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Affordability: The Quest for Clarity



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Disclaimer

The views and opinions expressed or implied in this research paper are those of the author. No agency or department of the United States Government has officially sanctioned any of these views and opinions.

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**Abstract**

The Department of Defense identifies affordability within its portfolio as a problem to be solved. Two questions might be asked. First, does the Department of Defense understand the problem? Second, has the Department of Defense defined the problem sufficiently so that the problem can be interpreted consistently across the Services?

The affordability problem is not new for the Department of Defense and neither are initiatives aimed at prescribing a definition. This research leverages the broad body of prior academic research and Department of Defense source data in examination of policy and guidance resulting in multiple accepted definitions of affordability. Data suggests that the definition of affordability is too subjective.

When asked to justify program affordability, program managers respond, based on training, with a recitation of approved acquisition program baseline parameters for cost, schedule, and performance for their individual programs or portfolios constrained to the Future Years Defense Program. The data derived from this research pursuit suggests that the Department of Defense considers affordability in a larger Department of Defense context beyond the availability of dollars over the five-year Future Years Defense Program. Considerations include prioritization related to National Defense Strategy goals, political sensitivities, and affordability assessed over a 30 to 40-year planning horizon.

This research examines three basic questions: 1. What is affordability? 2. How is affordability defined? 3. How does one know a program is affordable? The study to present current topics in affordability and provides a recommended definition of affordability. Questions not answered during the conduct of this research form the basis for additional future research efforts.

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## Introduction

Program managers are routinely asked if their programs are affordable. Program managers are conditioned to respond instinctively based on their Milestone Decision Authority-approved acquisition program baseline parameters for cost, schedule, and performance. Program managers also are taught to articulate and present data-driven analysis to demonstrate how they will deliver quantities of a required capability within the projected Future Years Defense Program budget. Program managers know their assigned programs, and maybe the complementary programs within their Service, but most do not consider what affordability means in the larger Department of Defense (DoD) context.

Program managers are specifically charged with managing the affordability of capabilities delivered to warfighting organizations. They are adept at maintaining the direct cost, schedule, and performance tradeoffs that contribute to affordability. Often, program managers do not consider the strategic level affordability considerations such as capability prioritization related to National Defense Strategy goals and political sensitivities. Additionally, program managers do not consider that, from a Department of Defense enterprise perspective, affordability is assessed over a 30 to 40-year horizon and not constrained to the Future Years Defense Program budget.

A principal concern is affordability, as currently defined by the Department of Defense, is too subjective to provide program managers a means to adequately assess total lifecycle affordability. According to recent research conducted by the Institute for Defense Analyses, “affordability is a term that has been the subject of much discussion over the past several years. In many cases these discussions have seemed to lack a full understanding of the term’s meaning” (Porter et al., 2015, p. 3).

There are many Department of Defense-accepted definitions of the term affordability. The Department of Defense assigns affordability constraints, affordability caps, and affordability goals, but does merely managing within these constraints make a program affordable? What is missing from each of the definitions is the underlying consistency that provide program managers with the means to justify affordability assessments quantitatively or quantifiably. This research is a continuation of research conducted by a long list of qualified researchers and decades of effort. Despite the effort, a quantitative or qualitative definition of affordability remains a point of important discussion.

This specific research is intended to provide a qualitative view of affordability from a Department of Defense perspective. The research leverages the broad body of prior academic research and Department of Defense source data to present current topics in affordability. Further, this research intends to offer a recommended definition of affordability sufficient to enable program managers to objectively assess program affordability.

## **Definitions**

### **Affordability (Multiple).**

**Better Buying Power Memoranda.** “Conducting a program at a cost constrained by the maximum resources the Department can allocate for that capability” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2010, p. 2)

**Defense Acquisition Guidebook.** “The degree to which capability benefits provided by a weapon system are worth the system’s total life-cycle acquisition, operating and support costs, and the degree to which the cost is in consonance with the long-range modernization, force structure, and manpower plans of the

individual Department of Defense Components and the Department as a whole” (Defense Acquisition University, 2012, p. 92)

**Component Acquisition Executives.** The senior official in each Department of Defense component responsible for acquisition matters (Defense Acquisition University, 2013, p. 1075)

**Congressional Defense Committees.** In accordance with 10 U.S.C., Section 2430a, “the Armed Services Committee of the House of Representatives, the Armed Services Committee of the Senate, the Subcommittee on Defense of the Committee on Appropriations of the Senate, and the Subcommittee on Defense of the Committee on Appropriations of the House of Representatives, and related agencies of the Committee on Appropriations of the House of Representatives” (Office of the Law Revision Counsel, 2021, 10 U.S.C, Section 101, p. 58)

**Designated Major Subprogram.** “A major subprogram of a major defense acquisition program designated under 10 U.S.C, Section 2430a” (Office of the Law Revision Counsel, 2021, 10 U.S.C, Section 2366a, p. 2981)

**Future Years Defense Program.** Summary of total Department of Defense resources and force structure information for 5 years (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2013, p. 6)

**Key Performance Parameter.** “Key system capabilities that must be met for a system to meet its operational goals” (AcqNotes, 2018b)

**Major Defense Acquisition Program.** In accordance with 10 U.S.C. Section 2430, a Department of Defense acquisition program that “estimated by the DAE to require an eventual total expenditure for research, development, and test and evaluation of more than \$525 million in Fiscal Year (FY) 2020 constant dollars or, for procurement, of more than \$3.065 billion in FY 2020 constant dollars” (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2020, p. 20)

**Milestone Decision Authority.** “Designated individual with overall responsibility for a program. The Milestone Decision Authority has authority to approve entry of an acquisition program into the next phase of the acquisition process and is accountable for cost, schedule, and performance reporting to higher authority, including Congressional reporting” (Office of the Under Secretary of Defense for Acquisition and Sustainment, Change 2, Enclosure 1, 2018, p. 2)

**Milestone A.** “An investment decision to pursue specific product or design concepts, and to commit the resources required to mature technology and/or reduce any risks that must be mitigated prior to decisions committing the resources needed for development leading to production and fielding” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017, p. 8)

**Milestone B.** “The decision to commit resources to the development of a product for manufacturing and fielding” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017, p. 8)

**Program Manager.** “The designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user’s operational needs. The Program Manager is accountable for cost, schedule, and performance reporting to the Milestone Decision Authority” (Office of the Under Secretary of Defense for Acquisition and Sustainment, Change 2, Enclosure 1, 2018, p. 2)

### **Purpose and Objectives**

The purpose of this research is to define or bound the term affordability within the context of defense acquisition. Additionally, this research explores the currently accepted Department of Defense definitions of affordability and common affordability themes.

This research has multiple objectives and culminates in recommendations, that if considered, may further the Department of Defense’s quest to better understand the many facets of affordability. A primary objective of this research is to discover answers to the fundamental questions of what affordability is and how one can determine a program’s affordability from a Department of Defense perspective. A secondary objective is to highlight how the currently accepted definitions of affordability and the acquisition culture of making program managers singularly accountable for affordability are inappropriate.

An inability to adequately answer the affordability question, either quantifiably or qualitatively, puts Department of Defense program manager in precarious situations when responding to senior Department of Defense leadership. Ultimately, for Department of Defense program managers to lead and execute affordable programs, they must know what affordable means and how affordability is measured. The best outcome would be that when, not if, asked if a program is affordable, Department of Defense program managers could respond crisply and confidently with information based on actual performance against objective metrics.

**Significance of Research**

This research is significant because the Department of Defense continues to strive to maximize the balance between its investments and acquiring the capabilities required to give its warfighters an unfair advantage against peer and near-peer adversaries. Although, the Department of Defense has pursued affordability initiatives since the 1960s (Kneece, Jr. et al., 2014), there is still no coherent, disciplined processes for assessing affordability and making appropriate and timely adjustments to ensure a more affordable investment program (Porter et al., 2015).

**Research Questions**

This research is necessitated by realization that for the Department of Defense to retain its competitive and strategic advantages, it must deliver innovative capabilities at the speed of relevance and within the budget allocated. In short, the Department of Defense must deliver affordable solutions to mitigate capability gaps. To achieve its affordability objectives, the Department of Defense must address the following three simple but significant questions:

1. What is affordability to the Department of Defense?
2. How does the Department of Defense define affordability?
3. How does the Department of Defense assess affordability?

Founded on the extensive research of Department of Defense, academia, and industry partners, this research, presented in four phases, examines the attributes of policy, the various definitions and interpretations of affordability, current affordability metrics, and policy application. In the end, one must ask, how do we really know if a program is affordable?

**Research Methodology****Methodological Approach**

The quest to determine affordability in defense acquisition programs is not a new endeavor. Even though affordability is a question asked of many program managers, few can justify affordability based on approved Department of Defense metrics. There are volumes of well-researched and documented attempts at prescribing a metrics-based definition of affordability to defense acquisition programs. This paper, based on the research and analysis of published material, identifies commonly cited affordability definitions, metrics, and initiatives. The additional intent of the research is to develop recommendations for the acquisition community and leadership to consider with respect to defining affordability.

The methodology undertaken in this research effort is a review of previously published, scholarly, and peer-reviewed literature documenting metrics and approaches to defining affordability. The data collected in the literature review process will be from online sources and qualitatively analyzed to ascertain metrics or attributes used to define affordability and approaches used across the defense acquisition community. Data sources will be annotated appropriately and organized alphabetically by author's last name.

**Literature Assessment**

For the purpose of this research, literature and approaches considered relevant must have publication dates no earlier than 2010. The more recent the literature's publication, the more useful the data set as it is more likely to reflect the ideologies of current or recent Department of Defense leaders charged with assessing defense acquisition program affordability. Should literature outside of the established window of relevancy be used, it will be used to validate

historical approaches to define affordability. Current literature and data will be used to the maximum extent practicable.

### **Data Collection and Sources**

The primary source of data is Google Scholar at <https://scholar.google.com>. Google Scholar is recognized as a validated source for scholarly and peer-reviewed data suitable to support any conclusions and recommendations resulting from this research. University research libraries and databases may be used, where required, as validated data retrieval sources to follow the logic, context, and references linking data resources more completely.

The table below is an excerpt of search results that identifies search engines used, search terms, and outputs used in the research process. The table represents the results of data searches based on search terms but does not represent the data sources used in the final research paper.

#### **Table 1**

*Database, Search Terms, and Results (Excerpt)*

## Searches and Terms

Database	Search Term	Results
Google Scholar (scholar.google.com)	Affordability in defense acquisition	Affordability of Defense Acquisition Programs, <a href="https://apps.dtic.mil/sti/pdfs/ADA620059.pdf">https://apps.dtic.mil/sti/pdfs/ADA620059.pdf</a> February 2015 Retrieved on September 20, 2020
Google Scholar (scholar.google.com)	Affordability in defense acquisition	Dispelling the Myths of DoD's Affordability Policy, <a href="https://www.dau.edu/library/defense-atl/DATLFiles/Sep-Oct2013/Ohlandt.pdf">https://www.dau.edu/library/defense-atl/DATLFiles/Sep-Oct2013/Ohlandt.pdf</a> Defense AT&L: September–October 2013 Retrieved on September 20, 2020
Google Scholar (scholar.google.com)	Affordability in defense acquisition	Affordability Specification, <a href="http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.587.7659&amp;rep=rep1&amp;type=pdf">http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.587.7659&amp;rep=rep1&amp;type=pdf</a> Retrieved on September 20, 2020
Google Scholar (scholar.google.com)	DoD definition of affordability	On a Quantitative Definition of Affordability, <a href="https://apps.dtic.mil/sti/pdfs/ADA544198.pdf">https://apps.dtic.mil/sti/pdfs/ADA544198.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD definition of affordability	Defense Affordability Panel, <a href="https://apps.dtic.mil/dtic/tr/fulltext/u2/a563469.pdf">https://apps.dtic.mil/dtic/tr/fulltext/u2/a563469.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD definition of affordability	BBP 3.0, <a href="http://fedne.ws/uploads/BBP_3.0_final.pdf">http://fedne.ws/uploads/BBP_3.0_final.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD Affordability	Reducing total ownership cost in DoD, <a href="http://www.acqnotes.com/Attachments/ReducingTotalOwnershipCostinDoD.pdf">http://www.acqnotes.com/Attachments/ReducingTotalOwnershipCostinDoD.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD Affordability	Improving Program Affordability through the Application of Data Analytics, <a href="http://www.iceaonline.com/ready/wp-content/uploads/2017/09/PA-6_Presentation_ImprovingProgramAffordabilityThroughTheApplicationOfDataAnalytics_Wang.pdf">http://www.iceaonline.com/ready/wp-content/uploads/2017/09/PA-6_Presentation_ImprovingProgramAffordabilityThroughTheApplicationOfDataAnalytics_Wang.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD Affordability	An analysis process for affordability and the relationship to cost, <a href="https://arc.aiaa.org/doi/10.2514/6.2002-1767">https://arc.aiaa.org/doi/10.2514/6.2002-1767</a>
Google Scholar (scholar.google.com)	DoD Affordability	Affordability analysis for DARPA programs, <a href="https://www.jhuapl.edu/Content/techdigest/pdf/V21-N03/21-03-Kroschl.pdf">https://www.jhuapl.edu/Content/techdigest/pdf/V21-N03/21-03-Kroschl.pdf</a> , Retrieved on September 21, 2020
Google Scholar (scholar.google.com)	DoD Affordability	Acquisition Failure A Coroner's Report on the Cause: Non-Affordability, <a href="https://apps.dtic.mil/dtic/tr/fulltext/u2/a328978.pdf">https://apps.dtic.mil/dtic/tr/fulltext/u2/a328978.pdf</a> , Retrieved on September 21, 2020
Google Search (google.com)	Defense Acquisition Guidebook	Defense acquisition guidebook, <a href="https://www.acqnotes.com/Attachments/Defense-Acquisition-Guidebook-11-01-2012.pdf">https://www.acqnotes.com/Attachments/Defense-Acquisition-Guidebook-11-01-2012.pdf</a> , Retrieved on September 21, 2020
Google Search (google.com)	10 United States Code	United States Code, <a href="https://uscode.house.gov/browse/prelim@title10/subtitleA/part4/chapter139&amp;edition=prelim">https://uscode.house.gov/browse/prelim@title10/subtitleA/part4/chapter139&amp;edition=prelim</a> , Retrieved on October 19, 2020

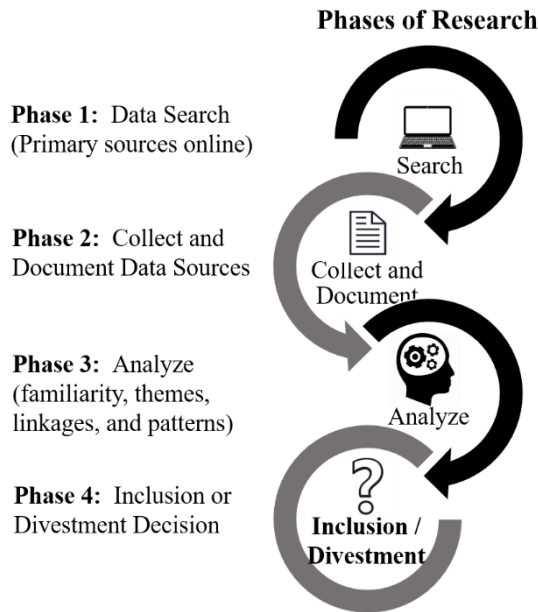
Data that offers an objectively determined connotation of affordability will be included in the pool of data sources used to determine if a common set of attributes is used across the Department of Defense. This research is intended to present an unbiased view of the definition of affordability; therefore, any data sources that offer opinion without peer-reviewed supporting rationale will be excluded. Objectively, this research will clarify the definitions of affordability presented in the Defense Acquisition Guidebook and the Department of Defense's Better Buying Power series of publications. The most valuable data sources relate affordability definitions and approaches to the concepts presented in the Defense Acquisition Guidebook and Better Buying Power series. Data sources for potential inclusion in this research will be reviewed to determine if common definitions and metrics exist to establish a concise set of characteristics for use in defining affordability.

## Research Phases

Research will be conducted in a four-phase approach as depicted in the figure below.

**Figure 1**

*Four Phases of the Research Process*



Research phases consist of search, data collection, analysis, and the decision to include or divest of the data acquired in the search. Data will be analyzed using qualitative methods. Since the data to be extracted will be descriptive words and observations instead of numbers and equations, qualitative methods of data analysis are best suited. Qualitative analysis for this research will follow the process of data collection and familiarity, documentation of themes, analysis against research objectives, linkage and pattern identification, suitability, and inclusion/divestment decision.

Restated, this paper seeks to identify commonly cited affordability definitions, metrics, and initiatives with an objective of developing recommendations to the acquisition community for defining affordability. With the objective in mind, all research will be conducted with

preservation of academic integrity as a primary consideration. Fairness and impartiality will be maintained when presenting facts and positions as stated in data sources.

### **Research Limitations**

Department of Defense efforts to objectively define affordability and implement effective affordability policy have been ongoing, by some accounts, since the 1960s. Given the long history of efforts, there are numerous published sources of information available for analysis and interpretation. The availability of data enhanced the likelihood of arriving at objective, data-driven research outcomes. Despite the availability of data sources, this research effort has several limitations. One such self-imposed limitation is this research only considers data sources developed no earlier than 2010.

This research effort is limited to the 10-months allocated to the Senior Service College Fellowship Program. The 10-month program timeframe is insufficient to evaluate the volumes of information published in examination of affordability within the Department of Defense.

This research effort competed directly with the Senior Service College Fellowship Program's 10-month executive-level curriculum of leadership and professional development seminars, completion of the 10-week Program Manager's Course (PMT 4010), and graduate-level collegiate courses with Webster University. These additional academic endeavors limited deeper analysis of retrieved data. While this research effort examined many sources, the volume of data sources, if examined to the level appropriate for this study, would exceed the 10 months available. In attempt to overcome the available time limitation, data sources were constrained to those published in 2010 and later. Given the data constraint, the research intends to depict the evolution of Department of Defense affordability efforts in a fair, balanced, and unbiased manner.

Finally, the researcher acknowledges the inherent bias that exists from being personally involved in the Department of Defense's affordability determination and assessment community and processes. Every attempt was made to remain true to the data, without personal interpretation or assumption.

### **Literature Review**

Imagine being a program manager assigned to a program intended to deliver a critical capability as part of the ongoing defense modernization initiative. Your program is being briefed to senior Department of Defense leaders for a decision on proceeding with the program. The capability that the program will deliver in the future is well understood and aligns with the current defense strategy. The only aspect of the program left to consider is affordability. Now, the program manager is on the spot and the dreaded question comes. Is this program affordable? Given the decline and uncertainty of defense budgets in the current political environment and that of the foreseeable future, how does a program manager know if an assigned program is affordable? An even bigger question is should it be the program manager that answers the affordability question at all?

This research examines three basic questions: 1. What is affordability? 2. How is affordability defined? 3. How does one know a program is affordable? This research builds upon the previous research body of work and prior examination of data compiled with the objective of defining, metricizing, and implementing affordability policies.

The data collected in the research process is presented in four phases. Phase 1 examines the affordability requirement and the laws, policies, and guidance that prescribe and shape it. Phase 2 of this research explores the broad scope and depth of the term "affordability" and the endeavors to foster a culture of affordability within the Department of Defense. Phase 3 explores

concepts, methodologies, and metrics used to determine affordability within the Department of Defense. Finally, Phase 4 examines the application of affordability policies to ascertain if they are applied consistently across the Department of Defense. Ultimately the research will provide recommendations based on the data collected in the research process.

### **Phase 1: The Basis of Affordability Requirements**

“Assuring the future affordability of the Department of Defense’s portfolio of acquisition programs has been an enduring goal that has rarely been achieved” (Kneece, Jr. et al., 2014, p. iii ). The independent research of the Institute for Defense Analyses and other organizations suggest that assuring the future affordability of acquisition programs in the Department of Defense has been an enduring goal, which too frequently has not been achieved (Kneece, Jr. et al., 2014). Affordability in the Department of Defense is not a new concept nor is it a new objective of the department’s leadership. There is evidence of Department of Defense attempts to address affordability in numerous policies, guidance, and studies as early as the 1960s according to the Institute for Defense Analyses (Kneece, Jr. et al., 2014). The Better Buying Power initiative is considered to have had the most impact on creating an affordability conscious culture, but is not the Department of Defense’s first attempt to achieve affordability in acquisition. Kneece, Jr., MacCarthy, and Mandelbaum (2014, p. iii) of the Institute for Defense Analyses, provide evidence that two initiatives; design to cost of the 1970s and cost as an independent variable of the 1990s, were implemented with the objective of achieving program affordability.

Analysis of current research on the acquisition community’s quest to define and implement processes to determine program affordability clearly demonstrates that there is more work to do. Compiled research data suggests Department of Defense leader concurrence that

defining and enforcing affordability in defense programs is essential to delivering the right capability, at the right time, and within approved costs to facilitate a more lethal force. The overarching goal of the affordability mandates is to “avoid starting or continuing programs that cannot be produced and supported within reasonable expectations for future budgets” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Enclosure 8, 2017, p. 126).

In the 2017 interim-issuance of the Department of Defense Instruction 5000.02, the Honorable Ashton Carter, then-Under Secretary of Defense for Acquisition, Technology, and Logistics, “acknowledges that the Department [Department of Defense] has a long history of starting programs that proved to be unaffordable. The result of this practice has been costly program cancellations and dramatic reductions in inventory objectives” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, Enclosure 8, 2017, p. 126). Congressional and Department of Defense desires to achieve affordability in acquisition while obtaining required capabilities and avoiding embarrassing program cancellations are the ultimate drivers behind the various policy and guidance implementations.

Affordability has both statutory and regulatory requirements for the Department of Defense. As a statutory requirement, affordability is specifically addressed in 10 United States Code (U.S.C.), Section 2366a and 10 U.S.C., Section 2366b for major defense acquisition programs. The law, in 10 U.S.C., Section 2366a, is clear that affordability assessments must be completed and certified in writing to the Secretary of the Service Component prior to approval of a decision to commit resources to the development of a product for manufacturing and fielding. 10 U.S.C., Section 2366b further mandates the requirement for written affordability certification,

again to the Secretary of the Service Component, prior to approval of formal initiation of a defense acquisition program (Office of the Law Revision Counsel, 2021, pp. 2973-2986).

Policy and guidance such as Department of Defense Directive 5000.01 (The Defense Acquisition System), Department of Defense Instruction 5000-series of documents, and multiple Department of Defense-authored Better Buying Power memoranda form the basis of regulatory affordability requirements. In policy, Department of Defense Directives and Department of Defense Instruction 5000-series of documents direct program managers to effectively balance requirements, risk, and cost with the dollars the Department of Defense can allocate to develop, field, and sustain the desired capability. Specifically, Department of Defense Directive 5000.01 directs that:

“all participants in the acquisition system shall recognize the reality of fiscal constraints, plan programs based on realistic projections of the dollars and manpower likely to be available in future years, and to the greatest extent possible, identify the total costs of ownership, and address affordability in establishing capability needs objectives” (Office of the Under Secretary of Defense for Acquisition and Sustainment, Change 2, Enclosure 1, 2018, p. 5).

The 2017 interim-issuance of the Department of Defense Instruction 5000.02 (Operation of the Defense Acquisition System) requires Department of Defense Components to present, at Milestone A, “affordability analysis and proposed affordability goals based on the resources that are projected to be available to the Department of Defense Component in the portfolio(s) or mission area(s) associated with the program under consideration” (Office of the Under Secretary

of Defense for Acquisition, Technology, and Logistics, 2017, p. 20). The same policy requires the finalization of affordability caps during the Technology Maturity and Risk Reduction Phase of the program's life cycle.

Better Buying Power memorandum guidance published by Secretary Ashton Carter, then-Under Secretary of Defense for Acquisition, Technology, and Logistics in September 2010, prescribed 23 principal actions to improve efficiency organized in five major areas aimed at a significant contribution to redirecting \$100 billion of defense budget dollars from unproductive to more productive purposes with the Department of Defense (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2010, p. 1). With a particular focus on affordability, the Better Buying Power policy targeted affordability and cost growth by mandating affordability as a specified requirement. Under the requirement, Honorable Carter's direction established affordability targets to be treated like a key performance parameter. The authority to approve costs exceeding the affordability targets was retained with the Under Secretary of Defense for Acquisition, Technology, and Logistics Secretary.

The law, policy, and guidance clearly establish affordability as a requirement that program managers must consider prior to initiation and throughout the lifecycle of an acquisition program. The requirement is unquestionable but how does the program manager objectively define affordability?

## **Phase 2: Affordability Defined**

What is affordability? In a general sense, affordability implies the ability to obtain a good, service, or, in the case of the Department of Defense, a desired capability, at a total cost within one's available means. "Affordability means that it will be possible to execute and sustain an acquisition program as planned with the fiscal resources that will likely be available

for it” (Porter, Conley, Gordon, Kneece, Jr., Rieksts, Shaw, and Tate, 2015, p. 3). The “October 2012 Military Operations Society workshop on affordability stated that affordability is not an inherent attribute of a program or requirement, but an informed judgment when compared to something else” (Porter et al., 2015, p. 3). The 2012 Naval Post-Graduate School Defense Affordability Panel determined that affordability is both a program and portfolio attribute that considers the questions of how likely future costs are to exceed projected resources and what tradeoffs are required to obtain the desired capability (Spruill, 2012, p. 9).

A Google search of the term affordable reveals Merriam-Webster’s (n.d.-a) online dictionary definition of affordability as “having a cost that is not too high”. Similarly, the Cambridge University Press (2020a) online dictionary defines affordable simply as “not expensive”. From an industry perspective, affordability is defined as a condition where “price is reasonable, it is inexpensive, and most people can afford it. An affordable product or service is one that is within most people’s budget” (Market Business News, n.d.).

The Department of Defense, academia, and industry definitions of affordability demonstrate that the term is intrinsically tied to one’s budget and the total amount of money that can be allocated towards the acquisition of goods or services. The various definitions highlight that affordability, as a concept, is subjective, relative, broadly defined, and interpreted in a multitude of ways based on one’s perspective. Affordability is subjective in the fact that it is based on means, perspective, perceived value, and expected reward. Affordability is relative in the sense that what is perceived as affordable to one may not be perceived as affordable to another. Affordability is subject to interpretation based on a variety of factors such as law, policy, prioritization, budgetary authorizations, organizationally imposed constraints,

affordability goals, and desired outcomes. The Department of Defense interpretation of affordability is an excellent example of how broadly the term might be defined.

Explicitly defining affordability will enable program managers at all levels of the Department of Defense to make well-informed, data-driven recommendations and decisions regarding the continuation or cancellation of acquisition programs. The definition of affordability is based in law, 10 U.S.C., Sections 2366a and 2366b, policy directives such as Department of Defense Directive 5000.01 and the Department of Defense Instruction 5000-series of documents, and in guidance such as Better Buying Power.

10 U.S.C., Subtitle A, Part IV, Chapter 139, Section 2366a mandates that, in brief:

“before granting Milestone A approval for a major defense acquisition program or a major subprogram, the milestone decision authority for the program or subprogram shall ensure that the Secretary of the military department concerned and the Chief of the armed force concerned concur in the cost, schedule, technical feasibility, and performance trade-offs that have been made regarding the program. Further, a major defense acquisition program or subprogram may not receive Milestone A approval or otherwise be initiated prior to Milestone B approval until the milestone decision authority determines in writing, after consultation with the Joint Requirements Oversight Council on matters related to program requirements and military needs, a cost estimate for the program has been submitted, with the concurrence of the Director of Cost Assessment and Program Evaluation, and

that the level of resources required to develop, procure, and sustain the program is sufficient for successful program execution” (Office of the Law Revision Counsel, 2021, pp. 2973-2978).

Similarly, 10 USC, Subtitle A, Part IV, Chapter 139, Section 2366b mandates that:

“A major defense acquisition program may not receive Milestone B approval until the milestone decision authority determines in writing that the program is affordable when considering the ability of the Department of Defense to accomplish the program's mission using alternative systems; appropriate trade-offs among cost, schedule, technical feasibility, and performance objectives have been made to ensure that the program is affordable when considering the per unit cost and the total life-cycle cost; reasonable cost and schedule estimates have been developed to execute, with the concurrence of the Director of Cost Assessment and Program Evaluation, the product development and production plan under the program; and the estimated procurement unit cost for the program and the estimated date for initial operational capability for the baseline description for the program do not exceed the program cost and fielding targets established under section 2448a(a), or, if such estimated cost is higher than the program cost targets or if such estimated date is later than the fielding target, the program cost targets have been increased or the fielding target has been delayed by the milestone decision authority; and finally funding is expected

to be available to execute the product development and production plan for the program, consistent with the estimates for the program”

(Office of the Law Revision Counsel, 2021, pp. 2978- 2985).

The law, as prescribed in 10 U.S.C., Sections 2366a and 2366b, establish the Milestone Decision Authority for major defense acquisition programs with primary responsibility for affordability certification to the Secretary of the military department concerned. In addition, the law demonstrates that affordability determination involves the inputs and approvals from multiple Department of Defense and Component organizations, not the program manager singularly. It is reasonably concluded that in accordance with 10 U.S.C. Sections 2366a and 2366b, affordable programs must meet the following four specific criteria:

1. Secretary of the military department concurrence of program cost, schedule, technical feasibility, and performance trade-offs when considering per unit cost and the total life-cycle cost
2. The level of resources required to develop, procure, and sustain the program is sufficient for successful program execution
3. The estimated procurement unit cost for the program and the estimated date for initial operational capability for the baseline description for the program do not exceed the program cost and fielding targets established under section [10 USC] 2448a(a)
4. Funding is expected to be available to execute the product development and production plan for the program, consistent with the estimates for the program

The Department of Defense Directive 5000.01 (The Defense Acquisition System) does not explicitly establish a working definition of affordability. Instead, Enclosure 1, paragraph E1.1.4 of the policy directs that:

“DoD Components shall plan programs based on realistic projections of the dollars and manpower likely to be available in future years. To the greatest extent possible, the MDAs shall identify the total costs of ownership, and at a minimum, the major drivers of total ownership costs. The user shall address affordability in establishing capability needs” (Office of the Under Secretary of Defense for Acquisition and Sustainment, Change 2, Enclosure 1, 2018, p. 5).

When the Honorable Ashton Carter was Under Secretary of Defense for Acquisition, Technology, and Logistics from 2009 to 2011, he prescribed a much broader view of affordability. In his signature 2010 Better Buying Power Initiative, the Honorable Carter defined affordability simply as “conducting a program at a cost constrained by the maximum resources the Department can allocate for that capability” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2010, p. 2).

In 2012, the Defense Acquisition Guidebook, arguably one of the resources most consulted by program managers, prescribed the definition of affordability in Chapter 3, paragraph 3.2 as:

“the degree to which capability benefits provided by a weapon system are worth the system’s total life-cycle acquisition, operating and support costs, and the degree to which the cost is in consonance with the long-range modernization... of the individual Department of Defense Components and the Department” (Defense Acquisition University, 2012, p. 92).

In the 2013 publication of the Defense Acquisition Guidebook, Chapter 3, paragraph 3.2.1.2, the definition was revised to read as the “ability to allocate resources out of a future total budget projection to individual activities as determined by Component leadership given priorities, values, and total resource limitations against all competing fiscal demands on the Component” (Defense Acquisition University, 2013, p. 96).

It is notable that while affordability considerations are growing in importance at the most senior levels of the Department of Defense, current versions of the Department of Defense Directive 5000.01, Department of Defense Instruction 5000-series, and the Defense Acquisition Guidebook do not specifically define what it means to be affordable. Even more, the definitions of affordability as written into law, policy, and guidance are broad statements full of subjectivity to be interpreted and applied by the well-meaning program manager.

Although affordability is often equated with a low acquisition cost, that is not the only consideration. “For a system to be affordable it must address multiple cost considerations, including those of total operating costs, viable funding profiles, and supportable development burdens (Kroshl and Pandolfini, 2000, p. 439).

### **Phase 3: Methodologies and Metrics**

“No single formula precisely defines an affordable system. At the tactical level: an affordable system is procured when needed within a budget, operated at a desired performance level, and maintained and supported within an allocated lifecycle budget. Strategically, affordable systems are constrained by top-line budgets, require timing for competing uses of resources, and must contend with the dimension of inflexibility in near-

term budgets, although long-term considerations may make many programs justifiable” (LaCivita and Wall, 2011, pp. 424-425).

If there is no formula to define an affordable system, then how does the Department of Defense measure affordability and what metrics or combination of metrics are used to determine it?

### **Metrics**

According to the Cambridge Dictionary, metrics are “a set of numbers that give information about a particular process or activity” (Cambridge University Press, 2020c). Metrics provide the means to measure performance quantitatively or qualitatively against established goals and are essential to determining what actions, if any, should be taken to achieve desired outcomes. The Department of Defense uses affordability goals, caps, and constraints as the measurements, or metrics, for assessing affordability in acquisition programs (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017).

These metrics are predicated on the foundational affordability analysis conducted by the program office in conjunction with the Component’s resourcing, requirements, and intelligence communities. The cooperative efforts of the Department of Defense community suggests that affordability assessment and determination are joint endeavors beyond the capability of a single program manager with affordability analyses approved at the appropriate level based on the program’s proposed or actual level of oversight.

The Department of Defense takes a deliberate approach to shaping program-specific affordability goals, caps, and constraints. The first step in framing affordability considerations is the program-specific affordability analysis. In the article Affordability Analysis for DARPA Programs, Kroshl and Pandolfini, researchers with the Johns Hopkins Applied Physics Laboratory, reemphasize the importance of affordability analysis in “understanding the

investments and the payoffs for all types of projects. To that end, competing claims on a shrinking defense budget means that not every idea, no matter how technically sound, can be developed” (2000, p. 438). Affordability analysis establishes the realm of capability possibilities based on cost, technology, and schedule parameters. The process begins with an identified warfighting capability gap, an influential senior leader sponsor, and Department of Defense validation that something, whether materiel or non-materiel solution, is required to close the gap.

Confidence in a program’s current and future affordability is realized when the Component commits to making funds available for the life cycle of the program. Acquisition policy, in accordance with interim Department of Defense Instruction 5000.02, Enclosure 10, paragraph 2f. directs that:

“at milestone reviews and for the Full Rate Production or Full Deployment Decision reviews, the Component must fully fund the program to the Component Cost Position in the current Future Years Defense Program, or commit to full funding of the cost position in the next Future Years Defense Program, with identification of specific offsets to address any funding shortfalls that may exist in the current Future Years Defense Program” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017, p. 135).

If certification of affordability and the associated commitment to funding the program is not obtained, there may be significant concerns about the long-term affordability of the program.

Subsequently, “a program may initially appear affordable, but if cost growth exceeds the perceived benefits, effectiveness

objectives cannot be achieved, or the capability becomes less important to the Department of Defense, resource allocators may be unwilling to devote the funds required to execute the program” (Porter et al., 2015, p. 3).

### **Affordability Analysis**

The interim Department of Defense Instruction 5000.02, Paragraph 5d(3)(b)2a, directs the presentation of an affordability analysis and proposed affordability goals:

“based on the resources that are projected to be available to the DoD Component in the portfolio(s) or mission area(s) associated with the program under consideration. Affordability analysis seeks to prevent starting or continuing programs that cannot be produced and supported within reasonable expectations for future budgets”

(Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017, p. 20).

Affordability analysis identifies projected cost and schedule risks but cannot with any degree of certainty predict changes in operational or strategic requirements over the life cycle of the proposed program. In years of fiscal uncertainty, a program manager’s reasonable expectation for a future budget may differ widely from that of a pentagon insider. The directive mandates that affordability analysis:

“will be supported by a quantitative assessment of all the programs in the prospective program’s portfolio that demonstrates the ability of the Component’s estimated budgets to fund the new program

over its planned life cycle” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017, pp. 20-21).

Analysis of the breadth and depth required by the directive is outside of the program manager’s direct control and requires support from the Department’s requirements and resourcing organizations. The affordability analysis is, in its essence, a broad estimate of projected costs based on the assessment of current and future threats, the state of technology, strategic objectives, and program office assumptions. Affordability analysis facilitates “ongoing communication with the requirements community on the cost and risk implications of capability requirements” (Office of the Under Secretary of Defense for Acquisition, Logistics, and Technology, 2017, p. 126). The Department of Defense acquisition community acknowledges affordability analysis, including the independent government cost estimates and engineering trades, as the critical first step in the Component’s development of affordability goals for unit production and future sustainment costs.

More-often-than-not, the question of affordability is directed at the program manager of an assigned program. While the program manager is responsible for the total life cycle cost of executing an assigned program, it is necessary to note that in accordance with the interim Department of Defense Instruction 5000.02, Enclosure 8, paragraph 2, “affordability analysis is a DoD Component leadership responsibility that should involve the Component’s programming, resource planning, requirements, intelligence, and acquisition communities” (Office of the Under Secretary of Defense for Acquisition, Logistics, and Technology, 2017 p. 126).

The 2010 Better Buying Power memorandum, published under the direction of the Honorable Ashton Carter, established two data requirements as early affordability indicators.

The first was the requirement to:

“present a formal systems engineering tradeoff analysis at Milestone B showing how cost varies as the major design parameters and time to complete are varied. The intent was to inform early decisions and actions to drive costs down without sacrificing critical capabilities. The second requirement was for program managers of major programs to conduct and present Should Cost analyses to justify program element costs and improvement over time when compared to relevant benchmarks for value” (Carter, 2010, p. 2).

If the answer to the affordability question was intended as a binary response, the 2017 publication of the interim Department of Defense Instruction 5000.02, Enclosure 8, paragraph 2e, opened the door to subjectivity. The language:

“when approved affordability constraints cannot be met, even with aggressive cost control and reduction approaches, then technical requirements, schedule, and required quantities must be revisited. If constraints still cannot be met, and the Component cannot afford to raise the program’s affordability cap(s) by lowering constraints elsewhere and obtaining Milestone Decision Authority approval, then the program will be cancelled” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2017,

p. 127).

The language transforms a once binary response into an if-then proposition with dire consequences if the Component cannot arrive at a favorable affordability decision. The language empowered Component Acquisition Executives and Milestone Decision Authorities to realign portfolio dollars, make appropriate engineering trades, and adjust affordability caps to achieve program affordability. This gives the impression that affordability caps are adjustable and therefore relatively subjective.

### **Affordability Constraints**

Affordability assessments and constraints are based on the “most accurate and timely assessment of resources that will be available in the program’s portfolio for 30 to 40 years” (Department of Defense, 2016, p. 20). Affordability constraints serve multiple purposes in cost management. The constraints define the objective (desired) and threshold (do-not-exceed) goals for program life cycle costs, “force prioritization of requirements, drive performance and cost trades, and ensure that unaffordable programs do not enter the acquisition process” (Department of Defense, 2016, p. 5). Affordability constraints are derived from the outputs of the detailed affordability analysis. The intent of affordability constraints is to “promote responsible and sustainable investment decisions by examining the likely long-range implications of capability requirements choices and investment decisions... before substantial resources are committed to a program” (Office of the Under Secretary of Defense for Acquisition, Logistics, and Technology, 2017, p. 126). Senior leaders of the Department of Defense prescribe affordability constraints in a top-down manner considering the resources a Component can allocate for a system and its competing fiscal demands. The constraints prescribed to the Component are flowed to the program manager in a formal acquisition decision memorandum that establishes thresholds that

cannot be exceeded without specific authority. “Affordability constraints force the Component to reconsider requirements, quantities, or even the program’s existence when the constraints cannot be met or raised” (Ohlandt, 2013, p. 5). Institute for Defense Analyses researchers attribute the Army G-8 with defining affordability constraints.

Affordability constraints are defined as:

“life-cycle cost goals and caps dictated by affordability analysis as determined in a top-down manner based on the resources the Army can allocate for an acquisition program given the priority of the capability provided, inventory objectives and required deployment schedule- not by program cost estimates. When approved affordability constraints cannot be met, technical requirements, schedule, and required quantities must be revisited” (Goeller, Horowitz, Ward, Wu, and Davis, 2016, p. 29).

### **Affordability Goals**

Affordability goals are the Department of Defense’s desired life cycle cost to acquire and sustain a warfighting capability.

“The concept of setting program affordability targets [goals] as a requirement is closely related to the concept of Cost as an Independent Variable introduced by the Honorable Paul Kaminski, Under Secretary of Defense for Acquisition, Technology, and Logistics, in the early 1990s” (Porter et al., 2015, p. 4).

The concept was championed by the Honorable Kaminski as the Department of Defense’s implementation of best commercial practices and means to achieve reduce life cycle costs.

Affordability goals set early cost objectives and highlight the potential need for tradeoffs within a program, and affordability caps set the level beyond which actions must be taken, such as reducing costs. Affordability goals are formally assigned to a program in the form of an acquisition program baseline approved by the responsible Milestone Decision Authority.

An acquisition program's goals for life cycle cost, schedule, and performance, measured in threshold and objective values, are codified in its acquisition program baseline. In short, "the acquisition program baseline is a convenient summary of the most important aspects of a program and provides a useful tool for management to assess how well a program is progressing towards its stated objectives" (Brown, 2010, p. 51). The acquisition program baseline is the current effective measure of a program manager's skill at executing a program within approved parameters, but does not consider prioritization, resourcing, or other decisions made at levels above the Component Acquisition Executive. "Affordability goals and caps established early in a program will only be relevant so long as the framing assumptions under which they were established continue to hold" (Kneece, Jr. et al., 2014, p. vii).

#### **Phase 4: Consistency or Inconsistency of Application**

According to research published by the Institute for Defense Analyses in 2015, all Services recognize the need to prioritize affordability when considering the initiation of acquisition programs. Whether this is in strict adherence to the Department of Defense's Better Buying Power initiatives or a strategy to position programs favorably in the eyes of defense appropriators is a question open for debate. Despite the rationale, the Institute for Defense Analyses' research determined considerable variation and maturity in the approaches used. "Generally, it was found that the U.S. Navy and U.S. Air Force had more mature methodologies than the U.S. Army and U.S. Marine Corps" (Porter et al., 2015, p. v).

There is a noted high degree of variability in the Services' approach to interpreting the tenets of affordability requirements and policy. The variations in approach are evident in the presentation of differing metrics and methods of computation that drive inconsistent decisions at the Department of Defense-level. It is also noted that "each Component determines the processes and analytic techniques used for affordability analysis within the basic parameters described" in law, policy, and guidance" (AcqNotes, 2018a).

Ohlandt (2013, p. 4) advises that "there are many techniques that have the potential to better estimate costs, to drive costs down, and to make products and services more affordable". "The Department of Defense's recognized cost estimating methodologies are analogy, parametric, and engineering build-up" (Mislick and Nussbaum, 2015, p. 49). The techniques provide cost estimators the discretion to use the methodology self-determined to be most appropriate thus subjecting a degree of variability into the cost estimating process. To achieve the same or similar cost estimating outcomes, the facts, assumptions, and methodology must be shared with, and agreed-to, by all parties involved in determining the validity of the cost estimate. According to Mislick and Nussbaum, "a good cost estimate can be validated by independent means, is within estimating/modeling accuracy, and traceable, auditable, able to be recreated from the bases of estimates, and explainable" (2015, p. 49). Finally, Mislick and Nussbaum advise that "we are lucky when they [management, program, and business leaders] read the executive summary of cost estimating documentation. Rarely does the audience read the entire details of cost estimates" (2015, p. 49). Department of Defense leadership cannot accurately and consistently assess program affordability given the Component's ability to select from and implement the various techniques and metrics to assess how it is measured.

### **Analysis and Findings**

The data collected in the conduct of this research leads to the conclusion that “affordability is a program characteristic that strategically balances cost, performance, schedule, and risk throughout the acquisition life cycle” (Randall and Nowicki, 2014, p. 1). The words in the various definitions of affordability are different but, in context, consistent with the definition offered by the Honorable Ashton Carter in 2010. Affordability, at the root level, is “conducting a program at a cost constrained by the maximum resources the Department can allocate for that capability” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2010, p. 2). The phrase “conducting a program at a cost constrained by the maximum resources the Department can allocate for that capability” (Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, 2010, p. 2) is vague since the Department can realign resources to meet any capability requirement given sufficient need and consequence of not delivering the capability.

The data retrieved in this research effort indicate that the assessment of affordability is dependent upon a variety of internal and external factors. The program manager can assess affordability in terms of managing a program against resources allocated in the Future Years Defense Program. The program manager cannot reasonably exercise control over resources not yet allocated, programmed, or otherwise designated for the execution of a program.

A consistent theme runs through the data despite the organization or researcher of presentation. Affordability is an abstract term that most people think they understand, have difficulty defining or explaining, and yet the Department of Defense requires program managers to “address affordability, detail constraints, and achieve affordability without providing a definition or even a clear idea of what affordability means” (Redman, 2012, p. 376).

Evidence exists to suggest that Department of Defense efforts to develop and sustain affordable acquisition programs have been ongoing since the 1960s. Yet, according to the Institute for Defense Analyses, “the Department of Defense still lacks coherent, disciplined processes for assessing affordability and making appropriate and timely adjustments to ensure a more affordable investment program” (Porter et al., 2015, p. vi).

The Institute for Defense Analyses also opines that affordability is a multi-faceted issue, not a characteristic for which analysis can provide a yes or no answer. Given sufficient priority, the Department of Defense can make any acquisition program affordable if it is technically in the realm of possible (Porter et al., 2015, p. 3). If one accepts the Institute for Defense Analyses’ assertion as truth, then one should consider that affordability is also related to perceived cost-effectiveness, the defense budget, and other factors that are outside of the control of the program manager. Subsequently, “when a program is declared “unaffordable,” what is really meant is that the program is not (or is no longer) of sufficient priority to justify its cost” (Porter et al., 2015, p. 3).

### **Prioritization**

“Many potential programs are “important” by themselves, but priorities are established beyond the program at the Component level, given missions and other needs” (Ohlandt, 2013, p. 6). The National Defense Strategy provides the high-level context for national objectives and the desired strategic-level outcomes for the Department of Defense. Programs that can demonstrate a direct capability linkage for achieving those strategic outcomes are generally considered priority programs and the front-runners for resourcing. Should the Department of Defense need to reallocate funding to meet strategic objectives, non-priority programs are reviewed to determine if, or where, the required funds might be realigned without impacting the

budgetary top line. Realignment of Department of Defense dollars from non-priority programs could have the unintended effect of causing programs to become unaffordable without adjustments to requirements or quantities. An excerpt from the 2018 Summary of the National Defense Strategy gives insight into the Department of Defense's acquisition objectives supporting the Build a More Lethal Force line of effort. It reads...

**“Modernize key capabilities.** We cannot expect success fighting tomorrow's conflicts with yesterday's weapons or equipment. To address the scope and pace of our competitors' and adversaries' ambitions and capabilities, we must invest in modernization of key capabilities through sustained, predictable budgets. The 2018 National Defense Strategy underpins our planned fiscal year 2019-2023 budgets, accelerating our modernization programs and devoting additional resources in a sustained effort to solidify our competitive advantage” (Mattis, 2018, p. 6).

### **Cost-Effectiveness**

Cost-effectiveness, or the perception thereof, is a significant contributor to obtaining a favorable affordability decision. The Department of Defense routinely uses the terms cost-effective and cost-effectiveness to inform affordability decisions. The broad interpretation of the terms renders both more subjective than objective without implementing quantitative metrics to bound its many interpretations.

Cost-effective is defined by the Merriam-Webster Dictionary as “producing good results without costing a lot of money” (Merriam-Webster, n.d.-b). The Cambridge Dictionary defines cost-effective as “good value for the amount of money paid” (Cambridge University

Press, 2020b). Throughout the course of this research, a Department of Defense definition of cost effective could not be found despite numerous hours of searching specific to the search term. The Department of Defense employs the concept of cost-benefit analysis to ascertain if a system's cost is affordable, consistent with the DoD Component's and DoD's overall long-range investment and force structure plans. The U.S. Army Cost Benefit Analysis Guide Cost (2018) describes the process of how the Army conducts cost benefit analyses. A definition of cost-effectiveness derived from the U.S. Army Cost Benefit Analysis Guide Cost (2018) is the benefit must balance or outweigh the cost and required tradeoffs. The Army, as represented in the Cost Benefit Analysis Guidebook (2018, p. 13), considers the resulting analysis a:

“decision support tool that documents the predicted effect of actions under consideration, defines a solution to achieve specific Army objectives by quantifying potential financial impacts and business benefits, and reduces or eliminates a capability gap”.

In the end, the cost benefit analysis informs senior leader decisions but does not alleviate the need for strategic insights, adaptability, and continuous management. The cost benefit analysis is subject to interpretation at the various levels of review and therefore more valuable as a subjective data source than an objective data source.

The Institute for Defense Analyses concludes in its 2015 report that programs adjudicated as not cost-effective will not compete well against more favorably viewed programs for the declining pool of Department of Defense resources (Porter et al., 2015, p. 3). A program that does not adequately demonstrate and sustain a suitable capability to total life cycle cost will find its priority with senior leaders diminished and its support for obtaining required resources

limited. Something that warrants repeating is that according to research conducted by the Institute for Defense Analyses:

“a program may initially appear affordable, but if costs grow to a point where they appear to outweigh the benefits or if the original effectiveness objectives cannot be achieved or become less important to the Department of Defense, then cost-effectiveness may decrease to a point where resource allocators are unwilling to devote the funds required to execute the program. In a sense, it becomes unaffordable” (Porter et al., 2015, p. 3).

### **The Program Manager’s Dilemma**

In application, the program manager or Milestone Decision Authority justifies affordability to Department of Defense and Component senior leaders. In theory and, in accordance with policy and guidance, Department of Defense and Component senior leaders determine affordability. All too often, “responsibility for addressing affordability within the Services tends to reside in the programming community with only varying levels of participation by the acquisition community” (Porter et al., 2015, p. v ). Ultimately, the program manager is held responsible and accountable for program affordability. It is a perceived cycle that begins and ends with the program manager. In most cases, the variables affecting strategic-level affordability decisions are far outside of the program manager’s, and sometimes, the Milestone Decision Authority’s sphere of influence and level of authority. The program manager plays a key role in establishing affordability metrics, goals, and constraints, but does not have significant influence on affordability caps set at the Department of Defense-level. The program manager is responsible for demonstrating affordability at prescribed points in time and for executing a

program within approved constraints. Given the data, who is responsible for determining affordability?

The current version of the Defense Acquisition Guidebook, Chapter 1, paragraph 4.2.15.1.2 is clear in that:

“while affordability analysis is the responsibility of Component leadership, the acquisition community (including the program manager) plays a role in informing decision makers of the practical implications (e.g., risks and realities from cost, schedule, technology, engineering, and interoperability perspectives) as tradeoffs are considered and made. This includes the magnitude of uncertainties and associated implications of setting affordability goals at or near current cost estimates” (Defense Acquisition University, n.d.)

Component Acquisition Executives and Milestone Decision Authorities experience a similar dilemma to that of program managers. They are responsible and accountable for program affordability with varying degrees of control of the critical Department of Defense-level objectives. Although responsible, Component Acquisition Executive and Milestone Decision Authority decision-making is disadvantaged further because they cannot holistically address affordability as part of the milestone review process without expert knowledge of overall Department of Defense strategies, capability, and fiscal trade space considerations. The data collected during the 2015 Institute for Defense Analyses’ research effort suggests that the Military Services share this conclusion and acknowledge that responsibility for affordability analyses is inherently shared with the Service programming communities (Porter et al., 2015,

p. vi).

Program managers execute acquisition programs based on funds that are likely available in the Future Years Defense Program, a five-year plan. When asked if their programs are affordable, program managers should, by regulatory guidance, be answering in terms of dollars and manpower likely to be available in future years, total costs of ownership, and affordability over a 30 to 40-year anticipated life cycle (Office of the Under Secretary of Defense for Acquisition and Sustainment, Change 2, Enclosure 1, 2018, p. 5). Additionally, programs are “constrained by the maximum resources the Department can allocate for that capability” (Office of the Under Secretary of Defense for Acquisition and Sustainment, 2010, p. 2). How can a program manager account for the maximum resources the Department could allocate for any specific capability when resources can be reallocated based on a wide variety of factors?

The current Department of Defense view of affordability is very subjective, broadly defined, and impacted by numerous variables that are controlled at echelons above the responsible program manager. In the end, affordability is relative to a point in time based on fluid budgetary constraints.

### **Recommendations**

There are many Department of Defense-accepted definitions of affordability. Data suggests that none provide a means to objectively define affordability nor what metrics are used consistently to measure it. Tuttle and Bobinis (2012, p. 2) suggest that:

Honorable “Ashton Carter’s definition of affordability is satisfied if a single solution can be found that satisfies all the constraints (e.g., capability, performance, cost, and schedule). Further, the Defense

Acquisition Guidebook definition does include “the degree to which...”

but does not provide guidance as to how to measure degree”.

Given the broad nature of the affordability definitions, for example, from the Defense Acquisition Guidebook... the “degree to which capability benefits provided by a weapon system are worth the system’s total life-cycle acquisition, operating and support costs” (2012, p. 92) and from the BBP memorandum definition: ... “constrained by the maximum resources the Department can allocate for that capability” (2013, p. 2), what metrics might a program manager use to answer the affordability question?

There have been many attempts in research and practice to bound the definition of affordability within the Department of Defense. The recommendations presented in this research validate and build upon the recommendations of previous research with the goal of enabling program managers to objectively determine program affordability. Data suggests that the root of the problem lies in the perception that affordability, as currently defined by Department of Defense, is too subjective to provide program managers a means to adequately assess total lifecycle affordability. Program managers, although responsible and accountable, may not be equipped to provide a true, data-driven answer to the question of affordability.

This research effort provides two recommendations that, if considered or studied further, may minimize the variability in assessing affordability across the Department of Defense. The recommendations are predicated on consolidating the diverse definitions of affordability into a singular Department of Defense-accepted definition. The definition should be based on a consistent set of objective metrics and methodologies codified in policy.

**Recommendation 1: Objectively Define Affordability.** If, as the data suggests, “affordability analysis and constraints have become a central part of life-cycle investment analysis, decision

making, and management in the Department of Defense” (Ohlandt, 2013, p. 8), then the Department of Defense must establish objective metrics to define what it means to be affordable. The Department of Defense should define affordability in terms that program managers can use to measure program performance. Recommend Component leadership, not the acquisition community or program management, take the lead role for conducting affordability analyses with support and inputs from the respective functional area subject-matter-experts.

A proposed definition of affordability is the costs for acquiring the capability complies with 10 U.S.C., Sections 2366a, 2366b, and 2448a where applicable; total ownership costs, when considering requirements and risk, are within established Department of Defense affordability goals; and consistent program funding is projected given the Component’s priorities and resource limitations. The proposed definition incorporates elements of the various affordability considerations and prompts program managers to holistically assess the intent of affordability.

**Recommendation 2: Place Responsibility for Answering Affordability Questions on the Appropriate Organizations.** Department of Defense senior leaders must reinforce the idea that affordability assessment and determination is a responsibility bigger than the program manager. Affordability determination is a Component-level responsibility that should involve the Component’s programming, resource planning, requirements, intelligence, and acquisition communities (Ohlandt, 2013, p. 4). There are factors that are outside of the program manager’s purview, such as detailed insight into the Component’s strategic priorities and resource limitations that must be addressed in conjunction with programmatic considerations. If it is the intent of the Department of Defense to cancel programs that are deemed unaffordable, then all responsible organizations must acknowledge their inherent roles and responsibilities with respect to affordability determination and take a seat at the table.

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