Continuously monitor and update information as needed	• Process improvement

**Table C.2**  
**Activities and Skills for Conducting Analyses**

Activities	Associated Specific Skills
<ul style="list-style-type: none"> <li>• Conduct supply positioning analyses: segmenting spending by cost and supply risk/vulnerability exposure</li> </ul>	<ul style="list-style-type: none"> <li>• Metrics, forecasting, knowledge of industry and business conditions, quantitative methods, statistical analysis, and new analytical tools and techniques</li> </ul>
<ul style="list-style-type: none"> <li>• Conduct supplier preference analyses: the market from the supplier's point of view</li> </ul>	<ul style="list-style-type: none"> <li>• External relationship building, foreign language(s), sales and marketing, strategic thinking, knowledge of industry and business conditions, quantitative methods, statistical analysis, and new analytical tools and techniques</li> </ul>
<ul style="list-style-type: none"> <li>• Conduct in-depth vulnerability analyses and management—examining the entire supply chain to identify future possible problems</li> </ul>	<ul style="list-style-type: none"> <li>• Metrics, entrepreneurship/taking appropriate risks, process improvement, forecasting, knowledge of industry and business conditions, MRP, continuous inventory review, knowledge of latest technologies, quantitative methods, statistical analysis, and new analytical tools and techniques</li> </ul>
<ul style="list-style-type: none"> <li>• Conduct analyses of product/service cost drivers—how to reduce total cost</li> </ul>	<ul style="list-style-type: none"> <li>• External relationship building, metrics, process improvement, foreign language(s), knowledge of industry and business conditions, value analysis, MRP, continuous inventory review, benchmarking, quantitative methods, statistical analysis, new analytical tools and techniques, and drafting (computer aided design)</li> </ul>

**Table C.3**  
**Activities and Skills for Sourcing Strategy Recommendations**

Activities	Associated Specific Skills
<ul style="list-style-type: none"> <li>Determine whether to lease or buy</li> </ul>	<ul style="list-style-type: none"> <li>Entrepreneurship/taking appropriate risks, strategic thinking, and cost analysis</li> </ul>
<ul style="list-style-type: none"> <li>Identify the best financing approach for purchases</li> </ul>	<ul style="list-style-type: none"> <li>Entrepreneurship/taking appropriate risks, strategic thinking, cost analysis, and contract financing</li> </ul>
<ul style="list-style-type: none"> <li>Determine the appropriate level of standardization</li> </ul>	<ul style="list-style-type: none"> <li>Strategic thinking</li> </ul>
<ul style="list-style-type: none"> <li>Determine the optimal scope/scale of any bundle</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of industry and business conditions, strategic thinking, cost analysis, and evaluating nonprice factors</li> </ul>
<ul style="list-style-type: none"> <li>Perform MRP</li> </ul>	<ul style="list-style-type: none"> <li>Forecasting, knowledge of industry and business conditions, strategic thinking, MRP, continuous inventory review, and cost analysis</li> </ul>
<ul style="list-style-type: none"> <li>Determine the best supply base strategies</li> </ul>	<ul style="list-style-type: none"> <li>External relationship building, entrepreneurship/taking appropriate risks, foreign language(s), sales and marketing, knowledge of industry and business conditions, and strategic thinking</li> </ul>
<ul style="list-style-type: none"> <li>Determine the best type of relationships with suppliers, including supplier integration</li> </ul>	<ul style="list-style-type: none"> <li>External relationship building, foreign language(s), knowledge of industry and business conditions, strategic thinking, and acquisition methods and appropriate applications</li> </ul>
<ul style="list-style-type: none"> <li>Determine the optimal length of agreements</li> </ul>	<ul style="list-style-type: none"> <li>Knowledge of industry and business conditions, strategic thinking, and acquisition methods and appropriate applications</li> </ul>
<ul style="list-style-type: none"> <li>Create solicitation strategies</li> </ul>	<ul style="list-style-type: none"> <li>External relationship building, entrepreneurship/taking appropriate risks, foreign language(s), sales and marketing, forecasting skills, knowledge of industry and business conditions, strategic thinking, MRP, continuous inventory review, knowledge of latest technologies, and preparing and conducting solicitations</li> </ul>

Table C.3—continued

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<ul style="list-style-type: none"> <li>• Determine the appropriate source selection criteria</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic thinking and evaluating non-price factors</li> </ul>
<ul style="list-style-type: none"> <li>• Choose negotiation strategies</li> </ul>	<ul style="list-style-type: none"> <li>• External relationship building, entrepreneurship/appropriate risk taking, foreign language(s), knowledge of industry and business conditions, strategic thinking, knowledge of latest technologies, cost analysis, and negotiating skills</li> </ul>
<ul style="list-style-type: none"> <li>• Select the best contract types, terms, and conditions, including incentives</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of industry and business conditions; strategic thinking; contracting laws, regulations, and policies; pricing arrangements; and methods of payment, price and fee adjustments, and terminating a contract</li> </ul>
<ul style="list-style-type: none"> <li>• Determine the most effective supplier development/improvement approaches, including quality assurance processes</li> </ul>	<ul style="list-style-type: none"> <li>• External relationship building, entrepreneurship/taking appropriate risks, process improvement, knowledge of industry and business conditions, strategic thinking, value analysis, benchmarking, quantitative methods, statistical analysis, new analytical tools and techniques, drafting (computer aided design)</li> </ul>
<ul style="list-style-type: none"> <li>• Select the appropriate performance measuring/monitoring approaches</li> </ul>	<ul style="list-style-type: none"> <li>• External relationship building, metrics, process improvement, foreign language(s), knowledge of industry and business conditions, strategic thinking, benchmarking, quantitative methods, statistical analysis, new analytical tools and techniques, and documenting and using past performance</li> </ul>
<ul style="list-style-type: none"> <li>• Ensure that recommendations are consistent with relevant policies, procedures, and other constraints on sourcing activities</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict resolution/management; contracting laws, regulations, and policies; and socioeconomic requirements</li> </ul>
<ul style="list-style-type: none"> <li>• Construct an implementation strategy and plan</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership, change management, strategic thinking, and process improvement</li> </ul>

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**Table C.4**  
**Activities and Skills for Sourcing Implementation**

Activities	Associated Specific Skills
<ul style="list-style-type: none"> <li>• Understand specific sourcing objectives and budget constraints</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict resolution/management</li> </ul>
<ul style="list-style-type: none"> <li>• Determine customer needs for the particular sourcing activity</li> </ul>	<ul style="list-style-type: none"> <li>• Forecasting skills and knowledge of business and industry</li> </ul>
<ul style="list-style-type: none"> <li>• Specify needs for the particular sourcing activity</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of business and industry</li> </ul>
<ul style="list-style-type: none"> <li>• Tailor sourcing strategy to customer needs</li> </ul>	<ul style="list-style-type: none"> <li>• Entrepreneurship/taking appropriate risks; process improvement; strategic thinking; MRP understanding; understanding continuous inventory review, acquisition methods, and appropriate applications; socioeconomic requirements; and documenting the acquisition strategy and source selection plan</li> </ul>
<ul style="list-style-type: none"> <li>• Prepare solicitation</li> </ul>	<ul style="list-style-type: none"> <li>• Sales and marketing, preparing and conducting solicitations</li> </ul>
<ul style="list-style-type: none"> <li>• Execute solicitation</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership, sales and marketing, knowledge of industry and business conditions, and preparing and conducting solicitations</li> </ul>
<ul style="list-style-type: none"> <li>• Analyze bids for best value</li> </ul>	<ul style="list-style-type: none"> <li>• Entrepreneurship/taking appropriate risks, cost analysis, strategic thinking, knowledge of business and industry, receiving and analyzing proposals and bids, evaluating nonprice factors, and documenting and using past performance</li> </ul>
<ul style="list-style-type: none"> <li>• Conduct negotiations</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership, conflict resolution, external relationship building, entrepreneurship/taking appropriate risks, foreign language(s), knowledge of industry and business conditions, and negotiation skills</li> </ul>
<ul style="list-style-type: none"> <li>• Select source</li> </ul>	<ul style="list-style-type: none"> <li>• Strategic thinking, leadership, and conflict resolution</li> </ul>

Table C.4—continued

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<ul style="list-style-type: none"> <li>• Prepare and issue contract</li> </ul>	<ul style="list-style-type: none"> <li>• Writing and modifying contracts; contracting laws, regulations, and policies; pricing arrangements; methods of payment; price and fee adjustments; and terminating a contract</li> </ul>
<ul style="list-style-type: none"> <li>• Administer contract and monitor performance</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership, conflict resolution/management, external relationship building, metrics, entrepreneurship/taking appropriate risks, process improvement, foreign language(s), value analysis, allowable costs, evaluating invoices, price and fee adjustments, and terminating a contract</li> </ul>
<ul style="list-style-type: none"> <li>• Coordinate, review, and respond to supplier inquiries, protests, and appeals</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict resolution/management, external relationship building, foreign language(s), and fielding inquiries and Freedom of Information Act requests</li> </ul>
<ul style="list-style-type: none"> <li>• Review and revise procurement practices for compliance with rules and regulations, ethics, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict resolution/management</li> </ul>
<ul style="list-style-type: none"> <li>• Close out contract</li> </ul>	<ul style="list-style-type: none"> <li>• Closing out a contract</li> </ul>

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## DAU and AFIT Training Assessment Approach

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We used a methodical approach for our assessment of whether the DAU and AFIT curricula support skills needed for commodity council members. We began with the list of activities in Appendix A and the list of skills in Appendix B and developed a large “RAND” matrix that matched commodity council activities with *specific* skills (Appendix C). Almost every activity (there were a few exceptions) was linked to a specific skill, and every specific skill was necessary for at least one activity. This exercise convinced us that the skills and activities lists, which had been developed independently, captured the important areas from our literature review and interviews.

We then compared the *skills* list (both general and specific skills) directly to the list of defense procurement “competencies” (Appendix E) and noted obvious matches. This comparison (and the resulting non-matches) provided an initial indication of skills we had identified that were not emphasized in DAU courses. Next, we compared our *activities* with the competencies and noted those activities that were addressed at least in part by acquisition training programs at DAU. Finally, for those *activities* that matched competencies, we used the “RAND” matrix to identify associated skills. Thus, some new skills were linked to competencies *through* the activities for which they were deemed necessary.

This exercise gave us a first cut at skills from the literature that were not covered by DAU courses. We then examined the list in more detail, and looked at course descriptions to determine if some “missing” skills were actually covered and whether or not some skills that appeared to be taught were taught at a level commensurate with

the requirements identified by commercial firms. We also spoke with DAU personnel involved in the process of updating the contracting curriculum. Finally, we examined course descriptions for AFIT's Graduate Strategic Purchasing Program and spoke with a faculty member involved in AFIT's short course on purchasing and supply chain management.

We recognize that this assessment is still tentative; a more detailed examination of DAU course syllabi and/or detailed conversations with DAU instructors across disciplines are necessary to confirm the skills we have identified as potentially missing from current courses, particularly since DAU is in the process of restructuring many of its contracting courses. Further discussions with personnel from AFIT would also be useful to learn more about the details of Graduate Strategic Purchasing Program courses.

## **Defense Procurement “Competency” List for the 21st Century Acquisition Workforce**

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This appendix displays the list of desired competencies for the 21st century acquisition workforce identified by Director of Defense Procurement Deidre Lee in her August 2001 memorandum to the president of DAU. The competencies are grouped into broad categories.

### **Policy and Processes**

Knowledge of contracting laws, regulations, and policies

Knowledge of acquisition methods and appropriate applications (including noncontract alternatives)

### **Contracting Fundamentals**

Customer business analysis and strategy

Market research

Procurement requests

Requirements analysis

Identifying possible sources

Limiting competition

Socioeconomic requirements

Offeror evaluation factors

Method of acquisition  
Pricing arrangements  
Recurring requirements  
Unpriced contracts  
Contract financing  
Obtaining bonds  
Methods of payment  
Documenting source selection plan  
Publicizing proposed acquisitions  
Subcontracting requirements  
Oral solicitations  
Solicitation preparation  
Inquiries and Freedom of Information Act requests  
Pre-bid/quote/proposal conference  
Amending/canceling solicitations  
Bids  
Responsiveness  
Receiving quotes and proposals  
Evaluating nonprice factors  
Pricing information from offerors  
Accounting and estimating systems  
Cost accounting standards  
Audits  
Price analysis (negotiated acquisitions)  
Cost analysis  
Evaluating other terms and conditions  
Award without discussion  
Communications  
Establishing competitive range

Negotiation strategy  
Conducting discussions (negotiations)  
Responsibility  
Mistakes in offers  
Protests  
Debriefing  
Post-award orientations  
Monitoring subcontract management  
Contract modification and adjustment  
Options  
Task and delivery order contracts  
Performance management  
Commercial/simplified acquisition remedies  
Noncommercial acquisition remedies  
Documenting past performance  
Assignment of claims  
Administering securities  
Administering finance terms  
Allowable costs  
Price and fee adjustments  
Defective pricing  
Invoices  
Fraud and exclusion  
Collecting contractor debts  
Administering special terms and conditions  
Resolving disputes  
Termination  
Closeout  
Knowledge of financial management regulation

Appropriate application of commercial/industry practices  
Appropriate application of competition requirements, policies, and procedures  
Knowledge of interoperability issues/concerns  
Knowledge of international acquisition laws/processes/issues  
Knowledge of the range of contract pricing techniques and appropriate applications  
Knowledge of appropriate source selection techniques  
Ability to conduct and conclude complex negotiations  
Appropriate application of pertinent laws, regulations, policies, and practices (i.e., labor, environmental, socioeconomic, international acquisition, and security)  
Knowledge of contract financing arrangements and the impact of each on the government and private sector  
Ability to develop productive relationships among suppliers, requiring activities, and contracting functions  
Acquisition-related experience in, or understanding of, more than one acquisition function (contracting, program management, etc.), agency, or sector (public or private)  
Professional development (education and continuous learning) in appropriate disciplines  
Appropriate application of past performance information  
Dispute resolution processes and alternatives  
Use and application of e-business techniques/processes

## **General Professional Business Attributes**

Communication  
Market research  
Teaming  
Analysis

Understanding the mission (buyer and customer)  
Commercial business practices  
Decisionmaking  
Use of knowledge/information management resources  
Appropriate use of contracting and noncontracting methods for satisfying requirements  
Appropriate, effective use of information/data to identify sound business alternatives, recommendations, and decisions  
Financial management  
Adaptability and flexibility  
Risk management  
Leadership  
Appropriate use of technology  
Dilemma resolution  
Multifunctional capabilities (within contracting and across acquisition functions)  
Organizational structure, roles, and relationships  
Project management  
Technical or business management expertise  
Contract/performance management

## **Acquisition Environment**

Familiarity with evolving acquisition issues, techniques, solutions  
Knowledge and support of contemporaneous organizational and governmental priorities and goals  
Awareness of the contemporaneous political environment and the implications for appropriate business arrangements  
Familiarity with the contemporaneous legal environment and the appropriate reflection of that environment in business arrangements

Familiarity with financial concerns of public and private sector entities

Knowledge and application of appropriate global ethics/standards of conduct

Knowledge of fraud and exclusion requirements

Knowledge of DoD-unique statutory and regulatory requirements

Knowledge of DoD-unique contracting environments (defense priorities, contingency contracting, etc.)

Integrity

## **Knowledge of Noncontract Fundamentals**

Purchase card

Ordering

Other transactions

Cooperative agreements

Use of existing inventory

Sealed bidding

Simplified acquisition procedures

Creating and using task and delivery contracts

## **Training Methods, Training Resources, and Organizations That Offer Training**

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The general literature on training contains a considerable amount of useful information for those interested in developing an in-house training program. In this appendix, we present ideas from several sources.

### **Training Methods**

O’Driscoll’s training architecture (discussed in Chapter Three) alludes to several different methods or modes of training in each of his “learning zones.” Elsewhere in the training literature, we encounter more-specific enumerations of methods of training, along with some of their characteristics.

Marx (1999) divides training delivery methods into synchronous (where all learners participate in the same “lesson” at the same time) and asynchronous (where learners can engage in course materials at different times). Synchronous delivery methods include the traditional classroom setting, video teleconferences, and satellite distance learning. Asynchronous delivery methods include print media and electronic performance support systems such as online tutorials, databases, help functions, documentation, references, templates, etc. Traditional computer-based training, with self-paced instruction and embedded tests, is also asynchronous; it now frequently involves multimedia (text, image, and sound) interactive CD-ROM, or access to

courses through the Internet. A final asynchronous approach to training is OJT.

Green (2001, p. 54) lists the following training methods: lectures, role-playing, case studies, “show, tell, and do,” computer-based training, computer-generated presentations, outdoor experiential activities, and mentoring.

Cook and Heacock (2003) offer several tips to achieve business results with e-learning, including linking e-learning strategies to specific business goals; modifying the performance system, where necessary, to support the learning outcomes; securing the support of management at all levels; and creating an “e-learning friendly environment.”

## **Resources for Purchasing and Supply Management Training Programs**

In the literature, several elements or “building blocks” for training programs are identified. A repeated thread in the purchasing and supply management training literature is the integrated use of multiple media and methods of training (Porter, 1998; Perreault, 2002; Marx, 1999, and others). The motivation for integrated media arises from two key observations about teaching and learning in general: different individuals learn better through different teaching modes and different media are appropriate for different topics or levels of training.

Integrated training programs can be built from the combination of several possible elements, some of which are discussed below.

### **Certification**

As noted in the discussion of Harley-Davidson in Chapter Three, certifications can serve as an endorsement of a minimum level of competency (Orange and Robinson, 1999). We found several certification programs that are well respected in industry: ISM’s CPM and APP, APICS’ Certified in Integrated Resource Management, CPIM, and Certified Fellow in Production and Inventory Management.

Each of these certifications covers a different target audience and awards a different level of credential for a purchasing professional. ISM's CPM certification is designed for experienced supply managers and focuses on managerial and leadership skills, plus a variety of specialized functions designed to enhance the value of the profession. ISM's APP certification, on the other hand, is specifically designed for entry-level supply management professionals, or those primarily engaged in the operational side of the supply function. The Certified in Integrated Resource Management certification requires a comprehensive understanding of cross-functional and interactive business tasks, the CPIM requires specialized knowledge of production and inventory management, and the Certified Fellow in Production and Inventory Management is an even higher-level production and inventory management certification.

There are several different avenues of preparation for these certifications. In addition to preparatory coursework offered by the certifying organizations themselves, we note (without endorsing) the following preparation opportunities: DATACHEM Software's (<http://www.datachemsoftware.com/>, as of May 2004) certification test preparation tool for ISM's CPM and APP; the "SkillQuest" Skills-Evaluation Tool, which is a generic skills evaluation tool offered by People Sciences Incorporated (<http://www.peoplesciences.com/>, as of May 2004); and CPIM in-house study sessions (offered by APICS).

### **Coaching/Mentorship**

Several sources emphasize the effective contribution of mentorship to procurement training programs. As we saw in Chapter Three, both Firm A and Harley-Davidson assert the value of mentorship. The value of mentorship is confirmed in the general training literature (see for example O'Driscoll's, 2003, training "architecture" in Figure 3.1) in the recognition that mid to high levels of skill mastery are obtained primarily through informal instruction and/or mentorship.

**Assessment**

Another important practice that received repeated mention is using skills assessments to tailor training to the needs of individuals, rather than applying “one-size-fits-all” training. We saw in Chapter Three that both Firm B and SmithKline Beecham made specific reference to this practice. We also learned that the Department of the Navy Human Resources division has an Early Career Professional Development program that is “competency based.” This program uses a software assessment tool before and after each rotational assignment of the trainees to determine what skills and competencies should be stressed in their training and to evaluate their progress.

**Coursework**

Coursework remains the core building block in training programs.

**On-the-Job Training**

OJT, like mentorship, can contribute to higher levels of mastery. Unless training directly relates to something an employee does on the job, it is unlikely to “stick.” As described in Chapter Three, Firm B views OJT with recognized experts as the most effective way to develop sophisticated purchasing and supply management skills.

**Organizations That Offer Training**

We identified the following organizations as good sources of purchasing and supply management training or training materials. We have divided them into academic and corporate sources.

**Academic/University**

The following schools were identified in the literature and in our interviews as good sources of purchasing and supply management training: The Supply Chain Management Institute at the University of San Diego, Michigan State University, Arizona State University, the Center for International Trade and Transportation at California State University Long Beach, the World Trade Institute of Pace Uni-

versity, the Massachusetts Institute of Technology Center for Transportation & Logistics, the Institute of Logistical Management, Colorado Technical University, Pennsylvania State University, and the University of Birmingham, England.

### **Corporate**

The following corporate sources offer training and/or certifications in a variety of environments: ISM (formerly NAPM), APICS, American Society for Training and Development (ASTD), Supply Chain Online, Strategic Management Solutions, and SkillSoft.

Note too that our interviews with well-regarded corporate entities revealed that one successful strategy is to hire professors from well-regarded university programs to provide in-house training (see Firm A in Chapter Three).

### **Topics/Content**

Actual content of purchasing and supply management training is generally considered proprietary. Vague outline material is occasionally available and is often similar to the following, which is from a syllabus by University of Chicago Professor J. Anklesaria (2003):

Activities to be covered by the class include:

- Trends/Best Practices/Core Competencies
- Strategic Supply Management Options
- Consulting Firms Supply Management Emphasis, Push and Pitch
- Zero Based Pricing and Strategic Cost Management
- Managing Assets You Do Not Own—Supply Management Strategy
- Partnership Theory and Practice
- Measurements & Feedback
- E-commerce prospects and applications
- Quality/Chains/Integration
- What's needed for Supply Management Success?



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