

Industrial College of the Armed Forces
National Defense University

Industry Studies Handbook

AGRIBUSINESS
AIRCRAFT
BIOTECHNOLOGY
EDUCATION
ELECTRONICS
ENERGY
ENVIRONMENT
FINANCIAL SERVICES
HEALTH CARE
INFORMATION & COMMUNICATIONS TECHNOLOGY
LAND COMBAT SYSTEMS
MANUFACTURING
NEWS MEDIA
PRIVATIZED MILITARY OPS
RECONSTRUCTION & INFRASTRUCTURE
SHIPBUILDING
SPACE
STRATEGIC MATERIALS
TRANSPORTATION
WEAPONS



Academic Year 2007

Report Documentation Page

*Form Approved
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 2007	2. REPORT TYPE N/A	3. DATES COVERED -	
4. TITLE AND SUBTITLE Industry Studies Handbook		5a. CONTRACT NUMBER	
		5b. GRANT NUMBER	
		5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)		5d. PROJECT NUMBER	
		5e. TASK NUMBER	
		5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Industrial College of the Armed Forces National Defense University Fort Belvoir, VA		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)	
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited			
13. SUPPLEMENTARY NOTES The original document contains color images.			
14. ABSTRACT			
15. SUBJECT TERMS			
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified	
			18. NUMBER OF PAGES 126
			19a. NAME OF RESPONSIBLE PERSON

INDUSTRIAL COLLEGE OF THE ARMED FORCES

**INDUSTRY
STUDIES
HANDBOOK**

ACADEMIC YEAR 2006-2007

This document contains educational material designed to promote discussion among the students of the Industrial College of the Armed Forces. It does not necessarily reflect the views of the Industrial College of the Armed Forces or the Department of Defense.

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1 October 2006

To Industry Study Students and Faculty,

The information contained in this handbook is intended to supplement the teaching material prepared by the faculty for each study group. This handbook is broadly organized as follows:

1. Program introduction, “Why ICAF Conducts Industry Studies”
2. Overview of how ICAF organizes industry studies
3. Student Deliverables related to individual and group reporting requirements
4. Awards related to Industry Studies
5. Field Study Travel Guidelines based on Joint Travel Regulations (JTR), ICAF procedures, tips and collective wisdom
6. Appendix that provides a compendium of reference materials to assist you in developing your own framework for industry analysis, and an
7. Index that provides a way for you to easily locate information contained in the handbook.

Please take the time initially to do an executive read of this handbook, so in the future you will know where to find answers to your questions. In particular, please note the format and organization requirements for the written report and oral briefings. I strongly suggest that you carefully read pages 1 through 17 and pages 19 through 29. If you do this, I am certain many of your questions will be answered. Suggestions to improve this handbook are earnestly solicited, so that future classes may enjoy an "improved version" based on your class's experience. Please email your comments to me at davisf@ndu.edu.

I wish you a challenging and rewarding Industry Study experience. If you have any questions, please do not hesitate to contact me.

Sincerely,

Faye Davis, PhD
Director, Industry Studies Program

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Why ICAF Conducts Industry Studies

The study of the resources component of national security is a major element in the ICAF curriculum; indeed, it emerged from Bernard Baruch's original intent: "I should like to establish a little school ... to keep in touch with industry." Today, maintaining that scholarly link is largely undertaken within the Industry Studies (IS) Program. Through this program, however, ICAF expands upon Baruch's mandate by establishing an analytical framework for you, the student, to use in assessing the state of a selected industrial sector. As a result, you not only learn about an industry in particular, you learn *how* to learn about industry in general.

The purpose of the IS Program is to contribute to the ICAF mission by providing students the opportunity to gain knowledge and experience in analyzing industry from a strategic perspective. The IS Program provides a practical experience, or lab, in analyzing the status of industry. Program objectives are to:

- Evaluate performance of industry in promoting economic welfare and serving national security needs.
- Examine the role of government policy or regulation and its effect on the capacity of industry to contribute to economic welfare and the national security strategy.
- Integrate the essential components of the ICAF core curriculum in an extended laboratory

The IS Program's goal is to provide a program of study and academic framework that enables ICAF students to accomplish the following learning objectives: [LA 1-4]:

- Comprehend the national security implications of the selected industry and assess its ability to meet national security requirements
- Understand the role of government in the selected industry, and how the government (legislative and executive) reaches decisions on the industry
- Develop skills in analyzing an industry or industrial sector that will be useful to a senior executive and strategist in dealing with industry and broadly with national resource issues
- Analyze an important industry or industrial sector of the economy

In order to achieve these learning objectives, each IS seminar is engaged in activities that develop knowledge, skills and abilities in various aspects of the following:

- Understanding the role of government in shaping and regulating the industry to include coordination between various branches of government and the interagency

role of government, who plays and how decisions are made [LA 1-4]

- Evaluating the current conduct, structure and performance of selected industries, including an assessment of their ability to satisfy national security requirements in peace and conflict [LA 1-4]
- Understanding the complex issues involved with maintaining an industrial base capable of providing efficient peacetime production and necessary additions to inventories in emergencies [LA 1-4]
- Analyzing the American and international economic environment within which the selected industries function. This includes the constraints to more efficient production, both in peace and war, as well as a specific evaluation of industrial surge and mobilization potential. In addition, the analyses place special emphasis on industries' reaction to the September 11th attacks, including an examination of the efficacy of subsequent government action to shore-up selected portions of the industrial base [LA 1-4]
- Evaluating the process of defining national security requirements and transmitting these requirements to industry. Analyses pay particular attention to the acquisition system's ability to respond rapidly to emerging commercial technologies of military interest [LA 1-4]
- Analyzing and evaluating the impact on productive capability of current and near-term industrial restructuring trends, including the increasing use of outsourcing and service contractors [LA 1-4]
- Recommending ways to improve efficiency and/or ensure attainment of national security objectives [LA 1-4]

The IS Program is unique to ICAF, and the capstone of the curriculum. Through analysis of industry, students draw on all they have learned throughout the academic year, in all of their core courses and electives. This practical application of economics, national security strategy, military strategy, acquisition, leadership, and more gives each student broad experience in dealing with issues common to all industries.

How ICAF Organizes Industry Studies

Students are organized into 20 Industry Study seminars that examine the industrial sectors considered vital to US national security. Each seminar's study is organized around a series of classroom sessions and field study visits to both domestic and foreign industries that directly support the research and analysis the seminar is conducting.

For the 2007 IS Program, students are divided into 20 seminars concentrating on the following Industry Study areas:

Agribusiness	Aircraft
Biotechnology	Education
Electronics	Energy
Environment	Financial Services
Health Care	Information & Communications Technology
Land Combat Systems	Manufacturing
News Media	Privatized Military Operations
Re-construction & Infrastructure	Shipbuilding
Space	Strategic Materials
Transportation	Weapons

Each seminar's study is organized around a series of classroom seminar sessions: seven full days available for local field studies or extended seminars, a week of domestic field studies, and two weeks of international field studies. The classroom sessions vary in focus and content. The IS faculty team invite industry, government and academic authorities on various aspects of the industry under scrutiny to meet with students in the classroom. Additionally, some of the seminar periods are used for student- or faculty-led discussions to focus the seminar's approach to industry analysis, to clarify or surface issues, and to go on information-gathering visits to local area government agencies, business establishments and other relevant sources.

The field study - to both domestic and foreign industries - is an integral part of the Industry Studies Program. Students visit sites such as prime and subcontractor corporate headquarters, production facilities, government activities, labor union organizations, trade associations, logistics and distribution facilities, financial institutions and research facilities. The field study program provides the laboratory for subjects students will have explored in the classroom with line and staff executives and government experts. It also facilitates observation of functioning managerial processes in operational settings. The international field study adds the dimension of comparative industrial analysis, enabling students to make a realistic assessment of US industry's long-term ability to compete successfully in the global marketplace.

Three products mark the conclusion of the Industry Study Program. Each IS seminar develops a comprehensive Industry Study Report, which includes a 10-page Executive Summary and a series of "issues essays". The latter is derived from the

individual industry issue papers that each seminar member completes. Additionally, every seminar briefs all the other seminars, highlighting critical findings and answering questions. Finally, a formal briefing to invited distinguished guests caps off the IS experience. The report and briefings provide a comprehensive view of the overall status of the focus industries, as well as the policy implications at the executive level. It is important to note at the outset that all reports present industry composite information only; neither company specific nor proprietary information is included.

The Industry Study Seminar Sessions

First Seminar Session

Purpose. To provide an introduction to the purpose, procedures and expected results from industry studies.

Relationship to the course. This session sets the tone for the seminar's efforts and establishes planning goals.

Lesson objectives.

- Introduction of the faculty and students.
- A discussion of the objectives and general methodology of the program.
- Specific instruction on seminar administration and field study procedures.
- Overview of the industry program relative to the ICAF curriculum.
- Statement of specific objectives, expected outcomes and individual and collective responsibilities.

Issues for consideration.

- How best to organize the seminar for success.
- How the available funds will best be utilized to provide for maximum learning.

Subsequent Seminar Sessions

Purpose. To build a body of knowledge and to develop analytic skills.

Content. Subsequent seminars will include:

- Tutorials, process and integration sessions designed to establish a common baseline from which students who have widely diverse backgrounds and interests may successfully proceed with their study.
- Development of an analytical framework and supporting methods that will be used to conduct the Industry Study.

Issues for consideration. Areas of inquiry include, but certainly are not limited to the following:

- What is the impact upon your industry of the changing world events such as the Global War on Terrorism (GWOT) and other global security issues; how effective has been your industry's and the government's response?
- What are the strategies of the industry to remain in the competitive lead (both domestic and international portions) far into the 21st century?
- Perceived strengths and weaknesses in the industrial base; e.g., human resources, raw materials, technology, finance, pacing items.
- Major problems, related goals, and strategies for optimizing performance in the industry under analysis.
- Future trends in the industry under study and the potential contribution of the industry to US national security.
- Problems involved in the peacetime acquisition process, such as burdensome regulations, declining budgets and transition to emergency situations.
- Problems involved in broadening the production base and preparedness planning for war production.
- Mobilization and surge potential and capability to respond to demand or reconstitution.
- Policy options for strengthening the production base and for improving the acquisition system's interface with the base.
- International aspects of the industry and their impact on strategy and decision making. Role of economic, political and social factors.
- Strategic need for increased international trade and the impact of increased international competition.
- Constraints upon international trade and competition including technology transfer policy issues.

Student Deliverables: Industry Study Products (Individual and Group Reporting Requirements)

Individual Paper: Industry Issue Paper

Every student is required to write an 8- to 10-page individual Industry Study issue paper. These papers require a thorough literature search to enable analysis of recent writings on topics of major interest to the industry sector under study. The individual paper is integral to the group's contribution to the body of knowledge on the industry. No one is excused from this effort. Papers are due on **4 April 2007** which is prior to the start of the domestic travel that is scheduled for 9-13 April 2007. The due date is selected intentionally so that each group has students who have researched the major issues facing their industry. Any change to the required due date requires program director approval. [Note: If a student (or students), as part of the IS program, is conducting substantive research resulting in a paper of comparable length for an outside source under the direction of the Industry Study faculty, this effort, with faculty approval, may be substituted for the required paper. See the section on "Industry Study Written Reports" that follows.]

Objective. A primary goal of your year at ICAF is to help you make better decisions and give better national policy advice concerning the resource component of national security. The Industry Study paper is designed to give you an opportunity to practice those strategic thinking skills. Specifically, you will write an Issue Paper on a major policy issue related to the industry you are studying in the Industry Studies Program. In so doing, you will have an opportunity to coalesce your thinking about marketplace and public sector resource allocation in support of national strategy by analyzing a difficult issue facing a segment of the nation's industrial base.

This is also an opportunity to produce high quality, potentially useful advice for senior-level decision makers, in that your ideas may be incorporated in your group's written report that is published on the ICAF website and available throughout the defense community after you graduate.

Finally, this paper is a vehicle to educate yourself on some critical aspect of the industry you are studying before you embark on international field studies. By doing so, you'll enhance your ability to interact with senior officials, domestic and international, in that industry. One way to consider this paper is as a literature search summary of a major issue facing your industry. The summary can then be further updated on the basis of ongoing seminar discussions, field study observations, and focus of your industry analysis.

Guidance. Your Industry Study faculty leader will discuss and/or distribute a list of candidate issues; you have the option of selecting an issue from that list or proposing a different one. For formatting, use the same APA style manual you've used for your other ICAF papers. Above all, you should communicate clearly and effectively. For

clarity, we suggest you consider using subsections that 1) provide a brief background, 2) develop viable alternatives, 3) evaluate options, and 4) build to a policy recommendation with supporting rationale. In bringing to bear your entire year's experience at ICAF, you should ensure that you consider the political, social, economic, and military dimensions of the issue you address.

Finally, do not be unduly concerned if you consider yourself somewhat of a novice in assessing your industry and some critical issue facing it. Newcomers and "outsiders" often see facets of problems that internal "experts" overlook. Above all, make the paper a worthwhile learning experience for yourself and a resource for your seminar's written and oral report. The Lockwood Award (p. 18) will be given to the best individual Industry Study paper.

DUE DATE - APRIL 4, 2007

The Industry Study Reports: Oral and Written

At the conclusion of seminar and field studies, each seminar collectively develops a professional quality briefing and a written report. Together, the briefing and the report provide a comprehensive view of the overall status of the industry studied and the policy implications for the defense executive. Both the written report and the briefings should address:

- Surge and mobilization issues and applicable policy recommendations
- Relevant government policy recommendations to enhance industrial effectiveness
- Assessment of appropriate government acquisition system changes to enhance DOD's ability to acquire and utilize rapidly the latest commercial technologies

Industry Study reporting responsibilities are both individual and collective. Reporting events will be accomplished in the following sequence:

Industry Study Briefings. Industry Study seminars will make professional quality oral presentations to each of the other seminars and to selected distinguished visitors. All presentations will be in the form of a briefing to be given to the Under Secretary of Defense (AT&L). The student seminar leader has full authority and responsibility for developing this presentation under the guidelines contained in this Handbook and with the approval of the faculty. Each briefing is 30 minutes, followed by a 20-minute Q&A period. Each seminar member is expected to present at least one briefing.

The seminar will prepare a written script plus a set of briefing notes for individual briefers to use. Briefers may use either the notes or the script, but the briefing is strictly limited to 30 minutes in order to allow sufficient time for questions and answers. There will be no "travelogue" in the presentation or in the time before or between each presentation. Briefings may include suitable film clips, photos and anecdotes where they enhance the professional quality of the presentation and simultaneously add to the overall

understanding of the material being presented. The bottom line is that the quality and depth of analysis is primary, not the quality or sophistication of the graphics. A detailed briefing schedule will be provided prior to international field studies.

Industry Study Written Reports. Each seminar will prepare a written report that will be "published" on the ICAF website following DoD approval. Responsibility and authority for the seminar's written report rests with the student seminar leader, but the faculty industry lead is the final approval authority. Industry Studies seminars should integrate findings from the program of guest seminars, field studies (both domestic and international) and individual and group research, developing conclusions and recommendations for consideration by appropriate government departments and agencies. The written report will be cleared through OSD for public release.

Industry Study Report Format

ICAF has selected *The Publication Manual of the American Psychological Association*, better known as APA, as a practical format for your academic papers, to include your Industry Study report. There is a copy of this book in each student room, along with *The Brief Handbook*, which also contains abbreviated directions for APA style. (*Note: Follow the templates that are provided in the sample report below for the report's preliminary pages. Use APA for the body text, citations and references.*)

The report will not exceed a maximum of 20 pages. Ten pages are the executive summary; the remaining ten pages include a small series of individual essays addressing major issues facing the industry under study.

Essentially, the report follows APA guidelines, with some exceptions. For example, it is single-spaced (not double-spaced, as APA generally calls for). Also, margins are both right and left justified for text. The page limitation includes text **and** any supplementary endnotes and appendices. It does not include the title page, seminar participants, and the list of places visited or the reference pages. *Please pay particular attention to the format examples that follow and check for completeness of citations.*

Sample cover sheet follows:

**Spring 2007
Industry Study**

**Final Report
*Space Industry***



The Industrial College of the Armed Forces

National Defense University
Fort McNair, Washington, D.C. 20319-5062

Preliminary information pages.

Page i:

- Group name centered at the top of the page (bold, 18 pt)
- Skip one line
- **ABSTRACT:** (bold, 12 pt) Then text (non-bold, 12 pt)
 - Note: an abstract is a 60- to 100-word paragraph that details the bottom line conclusions of the report. This is not a statement of what was studied or the method of analysis. Rather, the idea is to convince the reader to read on by piquing interest in how the study arrived at these conclusions, and how these conclusions are supported with analysis.
- Skip one line, and then list the names of the participants (centered, non-bold, 12 pt)

COL Joseph H. Smith, US Army

Lt Col Mary Jones, US Air Force

Mr. Sam Spade, Dept of State

(Note: spell out civilian agencies, but abbreviate department)

Skip a line before faculty list

Col Thomas Jefferson, US Marine Corps, Faculty

Dr. Samuel F. Adams, Faculty

Page ii:

- At the top of the page, (centered, 12 pt, bold): **PLACES VISITED:**
- Skip a line
- **Domestic:** (bold, 12 pt) List will include Canada visits, unless they are part of international travel
- Skip a line
- **International:** (bold, 12 pt) List company name, city and country

STRATEGIC MATERIALS 2004

ABSTRACT: Strategic materials are those materials and related technologies whose critical function or supply is essential to the economic competitiveness and security of the United States. Emerging materials and technologies are key enablers to military transformation and economic growth. The U.S. needs to continue to fund research and development and create an environment conducive to transitioning research to manufactured products. The Buy America policy needs to be reviewed and the waiver process streamlined. A virtual strategic stockpile needs to be created and rare earth elements considered for stockpiling. The government must vigorously enforce the intellectual property rights of U.S. companies.

LTC David V. Boslego, US Army
LTC Mark K. Davis, US Army
Col Denis Dion, Canadian Forces
Lt Col David J. Doryland, US Air Force
CDR Mark W. Harris, US Navy
CDR Steven B. Hemmrich, US Navy
Ms. Karen A. Hollman, Dept of Air Force
BG Mohd Amir Bin Ishak, Malaysian Army
Ms. Ilse J. Kleiman, Dept of Army
COL Kenneth J. Moran, US Air Force
Mr. James E. Porter, Missile Defense Agency
CAPT Michael L. Seifert, US Navy
Mr. Michael Y. Tang, Dept of Army
Dr. Jeffery D. Teska, Dept of Army
Mr. Mark R. Thornock, Dept of Energy

Dr. Sylvia W. Babus, Faculty
CAPT Tom A. Carlson, US Navy, Faculty
Mr. William F. W. Jones, Faculty

PLACES VISITED

Domestic

US Geological Survey, Reston, VA
Virginia Center for Innovative Technology, Herndon, VA
Naval Research Laboratory, Washington, DC
Army Composite Research Laboratory, Aberdeen, MD
University of Delaware Center for Composite Materials, Newark, DE
Massachusetts Institute of Technology, Institute for Soldier Nanotechnologies,
Cambridge, MA
Foster-Miller, Waltham, MA
Dynamet Technologies, Burlington, MA
St. Gobain Advanced Ceramics and Plastics Research and Development Center,
Northboro, MA
US Army Soldier Systems Center, Natick, MA
Triton Systems, Chelmsford, MA
Hyperion Catalysis, Cambridge, MA

International

ONERA/DSAC, Paris, France
CEA-LETI, Grenoble, France
Tronics Microsystems, Grenoble, France
EADS Corporate Research Center, Munich, Germany
Plansee, Reutte, Austria
NP Aerospace Ltd, Coventry, United Kingdom
Jaguar Cars Ltd, Birmingham, United Kingdom
DSTL, Farnborough, United Kingdom
QinetiQ, Farnborough, United Kingdom
University College of London, London Center for Nanotechnology, United Kingdom

Body of the report.

On the next page, begin the text of the report in APA format. Pages from here on are numbered 1, 2, 3, etc. Each report should include the following components:

- **INTRODUCTION:** A short introduction detailing the purpose of the study and its methodology. Maximum one page.
- **THE INDUSTRY DEFINED:** Using either the classic structure and conduct definition or a technology definition, define, in the most precise terms possible, the industry under study. This portion of the paper should indicate to the reader the scope and bounds of your study. Maximum one page.
- **CURRENT CONDITION:** Using the analysis tools provided in your economics course work, your Industry Analysis services with your Industry Study faculty and this Handbook, as a minimum, describe the recent past and current performance of the industry. We suggest using the following set of data/questions as well as those recommended by your Industry Study Leader.
 - Trends in sales/shipments adjusted for inflation.
 - Are there subsidies, quotas, trade restrictions, calls for protection?
 - What are the trends in productivity? How do they compare to international trends?
 - Is the industry competitive internationally? (Use import and export ratios)
 - How profitable is the industry? Return on assets or net worth.
 - What is the impact of information technology on your industry?
 - If appropriate, what is the impact upon productive capacity within your industry of increased use of outsourcing and reliance upon support contractors?

The bottom line of this section is an assessment of the current condition of the industry and an appraisal of the benefit to the nation of the industry's resulting allocation process. See the industrial analysis portion of this Handbook, Appendix II, pp. 77-82, for specific questions. Maximum three pages.

- **CHALLENGES:** Briefly describe in general detail with examples, the major challenges facing this industry. Indicate which challenges will be addressed more fully in the essay portion of the paper. (Your assessment of the adequacy of the industry's response to these challenges will be addressed in another section of your paper.) Also discuss your industry's reaction to changing world events (e.g.,

September 11th attack) including an examination of the efficacy of any subsequent government action to assist your industry. (About one or two pages)

- **OUTLOOK:** Project the future health of the industry. As a minimum address the following questions:
 - Can the industry under study support the national security resource requirements? What impediments exist preventing the industry from achieving its full surge and mobilization potential?
 - What is the short-term (1-5 years) outlook for the industry? What factors account for your projection?
 - What is the long-term (2008-2025) outlook? Factors?
 - What political and/or social factors impact the industry's short- and long-term outlook?
 - Is your industry positioned to maintain a preeminent position in the global marketplace? If so, why? If not, why not? What are the implications of a non-preeminent position?

This section should close with an assessment of the adequacy of the industry's response to the previously detailed challenges and the appropriateness of the industry's strategy to become or remain a preeminent force in the global marketplace. This section should be no longer than two pages.

- **GOVERNMENT GOALS AND ROLE:** What are the "proper" goals and role of the government relative to your industry? What, if any, response should the government make to your outlook assessment and the industry's strategies? What policy issues are involved including those directed at surge and mobilization? Present and analyze specific recommendations and options including those related to the acquisition system's ability to rapidly acquire needed commercial advanced technological equipment. This section should be no longer than two pages.
- **ESSAYS ON MAJOR ISSUES:** Suggest three or four short essays addressing major issues facing this industry, total not exceeding ten pages. The author's name should appear at the end of each essay. A short title should precede the essay.
- **CONCLUSION:** A maximum one-page summary of the major conclusions of this study. If readers read no more than your abstract and your conclusion, they should understand your major findings and recommendations relative to your industry's ability to support the national security requirements of the United States.

- **REFERENCES:** This is the report section that demands, but rarely receives, a sufficiently dedicated effort by the seminar. Please ensure that all references and data in the report have appropriate citations. Pay particular attention to providing the appropriate page number and volume numbers for journal or periodical article citations. Tables and figures should be identified according to APA. In short, follow the *Publication Manual of the American Psychological Association, 5th Edition*, for all report references and for in-text citations.

Per APA, endnotes may be used to explain or comment on information in your report and should be used to provide references for text in the report. An endnote consists of two linked parts: the note reference mark and the corresponding note text. You can automatically number marks or create your own custom marks. When you add, delete, or move notes that are automatically numbered, Word rennumbers the note reference marks. You can add note text of any length and format note text just as you would any other text.

In summary, this is a generic outline that is to be followed where appropriate and modified as necessary. However, the level of analysis required by the outline must be maintained. Remember: the Industry Study report is an executive summary, not a detailed road map through an industry. The twenty-page maximum (exclusive of title, abstract, authors, places visited and endnote pages) is non-negotiable.

A Suggested Quality Control Checklist for Your Industry Study Report

1. Is your report well written, balanced and suitable for presentation to the Secretary of Defense?
2. Do you provide appropriate citations and references?
3. Does your report analyze your industry in a global context?
4. Do you state and answer the big questions about your industry?
5. Do you include descriptions and industry analysis reflecting both the domestic and foreign visits your group made?
6. Is there a reasonable report balance between description (usually too much) and analysis (usually too little)?
7. Do you address the national security implications of your industry's current and future condition?
8. Are your policy recommendations realistic and achievable within our system of government?

Administrative Requirements

Each seminar will provide their Industry Study faculty and Industry Studies (IS) Program Director (Dr. Faye Davis) an electronic copy of the written report, the briefing script and/or the briefing notes, consistent with the following timeline:

DUE DATES:

- May 18, 2007: Email report to faculty and the IS Program Director
- May 21, 2007: Email briefings w/either script or notes to faculty
- June 2, 2007: Email the publication-ready copy of the report, the briefing and briefing script and/or notes to the Industry Studies Program Director

Industry Study Awards

The Antonelli Award

The Association of the Industrial College of the Armed Forces established the Major General Theodore Antonelli Award for Industry Study Excellence in 1993. The award annually honors the Industry Study seminar whose written executive summary and oral presentation best represent the high standards of the Industrial College in this endeavor.

The award is presented at the awards assembly at the end of the academic year. The selection committee, chaired by the Director of the Industry Studies Program, views all oral presentations and reviews all executive summaries that have been nominated by the faculty leaders. Award criteria are based on the guidance contained in this Handbook and the standard of excellence reflected in the industry analysis. In general, the greatest weight is assigned to the written report.

The selected seminar's name and the year of award are engraved on the Antonelli Plaque, which is permanently displayed at the Industrial College.

The Lockwood Award

The Lockwood Award is an endowed award sponsored by the Association For Intelligence Officers (AFIO) and recognizes the best individual Industry Study issues paper. The award is named in honor of Mr. Earl Forrest "Frosty" Lockwood, co-founder and former Chairman, President and CEO of Betac International Corporation, a systems engineering and information technology services firm that specialized in providing a wide range of systems integration, counterintelligence, and counterterrorism solutions to the Intelligence Community.

Each Industry Study group's faculty will nominate the best paper from that group as a candidate for the AFIO Intelligence Scholarship Foundation's Earl Forrest Lockwood Award. A panel of faculty judges will select the winning paper from the candidates nominated. This award includes a plaque and a set of books or a bond. The award will be announced at the ICAF Awards Ceremony in June.

Travel Guidelines, Information, and Tips

Please remember that our field studies hosts are expending considerable time, energy and money on our behalf. We need to be regarded always as gracious and grateful guests so that those who follow us will be welcomed back.

- **Conduct:** At all times, conduct is to be professional. This includes site visits, travel to and between sites, and off-duty hours. The faculty leader, regardless of rank or position, is the person in charge of all aspects of field study and has the full authority of the Commandant to ensure a successful field study experience.
- **Non-attribution:** The ICAF non-attribution policy applies to field studies as well as classroom seminars and Baruch presentations.
- **Schedule:** Domestic travel is currently scheduled for 9-13 April; international travel from 30 April-11 May.
- **International Travel Visits:** As a matter of policy, ICAF groups will not travel to countries listed on the State Department Current Travel Warning List.
- **Orders:** Every Industry Study seminar member will travel on official travel orders for the period January through June 2007.
- **Group vs. Individual Travel:** NDU policy requires that all students travel to and from their study travel destinations with their study group. The Commandant must approve any deviations. Requests for exceptions should go to the Commandant thru the appropriate IS faculty leader, the IS Director, and the Dean of Students.

Experience Teaches:

- Travel light. You must be able to carry your own baggage. If you cannot carry your baggage quickly up the three flights of stairs at ICAF, you'll never catch the train at Stuttgart station. Remember, the people you visit today do not know what you wore yesterday.
- Lock up valuables in hotel safes.
- Xerox all important documents (passport, credit cards, etc.); leave a copy at home and take one with you in a bag other than your wallet or purse.
- Travel in groups at night; stay off back streets and away from dark areas.
- Vary your daily routine.
- Run or jog with a buddy.
- Leave your expensive watch and jewelry at home - take your cheapo watch.
- Carry your blue passport if you have one, even if you are traveling with a red or black passport or on NATO travel orders. You may run into a situation in which you do not want to be identified as military or government.
- Do not carry any more cash than you can afford to lose; use your government credit card for cash from ATMs in country.
- If you need to carry electric hairdryers, shavers, etc., remember to determine if

you need a current converter or plug adapter for the country you will be visiting. Most hotels catering to North Americans have 60-cycle, 115-volt outlets. Even China has hair dryers in most hotels.

- Try to blend in. Of course, this may be a challenge for most of you in China, Hong Kong or Korea. Still, no cowboy hats, big buckles or signs that say I'm a rich American - help yourself.
- **Spouse Travel:** NDU policy prohibits spouses and family members accompanying or meeting students and faculty members on field studies. This policy is strictly enforced and exists to eliminate any possible perceptions that field studies are not a full-time, professional endeavor.
- **Sports Equipment:** NDU policy prohibits carrying golf clubs and other obvious sports equipment on field studies. If you want to play golf, pack your shoes and rent clubs at the course.
- **Travel Documentation:** The Foreign Country Clearance Guide (DOD 4500.45 series) maintained by the Air Force contains the definitive information as to what travel documents are required: passports, shot cards, etc. Generally, civilians must travel with an official (red) passport. Military will travel with NATO travel orders or with a red passport if required. NATO travel orders will be issued for each seminar visiting NATO countries. The Guide is located in the NDU Travel Office, Room 210A in Marshall Hall with a non-official copy in Room 210, Eisenhower Hall. The per diem rate guide is also at the same locations. Additionally the per diem rates may be found on the Internet at <https://secureapp2.hgda.pentagon.mil/perdiem/> and the JTR at <https://secureapp2.hgda.pentagon.mil/perdiem/trvregs.html>.
- **Government Travel Cards:** All travelers (except industry and international students) should possess a government VISA card. Department of Defense policy stipulates that DoD personnel use the VISA Government Card to pay for all costs incidental to official business travel, including travel advances, lodging, transportation, rental cars, meals and other incidental expenses. If you are one of the few who have not yet applied for the card, you may pick up an application for the VISA card at the RMD Office, Marshall Hall, Room 210C. Ms. Kathy Chittams is the POC, (202) 685-3907. More information on travel charge cards may be found at <http://www.govexec.com/dailyfed/0300/030100kl.htm>. Know your PIN and try out your card before you travel. The ATM around the corner from the post gas station takes the VISA card. Note that use of government VISA cards provides some insurance coverage for accidents and baggage loss. Industry Fellows should make reimbursement arrangements with their companies. International Fellows and other foreign students will be issued appropriate travel advances upon request through their faculty leader.

Your total government card charge limit is \$5000, plus an ATM withdrawal limit of \$2000. If, however, you do encounter a payment problem when checking out of a hotel on travel, we recommend that you simply give the clerk a personal card -- never

leave home without one. If you have any questions, please let your faculty lead know ASAP.

- **Security Clearances:** Obtain security clearance information from the NDU Security Office in Marshall Hall. This information may be required to gain admittance to host facilities. Advanced planning is often necessary. Passing security clearances: please refer to the NDU Handbook for the policy and procedures for sending security clearances.
- **Anti-Terrorism Training:** DoD Instruction 2000.16 requires annual Anti-Terrorism (AT) awareness training (no later than 12 months prior to overseas departure) for all OCONUS-based DoD personnel, all Active uniformed members of the combat commanders and Services, all CONUS-based DoD personnel eligible for official OCONUS travel on Government orders, and all CONUS-based personnel if the CONUS terrorism threat level is promulgated above "MODERATE." The current on-line training is designed to fulfill that requirement for uniformed service members and government employees. The Level One Anti-Terrorism/Force Protection Computer-Based Testing website is linked to NDU's home page. Faculty and students are able to complete the mandatory AT/FP training before traveling overseas from the convenience of their desktop computers.

The website can also be accessed at www.at-awareness.org. The current access code is - *aware*. If that doesn't work, the current code may be obtained from the NDU Security Department at 685-3834. If there are any questions, please contact Joe Pallanez, Chief of Security at 685-3835 or Anthony Brown, Physical Security Superintendent at 685-3032.

Upon completing the training, the program will issue a certification of completion and certificate number. E-mail the certificate to "Security" (pallanezj@ndu.edu). A copy of the certificate will be documented in your security file and tracked in a separate database. Also please advise Theresa Smith, ICAF Travel Coordinator, at (smitht24@ndu.edu) that you have completed the training, so she can complete the record at ICAF.

- **Travel Advisories:** Even in times of relative stability, it is important to keep a weather eye out on the countries you plan to visit. As a minimum, we suggest you or one of your group regularly check the following State Department travel advisory website for the latest information: <http://travel.state.gov>. For those groups going to areas of potential problem, we suggest you also do a regular check of the classified country report in the NDU Classified Library.
- **Carlson Wagonlit:** All travel arrangements must be made through Carlson Travel and will be managed by the Industry Study faculty.
- **Electronic Ticket (E-ticket) Advisory:** IS travel uses e-tickets, period. In most cases airlines now charge a fee for issuance of paper tickets. Travelers who select paper

tickets over e-tickets will be responsible to the airlines for the paper ticket fee. Further, the traveler will be charged a fee when the commercial travel office must issue a miscellaneous charge order for the issuance of a paper ticket. The exception is when the cost associated with the issuance of a paper ticket is reimbursable in accordance with the Joint Federal Travel Regulations (JFTR) and the Joint Travel Regulations (JTR), such as when the airline must issue a paper ticket because of a computer failure.

- **MILAIR:** Opportune MILAIR lifts may be used to defer travel expenses.
- **Airline Upgrades:** Airline tickets issued by Carlson are group tickets, even though they appear to be individual tickets. Any changes to the tickets and seat selections must be coordinated through the faculty leader. An individual change may result in cancellation or unintended changes to all the other tickets. In the event upgrades are obtained, we suggest that if there is not a sufficient number for the entire seminar, place the names of all the students in the hat and draw for upgrade assignments.
- **Premium Class Air Travel:** It is government policy that coach (economy) class travel accommodations will be used for all passenger transportation for official government travel. Premium class accommodations must be made and authorized in advance of the actual travel. The Executive Secretary, Office of the Secretary of Defense and Defense Agencies is the authorizing/approving authority for first-class air travel. Authority to authorize/approve business-class air travel is delegated to two-star level general/flag officers (ICAF Commandant). Please review the JTR/JFTR at <http://www.dtic.mil/perdiem/pdrates.html> for additional details.
- **Rental Cars and Insurance:** The government contracted rental car rate includes insurance as long as the company subscribes to the Military Traffic Management Command (MTMC) rental car agreement. All of the major companies -- Hertz, Budget, Avis, etc. - subscribe, as long as you don't end up with Happy Joe's \$1-a-Day. The government-contracted rate may very well be higher than that quoted by the rental car company, on their website, advertised on TV, etc. -- that is not unusual. The government looks at many issues when negotiating contracts -- lowest cost is not always the result -- you probably have seen this with airfare in the past. All drivers should be reimbursed fully for their rental cars as long as you make arrangements thru Carlson. If you deal directly with a rental car company, you have to make sure they understand you are a government employee and require the government rate (which includes insurance).

Travelers are not reimbursed for rental car insurance coverage purchased in the United States or its territories and possessions regardless of the vendor from whom the rental car is rented. Travelers are reimbursed for mandatory rental car insurance coverage required in foreign countries. When a compact rental car (the "standard" for TDY travel) does not meet requirements, the faculty leader may authorize the size vehicle appropriate to the mission. Claims for damage to rental vehicles while being used for official business are reimbursable to the traveler or the rental car company, as

appropriate, as miscellaneous transportation expenses if adjudicated as payable under the procedures set forth in the *DoD Financial Management Regulation* (Volume 9, Chapter 4) (found at the following website: <http://www.dtic.mil/comptroller/fmr/>) (or appropriate Service regulations for the non-DoD Services). Reimbursement for personal funds for damage sustained by a rented automobile while being used on other than official business is not authorized.

- **Medical:**

- Shots: The NDU physician will make shots available to those groups traveling to destinations requiring immunizations.
- Travel medicine kits: Kits for either US or foreign travel are available from the NDU Health & Fitness office.
- If you wear contacts or glasses, take a backup pair of glasses.
- If you take medicine daily, carry enough for the full trip in the original container. Do not wait until the night before the trip to refill your prescription.

- **Hotel Safety:** Joint Travel Regulations (JTR) Volume 2, paragraph C-1059, which applies only to civilians, strongly encourages use of only "fire safe public accommodations" - that is, hotels with sprinklers, smoke detectors and fire alarms. Personnel making hotel reservations should make a reasonable effort to ensure that all berthing facilities are indeed fire safe. This concern should also be extended to military personnel, who are apparently more fire-resistant than their civilian counterparts are.

- **Dress:** Professional attire (coat and tie for gentlemen; comparable attire for ladies), including ICAF nametag, is required for all official visits. Although "dress professionally" is the rule, wear shoes you can walk and stand in all day. When in doubt, leave your leather soled shoes at home and wear/carry rubber soled shoes.

The faculty leader may relax the professional attire rule during travel and when the seminar is not being met by a company or host government. Additionally, relaxed dress may be worn if the seminar is on a Normandy staff ride, touring a coalmine, etc.

- **Laundry:** The cost incurred during TDY travel for personal laundry/dry-cleaning and pressing of clothing is not a separately reimbursable expense for OCONUS travel and is part of the incidental expense allowance included within the per diem rates authorized for OCONUS travel. Here's the scoop from the Joint Federal Travel Regulations (JFTR),

Joint Federal Travel Regulations (JFTR), Volume 1 (Military):

CHAPTER 4 - TEMPORARY DUTY TRAVEL TDY

PART F: MISCELLANEOUS REIMBURSABLE EXPENSES
U4520 MISCELLANEOUS EXPENSES

The cost incurred during TDY travel (not after returning to PDS) for personal laundry/dry-cleaning and pressing of clothing, up to an average of \$2 per day, is a separately reimbursable travel expense in addition to per diem/AEA when travel within CONUS requires at least seven consecutive nights TDY lodging in CONUS. The cost incurred during TDY travel for personal laundry/dry-cleaning and pressing of clothing is not a separately reimbursable expense for travel OCONUS and is part of the incidental expense allowance included within the per diem rates/AEA authorized/approved for travel OCONUS.

Joint Travel Regulations QTR), Volume 2 (Civilians):

CHAPTER 4 - TRAVEL OF EMPLOYEES

PART L: PER DIEM ALLOWANCES

C4553 PER DIEM COMPUTATION FOR OFFICIAL TRAVEL UNDER THE
LODGINGS PLUS SYSTEM

C. Per Diem Allowance Elements

2. Meals and Incidental Expenses (M&IE) Allowance.

The cost for laundry, dry cleaning and pressing of clothing is a separately reimbursable expense in addition to per diem/AEA when travel is within CONUS and requires at least 4 consecutive nights TDY/PCS lodging in CONUS. The cost for laundry, dry cleaning and pressing of clothing is not separately reimbursable travel expense for travel OCONUS and is included as a reimbursable expense within the AEA authorized/approved for travel OCONUS.

- **Meals:** Meals received from hosts -- usually lunch -- must be deducted from each traveler's travel claim for that day. The faculty leader will determine the "deductibility" of such meals. Meals received from a host must be entered on block 3 of the travel voucher (DD1351-2). Complimentary meals from a hotel need not be deducted.

The following was received from NDU legal regarding meals provided on travel:

"In response to your student's question regarding the procedures used by ICAF Industry Studies to ensure compliance with the requirements of the JFTR and the JTR deductible meals rules:

While it can be argued that the applicable provisions of these regulations are less than clearly written, the basic rules remain the same under your fact pattern. Paragraph U4165 (and its companion C4554) do not expressly address meals during Industry Study trips by hosts as "deductible meals". However, meals provided by a defense contractor do not fall within the definition of "nondeductible meals" found in paragraph U4167 (and its companion C4556)". Because of this lapse in coverage, general rules of fiscal and appropriation law apply: the traveler is required to report meals provided at no cost by defense contractors or other hosts and is not entitled to the full per diem for meals on that day. The only exceptions are for meals provided

by the airlines and hotels.

There are many permutations to these regulations as to different sources, etc., and again, it is in artfully written. However, no ICAF traveler wants to be in the position of accepting a full per diem for meals, when they have not had that legitimate expense, without express regulatory authority. It would be hard to argue that the meals provided to ICAF travelers in this situation were a "nondeductible meal" under the applicable JTR and JFTR. We do intend to make the suggestion to the Per Diem Committee that this gap be closed, however it will take some time."

- **Information Security:** As a part of a sound force protection program, personal information should not be disclosed or transmitted by unsecured email. Personal information includes but is not limited to: social security numbers, home addresses, home telephone numbers, credit card information, and travel plans/itinerary.

In addition to security issues, use and handling of personal information is protected under the Privacy Act of 1974.

- **Use of Laptop Computers Overseas:**

1. The toll-free number to NDU does not work from overseas!
2. Telephone connections overseas have different voltages and configurations, which can damage modems in our laptops. Check with the hotel to see if you can get access to a US analog phone jack.
3. From any computer that has access to the Internet, you can access your email. For varying fees, you can check out the local Internet cafe by the hotel and access your email by going to this address: <https://webmail.ndu.edu>. (NOTE: use https://, not http://) From there, log on with your user name and password. Be sure to close your browser (Explorer) after you log out.
4. All our laptop power supplies can handle the following: 90- to 240-volt and 50- or 60-cycle AC. This covers most all power sources worldwide. HOWEVER, the plug that you plug into the wall (local power source) on the power supply is a US standard power plug. We do not supply the adapter/converter to allow this plug to be used overseas. You can pick up a set of these adapter/converter plugs from your local Radio Shack or travel store. When traveling, make sure that you do not let the laptop out of your control. A recent scam at airports is cutting ahead of a person that has put a laptop through the security scanner and picking up the laptop before its owner comes through the security check.

- **Personal Phone Calls Policy:** A number of questions have arisen about reimbursement for "personal" phone calls while on Industry Field Study. The policy simply stated is

this: ICAF will not, as a matter of course, reimburse or authorize personal calls in accordance with JTR (C4706). Our 24-hour admin watch has been set up to handle the conditions described in C4706. The admin watch should receive the first call to the US from the faculty when an emergency exists, so that all appropriate people may be notified and action taken. In the event of unusual circumstances, the Industry Study faculty leader has the local authority to authorize official call reimbursement on a case-by-case basis when the need arises. Official calls are authorized by the IS travel orders. Bottom line: It is usually cheapest to purchase a phone card at your travel location.

- **Mementos:** When funding is available, each seminar will be provided with mementos (to be determined) that bear the college logo. These items are for official use to be given to our hosts as a small token of thanks for our visits. In addition, thank-you certificates may be obtained from the ICAF Operations website for our hosts. Folders for these certificates are available from the IS Program Office.
- **Gifts, Free Lunches, etc:** Receiving an item or lunch from any of our hosts gratis in CONUS is not usually a problem, especially when visiting defense contractors (since none will likely be offered). Other hosts, particularly overseas hosts, may not understand the rules and that the seminar is receiving per diem and would prefer to pay for their meals. If, however, all reasonable and gracious attempts fail, accept with grace if to do otherwise would embarrass the US Government. The current limit on the value of gifts received from sources outside the government is \$20. In any case, always document on the Report of Gratuities what has been received in terms of meals and items. Gifts to the College -- such as aircraft models, plaques, etc. -- must be turned over to the Industry Studies Director.
- **Thank You Letters:** Letters for the Commandant's signature must be initiated as soon as domestic and international travel is completed. This vital social grace is tracked to ensure all seminars send timely letters. Thank you letters to companies/activities are prepared by Jeanine Haran, Room 210, with your input. One comprehensive thank you letter from the Commandant should go to the CEO or other high-ranking member of the firm or agency. This letter may as a courtesy mention all those who helped to make the visit a success and/or to recognize the point of contact who arranged the visit details. If the IS leader wants to send additional thank you letters on ICAF letterhead to specific individuals other than the CEO, they should be prepared and signed out at the IS team level by the lead faculty.

Avoid Travel Claim Processing Problems (Manual/Non-DTS):

1. Need to specify who *and how much* for official calls and/or Internet access amount QTR /JFTR T4060-B5)
2. Receipts - all claims \$75.00 or more, AND all hotel
3. Convert currencies to US \$
 - a. Too much rounding - if possible, use at least 3 digits to right of decimal.

- b. Do not use hotel rate - use official rate of exchange from credible source. DFAS uses 5 digits.
 - c. Recommended site - (<http://www.oanda.com/convert/classic>) use Credit Card Rate (+2%) from interbank rate.
4. Settlement forms (DD 1351-2)
- a. Ensure block 20/21 are signed and dated and not by the same individual.
 - b. Use current DD Form 1351-2 (one submitted dated July 04) - use either Form
Flow RMD website: <http://ndunet.ndu.edu/rmd/rmd00.html> (travel/travel forms {Adobe or Form Flow}).
 - c. Check for DD Form 1351-2 missing data - grade, SSN, zip codes, etc.
 - d. Ensure reviewer pays attention to expenses and does not do split disbursement.
5. When two students occupy a room, either get the hotel to split the bill or make copies and have each student claim half. Also, include the name of the other occupant on the hotel receipt. Not following this procedure causes rates to exceed per diem, slows the process, and causes problems with standardizing rates within the group.
6. Individual travel vouchers should be faxed to DFAS at (317) 510-3997. Never use staples to hold receipts onto page. Please tape all receipts to a sheet of paper, copy it, and then fax the information to DFAS. Package group vouchers; submit to Teresa Smith, Room 210, 685-4782, for quality control and subsequent forwarding to DFAS.
7. Don't send extraneous documentation (i.e., itinerary, receipts under \$75)
8. Paid for extra nights due to early check-in.
9. Errors in direct deposit forms – complete a SF Form 1199A and include a copy of a voided check.
10. Have cover sheet for each group - group roster - annotate who didn't travel and who will be submitted in a separate batch.
11. Put the vouchers in same order as TO/cover sheet.
12. Reimbursable Expenses:
- a. Specify max amount per bag for tip (nominally -\$2.00/bag is what DFAS uses). Individuals should claim their own tips (do not consolidate).
 - b. Do not include claims for bar, laundry, VAT (value added taxes), pay TV, or meals (breakfast, room service, water, etc.) in claim for hotel reimbursement (basic hotel cost). These items should be claimed under other expenses.
 - c. List airport transportation expenses (parking, taxis, etc.).
 - d. Note whether or not VAT is included in stated rate - normally broken out at bottom of receipt - not in addition to stated rate.
 - e. Be specific in reimbursable expenses (what is "cultural events" or "gratuities" – to whom, for what).
 - f. Do not claim medical expenses.
 - g. Be sure credits (VAT exempt) were not deducted from room charges and caused over reporting of room costs.

More General Travel Claim Processing (Manual/Non-DTS):

When the group returns from any travel requiring a travel claim, please have all claims completed with the IS faculty leader signing block 21a of all the claims. The claims should then be turned in as a complete package to Teresa Smith, Room 210, 685-4782, who will forward them to RMD for shipment to DFAS. Please ensure claims are complete and accurate, and comply with the instructions. DFAS may simply return incomplete claims without action.

Do not use block 22 of the DD Form 1351-2 for comments explaining expenses claimed. This block is reserved for the accounting classification data. Block 29 is the Remarks section. Group faculty leaders signing in block 21a as Approving Officer on DD Form 1351-2 -- please ensure you sign both copies of the voucher, not just the top copy.

All travel claims must be submitted with the original and one copy of all documents. It is very important in the event that a voucher is lost, students need to retain a copy of their voucher for their own records, RMD does not keep copies of vouchers.

DD Form 1351-2, Travel Voucher
DD Form 1610 & amendments, Travel Order
Invitational Travel Orders for International Fellows
All required receipts (lodging, rental car, other expenses over \$75)

If airline/rail tickets were purchased on individual travel cards (rather than the corporate card as is standard), include the ticket stub or Carlson Itinerary and claim the charge on the voucher. If airline/rail tickets were purchased on the corporate card, do not claim charges for the ticket on the voucher. Include the ticket stubs and Carlson Itinerary separately in the total group package.

- **Electronic Funds Transfer (EFT):** Since the end of December 2000, DFAS will not process travel payments for anyone not signed up for direct deposit. They will return the claim voucher to the traveler. Although individuals, usually civilians, may have direct deposit for their pay, that is handled through their parent organization, which is usually not DFAS. If they submit a travel claim through NDU and have not signed up for direct deposit of travel payments, DFAS will remit payment via manual check, and then mail, which may take up to 10 business days. The easiest solution to this problem is simply to attach a voided personal check to the first travel claim you submit here at ICAF.
- Travelers should complete section 1 and 2 of SF 1199A (available on FormFlow) and attach a voided check or deposit slip for the account they want the EFT established with. This should be submitted with their first travel claim. Individuals should not submit the SF 1199A in advance of travel -- DFAS will not process it.

- **Recall Bill:** Prior to commencement of any travel, each Industry Studies seminar will provide the Director of Operations a complete seminar itinerary showing dates, times, locations, phone numbers, POCs, hotels, etc. Additionally, the latest emergency contacts with phone numbers for each traveler should also be provided.
- **myPay Voucher Status:** Government employees may access the myPay website to view travel pay history and check the status of voucher payments.

Appendices

Industry Analysis: A Reference Compendium

This reference section is intended to supplement the materials, instruction and insights you received in previous Terms and those you are currently receiving. The tools provided in this reference are far from comprehensive. They have been tailored to be those deemed most helpful during your industry studies. However, the specific tools you and your study group will use to analyze your industry must be crafted by you to suit the industry under study. There is no one-size-fits-all set available. The information provided has been drawn from a wide variety of sources. It is intended to complement your entire course of study.

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Appendix I-A

Markets, Competition and Industrial Analysis: Modern Views in a New Economy

Gerald Berg, August 2002

I. Introduction

The MIT Dictionary of Modern Economics defines “market,” as

“(g)enerally, any context in which the sale and purchase of goods and services takes place . . . (and for which t)here need be no (corresponding) physical entity . . .” (MIT, 1993)

According to this definition, a market includes all offerings and transactions of goods and services regardless of form and place. These offerings subsume all that can be called “competition,” which is vital to the economy’s efficiency and prosperity. For this reason, markets are crucial to an efficient economic system. Understanding them is essential to understanding the economy.

Because of their importance and complexity, researchers have studied markets for about as long as they have studied economies. A difficulty in understanding markets is that they change constantly as the economy changes. New technologies, cheaper transportation, easier communications, network industries, expanded international trade, and the growth of services have all changed the fundamental nature of competition.

In this paper, I survey the modern literature on markets and competition. I review experts’ opinions about conditions affecting competition, the means by which economic agents compete, the effects of competition, how the economy has changed, and the implications for industrial analysis and strategic thinking.

Why Analyze Markets?

We analyze markets in order to know what conditions are likely to produce desired results and what policies are likely to be beneficial. Conditions that affect results include endowments of nature, technology, laws and governance, business practices, and the strategies of those active in the market. The “results” of the market, or “market performance,” include the benefits and costs to all affected parties.

This knowledge of market causes and effects is vital to understanding the economy and essential information to any policy maker or strategic planner. Those charged with managing the nation’s resources to advance the national will must understand markets in order to know when and how to manage them and when to leave them alone. An example of the value of economics in national strategy is provided by the Cold War. Many analysts credit the West’s stronger economy for victory. Some believe

that it was a deliberate policy of the Reagan Administration to engage in an expensive arms race to drive the Soviet Unions' fragile economy to destruction. Strong markets were the weapon of choice in a successful campaign against an "evil empire."

The world petroleum market provides another example. In the 1970s and at times since, many observers feared that the United States and other industrialized nations were becoming dependent on a dwindling world supply of fossil fuels that was and would continue to be controlled by a cartel of major exporters. An understanding of markets alleviates a good deal of the anxiety. First, markets facilitate a deft adaptation to incipient "shortages." Higher prices encourage conservation in consumption, expansion of output, and expansive searches for new sources of supply and substitutes. In addition, the cartel of petroleum exporters, OPEC, which produced a daily average of 23.3 million barrels of crude petroleum in 2001 or 30 percent of world output and a much higher percentage of world exports, is subject to the same strains as any cartel.¹ The nations in the cartel, now numbering eleven, vary in their costs of production and their need for revenues. Each has an incentive to exceed its production quotas. Exceeding the quota is hard to detect in the short run and hard to punish if detected. It is especially hard to punish if multiple members exceed their quotas at once, which has often happened. Agreements to limit production and raise price quickly break down under the powerful force of competition among suppliers in spite of the enormous joint benefits of cooperation.

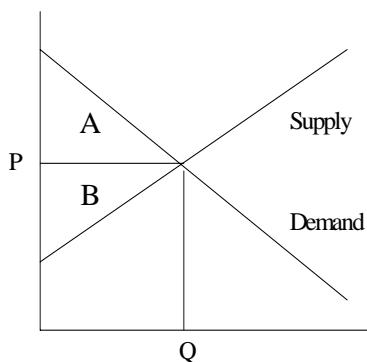
Armed with an understanding of markets, the strategic thinker is far more effective.

Market Performance

The "performance" of a market is the net value it generates. More net value — better performance. Net value is the collective benefits above costs generated for consumers and suppliers in the market, absent any external effects.²

¹Source: U.S. DOD, Energy Information Administration. OPEC, the Organization of Petroleum Exporting Countries, includes Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the United Arab Emirates, and Venezuela.

²In the short run and apart from any effects external to the market, the net benefits are the sum of net benefits to consumers, area A in the diagram below (the area below the demand curve and above price), and benefits to producers, area B (the area below price and above the market supply curve. "External effects," or "externalities," are benefits or costs affecting persons who are not a party to a transaction.



In most practical evaluations, supplier benefits are disregarded. Although not justifiable conceptually, this omission is made for two very practical reasons. The first is that benefits to consumers and suppliers are partially offsetting in the sense that each is partly at the expense of the other. Adding to this, consumer surplus is generally regarded as more important than profits and far more difficult to measure. Consequently, analysts often take high profitability as an indication that consumer surplus is lower than it could be. With some irony, profitability is considered more valuable as an indirect indicator of consumer benefits not obtained than as a direct measure of benefits to producers.

The second reason that analysts generally discount benefits to producers is that consumers are rarely strong enough as individual agents in the market or as collusive agents to extract from suppliers greater benefits than would obtain in a competitive market. Consequently, low profitability is not regarded as a concern. When it occurs, it is expected to be eliminated in time by the exit of capital from the market as capital-owners seek better returns in other markets.

Military procurement provides a valuable perspective on this issue and a somewhat contrary view. The rapid draw down of the military since the late 1980s with disproportionately large reductions in procurement has caused many military suppliers to leave military industries or to merge with other suppliers. Depleted numbers of suppliers of these highly capitalized systems has reduced competition to the point that it has become a major concern of those planning for an efficient defense. For many systems and subsystems there are only two active suppliers. For some--aircraft carriers, thermal batteries, specialty fuses—there is only one. Military planners worry about the loss of competitors and recognize that sufficient profits are needed to keep competitors in business. Fearing reductions in competition among prime contractors, DOD blocked the proposed mergers of Lockheed Martin with Northrop Grumman in 1998 and General Dynamics with Newport News in 1999. But blocking a merger does little to maintain competition if both parties are not profitable enough individually to remain in business.

II. Definitions and Meanings

Casual speakers use the words “market” and “industry” nearly interchangeably. Their meanings do overlap, but “industry” more precisely refers to the supply side of the market, to the suppliers and their operations. “Product market” is an antitrust phrase usually meant to focus on the products competing in a market and the geographic area of effective competition. Delineation of the relevant “product market” is often one of the most difficult and contentious parts of the process. Many cases rise or fall on this decision. Similarly in international trade law, the determination of the relevant domestic “like product” is crucial to the evaluation of injury and disposition of a case.

In defining terms, it is important to recognize that there are (at least) two different kinds of definitions. One kind is conceptual, the other discriminating. A discriminating definition distinguishes what is inside the category being described from what is outside it. The MIT Dictionary of Modern Economics definition given at the beginning of this

paper is a conceptual definition. According to it, a “market” is in concept the institutions associated with the purchase or sale of closely competing products or services, actions incident to those sales, and the agents making them. Building a discriminating definition on this concept is a daunting task. What is meant by “closely competing?” How close is close enough? How can competition be measured? Are we concerned with competition among buyers or among sellers or both? What tells us where borders lie between markets?

Traditional Approaches

A traditional approach to defining markets is based on the “law of one price.” Nineteenth century economists Cournot and Jevons used this “law” to define markets. According to the law, two products that directly compete must sell for the same or nearly same price. If they do not, consumers would choose the cheaper one. Competition and arbitrage keep their prices in parity. Similarity of price is therefore an indicator of direct competition. More importantly, dissimilarity of price is a good indicator that two products are not closely competing and not part of the same market (Geroski, 1998).

The law of one price provides an exacting standard that defines industries narrowly. It does not allow for reasonably close competition among differentiated products. Tires, for example, vary a fair amount in quality and price, but perform much the same function. It is also possible that not competing products sell for the same price by coincidence. Still, the law of one price has a good deal of appeal and is sometimes still applied. Products that sell for different prices must be perceived by consumers to be different. Competition among them must be limited.

“Substitutability” is a measurable characteristic that adds precision to the concept “closely competing.” Substitutability in consumption between products is measured with the cross-elasticity of demand, which is the percentage change in quantity demanded of one product that results from 1 percent change in the price of another (Carlton and Perloff, p. 165). Formally,

$$\epsilon_{ab} = (\delta Q_a / \delta p_b) / (p_b / Q_a),$$

where ϵ_{ab} is the cross-elasticity of demand for product A with respect to the price of B,
 Q_a is the income-compensated demand for product A, and
 p_b is the price of product B.

The higher is the elasticity, ϵ_{ab} , the more readily consumers substitute one product for the other as their relative prices change. How high the elasticity must be for two products to be considered part of the same market is a matter of judgment. There is no obvious threshold.

Antitrust Product Markets

Since late in the 19th century, the United States has instituted four major antitrust laws and a spate of modifications. The Sherman Act of 1890 addresses the creation or use of monopoly power and collusion by rivals. The Clayton Act, 1914, built on the Sherman Act by prohibiting price discrimination,³ tying,⁴ and exclusive dealing⁵ that tended to be anti-competitive and limiting stock acquisitions by rivals and interlocking directorates. The Federal Trade Commission Act, 1914, outlawed “unfair methods of competition,” notably exclusionary practices. The Celler-Kefauver Act, 1950, limited mergers. (Posner 1976, Carlton and Perloff, pp. 601-606.)

The purpose of antitrust policy is to promote the welfare of consumers. The strategy for achieving this embodied in the law is to promote competition in all markets. The tactics are to prohibit anticompetitive practices and prevent mergers that would reduce competition. Many high--profile cases pertain to monopoly and monopolization. These include Standard Oil (1911), Alcoa (1945), AT&T (agreement reached in 1982), IBM (suit withdrawn in 1982), and the ongoing case against Microsoft. Being a monopoly is not illegal, but establishing or maintaining one by proscribed means is. The government litigates many more cases against firms in oligopolized industries for alleged collusion than against monopolists. Additionally, a great deal of antitrust activity pertains to prospective mergers. Current law requires firms to notify the government in advance of an intention to merge. The law empowers the government to prevent mergers it believes would be likely substantially to reduce competition in any product market. Government merger determinations are subject to court appeal.

The vigor of U.S. enforcement of antitrust has varied a great deal since institution of the Sherman Act. Owing to changes in public and political opinion and varying interpretations by the courts, the United States experienced relatively lax enforcement, especially of anti-merger policy, prior to 1950, followed by vigorous enforcement from 1950-74, followed by more lax enforcement since then (Mueller, 1997).

A discriminating definition of the market is essential to effective antitrust policy. Antitrust laws govern competition. Competition occurs within markets. The antitrust authorities use the following definition of a product market. The courts have upheld it.

“Absent price discrimination, the (government) will delineate the product market to be (the smallest) product or group of products such that a hypothetical profit-maximizing firm that was (sic) the only present and future seller of those products . . . likely would impose at least a ‘small but significant’ and ‘nontransitory’ increase in price (DOJ, 2002).”

³ “Price discrimination” is selling the same or essentially same product or service to different customers at different prices. A price difference based on a bona fide cost difference is not considered discriminatory.

⁴ “Tying” is linking the sale of one product or service to the sale of another.

⁵ “Exclusive Dealing” is an arrangement in which one agent buys from or sells to only one other agent. For example, a retailer that agrees to sell the output of only one producer is an exclusive dealer.

This definition can apply to any product or service and is directed at the extremely difficult task of establishing a boundary to the market around that product. The definition stipulates that the relevant product market is the smallest product area for which a hypothetical monopolist would charge significantly more than competitive suppliers. Usually, the government considers 5 percent or more to be a “significant(ly)” higher price within the meaning of its definition (DOJ).

The antitrust definition allows for the possibility of overlapping product markets as in Figure 1. As an example, product markets for global positioning system equipment and guided missile parts would both include GPS parts used in guided missiles. Each would also include other products.

Figure 1:
Overlapping
Markets

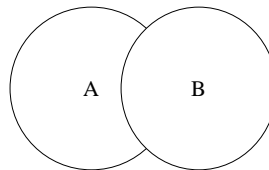
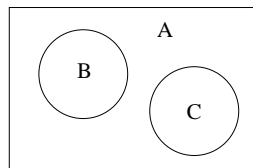


Figure 2:
Market A with
Submarkets B
and C



The antitrust definition also allows for the possibility of narrow product markets nested within broader product markets, depicted in Figure 2. Each such product markets has the same legal status. The Supreme Court established the principle of nested markets long before the current antitrust guidelines were written. In *Brown Shoe vs. the United States* (1962) the Court found that men’s, women’s, and children’s shoes each constitutes a product market within the broader product market of shoes. The Court upheld a lower court’s prohibition of a merger between Brown and Kinney based in part on the analysis of the likely effects of that merger on competition in submarkets (Stelzer, 1981).

Modern Views

Modern views of markets and a useful definition for them reflect in part changes in the economy in recent years and in part a changed understanding of what was already there. There is no widely held alternative definition from what has been described. However, there have been some changes in widely held views of what a market is and

some specific proposals for working definitions. Important modern views about markets include the following.

- (1) Substitutability in supply is much more important than in the traditional view and substitutability in demand less important in defining markets.
- (2) Technology is extremely important in some markets. Rapid changes in technology cause rapid change in these markets.
- (3) Markets are regarded as less likely to share characteristics. As a result, market studies more often focus on individual markets.

Part of the reason for the changing views of markets is a body of analysis put forward mostly in the 1980s of what was called “contestable markets.” This analysis focused on conditions of entry and exit. A contestable market was defined to be one for which entry is free in the sense that entrants bear no disadvantage compared with incumbents and exit is costless in the sense that the economic value of all assets can be fully recovered. According to this analysis, in a contestable market the potential entry of firms outside the market is sufficient to discipline the market and provide for competitive consumer welfare, efficient producers, and the most efficient market structure (Baumol, 1982).

At its peak, the theory of contestable markets rivaled, or perhaps improved, the theory of competitive markets in its application because it offered competitive results with fewer required conditions. In time, analysts came to the view that few markets are contestable within the requirements of the theory since an incumbent’s exit from a market is almost always costly. The image of “hit and run” predators disciplining markets faded and the theory died a quiet death—or at least faded away. But the theory left behind the important legacy that the potential entry of firms outside a market can have a copious pro-competitive effect. Fewness of incumbents in a market does not necessarily imply a lack of competitive discipline. The potential for this effect implies that supply substitutability is a crucial part of market analysis and is an important element in defining markets.

For reasons besides market contestability, some recent researchers have concluded that traditional views are no longer useful for defining markets, especially those driven by technology (Geroski 1998, Pleatsikas and Teece 2001). Geroski observes that there are three kinds of market definitions, those based on “trading markets--” the law of one price and demand substitutability--, antitrust markets, and “strategic markets.” He bases the strategic-market definition on corporate strategy for which it is useful to analyze. It focuses on the supply and supplier characteristics such as economies of scale, technology, identification of rivals, and network and distribution channels. In a similar vein, Pleatsikas and Teece found that technology-driven industries are very different from mature and relatively stable ones and therefore require different analysis. They found that firms in high-tech as compared with traditional industries compete more on the basis of quality, reliability, and service, and less on price, that product differentiation is generally

greater and change more rapid. Because of these distinctions, they argue that the government's antitrust market definition is not useful. Instead monopoly power should be assessed on the basis of efforts at innovation, shifts in market shares and consumer preferences, and pricing responsiveness. Additionally, Geroski and Mata (2001) observe that most modern researchers analyze markets with case studies rather than cross-section analyses of multiple industries contemporaneously.

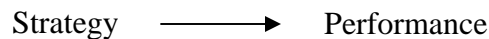
The United States Government, the United Nations, and other governments and organizations have developed systems of classification of economic activity. The traditional U.S. system is the "Standard Industrial Classification" (SIC). The government has recently replaced the SIC with the "North American Industry Classification" (NAICS). The government also uses the internationally based "Harmonized System" to classify exports and imports and to assess import duties. The NAICS system is described in section VI.

III. Market Analysis

There are two basic approaches to analyzing markets. The more traditional approach focuses primarily on market structure to explain firm conduct and structure and conduct to explain market performance. The second approach focuses on strategic behaviors of firms to explain market performance. The first approach is called "structure, conduct, performance (SCP)," generally written:



It is sometimes simplified both in name and substance to "structure, performance." The second approach is called "strategic" or "game theoretic," and might be written as:



The two approaches differ a great deal, but are basically compatible with each other as analytical methods.

Structure, Conduct, Performance

SCP is a descriptive way of organizing information about a market or industry and a paradigm about how one works. Economists developed it in the middle years of the 20th century, a time when markets changed slowly and the technical tools for analyzing them were limited. According to the paradigm, a competitively structured market should lead to competitive conduct by suppliers in terms of pricing, quality, service, and efforts to innovate and to favorable economic performance. Uncompetitive structure could be expected to be less competitive and possibly lead to collusive conduct and poorer

performance.⁶ Market performance was described in section I. Market structure and conduct are described here.

Market Structure

The definition of “market structure,” has drifted over time and is subject to some variation now. A good definition is that “market structure” comprises all conditions affecting the market that are fixed in the short- to medium-run. Because they do not vary, these conditions are said to be “exogenous” or outside the control of agents in the market in this time frame. They include the minimum efficient size of operation (economies of scale), legal restrictions such as patents or regulations affecting competitive behavior, barriers to entry to the market or costs of exit, and the size distribution of buyers and sellers. Some would add to this list product differentiation, meaning the degree to which products competing within the market vary in some characteristics. Wristwatches, for example, vary by quality and somewhat by the functions they perform. Retailers vary by location. A barrier to entry is any condition that imposes additional costs on entrants. Some would define “barrier” to be a cost not incurred and never incurred by incumbents (Carlton and Perloff, p. 77). Barriers include customer loyalty, uncompetitive access to inputs or channels of distribution, minimum efficient firm size, and, with the less stringent interpretation, advantages of learning by doing.⁷

Analysts generally use the size distribution of suppliers in the market as the metric for market structure. This size distribution is most often measured with the four- (C4) or eight-firm (C8) concentration ratio. This “ratio” is the percentage of industry sales or assets accounted for by its largest four or eight firms in a given time period.⁸ These data are published by the U.S. Census Bureau. Market share with respect to sales is most often used. Alternatively, some analysts use the Herfindahl Index (or Hirfindahl-Hirshman Index). The Herfindahl Index is the sum of the squared market shares of firms in the industry.⁹ Conceptually, it is a better measure because it is sensitive to more information and the exact market shares of the largest several firms. Concentration ratios and Herfindahl indexes correlate to a great degree and as a practical matter produce similar results in most studies for which comparison is possible (Carlton and Perloff, pp. 247-250).

It is worth noting that the size distribution of suppliers (or buyers) is probably the least fixed of the conditions that are included in market structure. Indeed, it is likely to be greatly affected over time by other structural conditions, such as barriers to entry and product differentiation, and firm conduct, such as advertising and innovation. This relative variability accounts for some of the difficulty with empirical SCP studies.

⁶ This analysis is based on competition among suppliers. Lack of competition among consumers would also be expected to result in poor market performance.

⁷ For a discussion of barriers to entry, see Agarwal and Gort (2001), Porter (1975), and Bain (1956).

⁸ Mathematically, the concentration ratio is written $\sum S(i) / S$, where summation is over the largest 4 or eight firms and S represents sales or assets. The ratio is usually expressed as a percentage.

⁹ Mathematically, the Herfindahl index is written $\sum S(i)^2$, where S is market share of the ith firm and the summation is over all firms in the industry.

Conduct

Conduct refers to behavioral characteristics of firms that are variable in the short as well as long run. These include pricing, capital investments, research and development and other efforts to innovate, advertising, promotions, differentiation of products, and mergers and acquisitions between firms. The SCP paradigm suggests that market structure greatly affects firm conduct, and the two together determine market performance. For example, in a market for which a firm must be large to be efficient and customer loyalty is high, a firm trying to enter would probably try to do so on a grand scale and promote itself vigorously to win customers. Incumbents might vigorously oppose entry of a new competitor with promotions of their own. Or, depending on costs and the degree of customer loyalty, an incumbent might allow the entry to occur with little opposition and accept a gradual loss of its market share. This would be especially likely in an expanding market.

SCP Studies

Early work by Joe Bain in the 1950s and others was based on cross-sectional studies of industries. He found that highly concentrated industries tend to be more profitable—usually measured by rate of return on invested capital. Researchers found that firms in industries with C4 below 50 percent or C8 below 70 percent generally earned competitive rates of return whereas firms in industries with concentration ratios above these levels generally enjoyed higher than competitive rates of return. These concentration ratios themselves are highly correlated. The logic of this finding seemed clear—concentration has a threshold effect. Below the critical level, firms in the industry compete; above it firms recognize their interdependence and find ways to cooperate rather than compete. The result is higher profits and poorer market performance.

Recent studies have had different results. Most show none or only a weak statistical relationship between high profitability and concentration or other market structure variables. Some argue that the economy has changed, others that the early researchers on this issue used poor statistical techniques to analyze data (Carlton and Perloff, pp. 251-254, 257). This has obtained in spite of persistently high profitability in a number of industries (Mueller 1985, 1997).

There are a number of difficulties with doing SCP studies, some of which apply to all market studies.

- First among these is the difficulty in defining the market under study. If the relevant market is poorly specified, the analysis of pertinent data is likely to be flawed or misleading, as implied in the saying “garbage in—garbage out.” Carlton and Perloff (pp. 249-250) observe that government data might overstate the degree of concentration in a markets by over-aggregating, or understate it by failing to take into consideration effective competition from outside of the defined market.

- A second major difficulty is that in some instances economic theory does not give a clear indication of the direction of causation if it exists. As noted, firm conduct might in the long run alter industry concentration or other structural conditions. Structure might affect conduct as SCP postulates or might be affected by it. That is, in some markets causation between structure and conduct might run in either direction or in both directions simultaneously, a condition called “simultaneous causality” or “simultaneity bias.” If causation runs both ways, the analyst errs in interpreting a statistical relationship as running only from structure to conduct. Similarly, the direction of causality is ambiguous between concentration and profits. High profitability might be a cause of concentration as well as the other way around (Carlton and Perloff, pp. 248-249, 259). Symeonides (2000) studying manufacturing industries in the U.K. for the period 1958 – 77, following the abolition of cartels, found that price competition tended to increase concentration in industries with large sunk costs and in advertising- and R & D-intensive industries. Arbatskaya (2001) studied low-price guarantees as a strategic behavior and found that in some conditions they can deter entry.
- Third, most studies do not take into consideration imports, giving a bias in domestic data towards higher concentration (Carlton and Perloff, p. 250).

• **Strategy, Performance**

The basic paradigm of the strategic market analysis is that the strategies of firms (and possibly consumers) are the dominant force affecting market performance in all of its aspects. An analyst seeking to understand a market should focus on strategy.

It is important to note that the word “strategy” does not mean the same thing to market analysts and game theorists as it does in the national security context. In game theory, “strategy” is any action or plan for action intended to advance a player’s objectives made in consideration of a possible response from a rival with whom there is interdependence. An action taken without consideration of rivals’ response or in the absence of interdependence, as in a perfectly competitive market, is not strategic. As two authors put it:

“Strategic thinking is essentially about your interactions with others . . . (G)ame theory is the science of rational behavior in interactive situations.” (Dixit and Skeath, 1999, p. 3)

The strategic approach to market analysis developed gradually. By the 1980s it had become a major alternative to SCP. Prior to then, most analysis of imperfectly competitive markets was based on “oligopoly models” or specific scenarios posited for markets with few suppliers. These models provided useful insights into how markets work in given conditions. But they were inflexible, with each dependent on a particular set of assumptions. One model answered only a few questions; many were needed. Some of the more important models were based on the following.

- Each firm assumes that rivals will match a price decrease but not a price increase.
- Each firm assumes that its actions will not cause rivals to alter their output levels.
- One firm leads in setting the industry price; others follow.
- Two or more firms try to set the industry price.
- Firms differentiate their products in order to reduce competition.
- The firm or firms in a profitable industry deter entry by setting a sufficiently low price and sacrificing some amount of profitability in the short run.
- Firms in a profitable industry advertise intensively to increase the minimum efficient scale of operation and deter entry.
- Firms maintain excess capacity to deter entry.

And on and on and on and on. Each model allowed for only one set of strategies. Each new possible strategy required a new model. Something more flexible was needed that focused on the multiplicity of possible strategies of competitors and their implications.

Practitioners of what was then an obscure branch of applied mathematics were already developing a body of analysis that would do these exact things. Game theory focuses heavily on the possible strategies of players in a competition and their consequences. Additionally, it is readily adaptable to varying game or competitive conditions. Economists adopted game theory as a means to analyze markets and have contributed copiously to its development in the past quarter century. Additionally in recent years, game theory has drawn from and been applied to other disciplines such as evolutionary biology (Samuelson, 2002).

Games can occur in one time period or many or in an indefinite number of periods, have varying reward systems (zero-sum, not zero sum), sequential or simultaneous play, and have other distinctions. These variations are important, but not for understanding the most important concept and results of game analysis. All games have a basic form and structure, require “play” or decisions by players, and have an outcome dependent on these decisions. There must be interdependence among players, meaning that one player’s actions affect other players. Otherwise it is not a game.

A great deal of the power of game theory as an analytical tool derives from one supreme act of insight made by John Nash over a half century ago. Nash observed that equilibrium in a competitive game is characterized by each player’s strategy being optimal given the strategy of all other players (Dixit and Skeath, p. 82). The reasoning for this is compelling. If one player’s strategy were not optimal, he would change his strategy sooner or later. His new strategy might then cause an opponent’s strategy to become non-optimal and to change in turn. Adjustments would continue until none is needed. When that occurs, the Nash equilibrium, as it has come to be called, is achieved.

The Nash equilibrium tells a great deal with little initial information. Because a competitive system is likely to move to equilibrium and remain there, the players’ initial strategies are not important. The outcome of the game in equilibrium depends on the equilibrium strategies, which can generally be derived from the structure of the game.

It should be noted that, as with many systems, a Nash equilibrium does not necessarily exist for a given game. If it exists it might not be unique. But, these contingencies still provide a great deal of information. For example, a system with no equilibrium is likely to be unstable with respect to players' strategies and the outcome.

For his work, Nash shared the Nobel Memorial Prize in Economic Science in 1994 and had a novel written about his life, which was made into a movie in 2001, "A Beautiful Mind."

Strategy affects markets in two ways. It affects markets directly by affecting how suppliers and sometimes consumers compete and the market equilibrium. Indirectly and more subtly, strategy affects some markets through its effect on market structure. As noted, firms' strategies can alter market concentration over time. Efforts to innovate, for example, can change the products available and the relative efficiency of competitors, both with important implications for market performance.

Kim and Vale (2001) studied the banking industry in Norway. They found that bank branching is a "strategic" behavior of banks. Branching is a form of non-price competition that banks use to increase market share at the expense of rivals, not to increase the overall volume of bank assets. Banks make branching decisions in consideration of the response of rivals. Mathias and Koscianski (1997) found that U.S. titanium producers create excess capacity to deter entry into the market. Matrons (1999) noted that the modern view of market structure is based on the theory of competitive behavior. She found that in the global pharmaceutical industry, endogenous sunk costs have a substantial effect on market structure.

IV. Market Structures

I provide in this section a brief overview of market structures and their implications. A much more detailed treatment can be found in any microeconomics textbook.¹⁰

Perfect Competition

A perfectly competitive market has these four characteristics:

- (1) The product is homogenous.
- (2) All buyers and sellers have all relevant information.
- (3) No buyer or seller is big large enough to affect significantly the market price or other market conditions.
- (4) Entry and exit from the market are unencumbered.

Some would add to these requirements that there are no external effects from the market affecting those not participating in it, such as pollution.

¹⁰ For example, see Baumol, William, and Alan Blinder, Economics/Principles and Policy, Eighth Edition, 1999, New York: Harcourt College Publishers, pp. 189 – 268.

In a competitive market, market demand and supply determine the price. All agents can buy or sell as much as they want at that price. Firms maximize profits by choosing the output level that equates the market price, which is also its marginal revenue, with its marginal cost of supply. If profits are higher than in the economy at large, firms can be expected to enter the market and drive down the price and rate of profitability. If profits are lower, exit will occur, driving prices and profitability up.

Besides the obvious high degree of economic freedom, a competitive market has the desirable characteristic that it tends to generate maximum benefits in the short run in terms of summed consumer and producer benefits.

Monopoly

In a monopoly, there is only one seller. All other characteristics might be the same as in perfect competition. If the monopolist can charge only one price, he, as all suppliers, maximizes profits by choosing the output level that equates marginal revenue with marginal cost. He sets the price by picking a price off the demand curve for his product, the maximum he can charge for his chosen output level. The monopolist is almost certain to charge more and supply less than suppliers in a competitive industry whose collective cost structure is the same as the monopolists.¹¹ This result gives two important effects of monopoly compared with an equivalent competitive industry. First, the monopolist supplies less than the quantity that would maximize net benefits. Because it sets price above marginal cost, the sum of consumer and producer benefits is less than would have obtained with competitive supply. Second, part of the benefits to consumers that would have obtained with a competitive price is transferred to producers in the form of profits. The former effect is an unambiguous loss of value and reduction in market performance, sometimes called an “efficiency” or “deadweight” loss. The latter effect, the transfer from consumers to the monopolist, is not a loss of value if the consumers’ and producers’ welfare are valued equally.

Two other possible effects of monopoly are worth noting. One is that because a monopolist incurs little competition—only that from potential entrants if they exist and producers of substitute goods—it is likely to be inefficient in its internal operations. This is called “X inefficiency.” The other is that a monopolist might have less incentive to innovate or improve its product or provide the best quality it can in whatever form that might take. This failure might be called “complacency.” Examples would be IBM’s lethargy in developing personal computers and Ford’s erstwhile refusal to make Model Ts in any color besides black. However, some analysts disagree. They argue that a monopolist is more likely than competitive suppliers to have the vision, the resources, and the will to be an aggressive innovator (Schumpeter, 1950).

The potential for negative effects has produced a presumption in favor of competition and against monopoly that is the basis for antitrust policy relating to monopoly.

¹¹ This is a rather extreme qualifying condition, but the only one that allows a direct comparison of a competitive market and one monopolized.

This presumption has become more tentative in recent years. One reason is the view of Scumpeter and others that monopoly might facilitate greater research effort and a better organization of resources for the longer term. Another is that monopoly might be the result of a best firm dominating its market through successful competition. This dominance seems especially likely for markets with rapidly changing technology. An example might be Microsoft in personal computer operating systems. The rapid change of technology that makes monopolies in such markets also makes the monopolist's dominance tenuous. Researchers and casual observers have observed this instability. Some have given the name "leapfrogging," to the event of an initially secondary supplier in a market or a supplier not in the market at all developing a better product or process and replacing the leader. An example might be Wal-Mart, which has become the nation's largest retailer. Rosencranz (1997) using a model to study this issue found that in a wide range of circumstances the lower quality suppliers in a market have greater incentive to innovate than the dominant supplier, which tends to produce leapfrogging of leadership.

Further, it is public policy to reward a good innovator with monopoly rights to his innovation for a period of time. This is the reason for the legal sanction of patents with similar justifications for copyrights and trademarks.

Of course, a monopolist need not charge the same price to all customers. Many charge two or more prices for the same or virtually same product or service. If not based on a bona fide cost difference, this practice is called "price discrimination." The practice of price discrimination by monopolies and those possessing a greater or lesser degree of market power has become widespread. Senior citizens' discounts are one example. Highly differentiated airline fares based on nominal distinctions like length of stay at destination are another. In order to discriminate successfully, a supplier must face potential customers with differing willingness to pay, be able to distinguish among them, and be able to charge different prices.

Price discrimination has the effect of transferring additional value from consumers to producers. It also tends to increase the volume of supply, mitigating the efficiency loss. Benefits to suppliers can be considerable. But, the potential for efficiency gain means that the performance of the market overall might not suffer. In fact, those paying the higher price might not be worse off than if the monopolist charged only one price. One place where this shows up is "network industries" in which the value of the product increases with the number of consumers. Network industries are discussed in section V.

Price discrimination, even more than monopoly itself was once viewed with extreme suspicion, prompting Congress to outlaw the practice in the Clayton Act. However, it is now viewed much more benignly by analysts and the courts. In antitrust litigation, the courts now attach a "rule of reason" to price discrimination complaints.

Monopsony

In a monopsony, there is one buyer. It is monopoly in reverse. Instances are rare, but highly significant. They include government purchases of goods and services if it is the only buyer. Abstracting from foreign military sales, the U.S. government is a monopsonist for the purchase of military products.

The analysis of monopsony is nearly identical to that of monopoly in reverse. The lone buyer picks a point on the industry supply curve, the one that maximizes its welfare. In so doing, it extracts value for itself that might have been producer surplus in a competitively purchased market and the overall quantity is lower. There is a transfer of value favoring the consumer and there is a loss of overall net benefits because of the reduction in quantity purchased. Price discrimination by the buyer is not considered a major concern.

Bilateral Monopoly

In a bilateral monopoly, there is one buyer and one seller. The outcome of this market is indeterminate. Price and quantity could end up anywhere in the range from monopoly to monopsony. The result might depend on how skillfully the players bargain. It is possible that the players will agree on the competitive output level, which generates the maximum joint benefits. The military purchase of a weapons system for which there is only one supplier is an example of bilateral monopoly.

Monopolistic Competition

In a monopolistically competitive market, the product is not homogeneous. Each supplier's product or service is less than perfectly substitutable with that of its competitors. Their products are "differentiated." All other conditions are the same as in perfect competition. In this kind of market, suppliers compete, but each has a small amount of monopoly power. An example would be retail pharmacies that are differentiated by location. Many people prefer a conveniently located pharmacy, so location is a significant differentiating characteristic. Another would be the market for clothing, which is differentiated by style, fabric, and quality, although highly competitive. Small price differences do not result in complete shifts in purchases, although some shift is likely to occur.

This kind of market has some of the characteristics of perfect competition and some of monopoly on a small scale. Suppliers compete to a greater or lesser degree and probably drive prices and profits down to near competitive levels. However, firms do have some power to set price, to price above marginal cost, and possibly to price discriminate. Market performance, measured by summed consumer and producer surplus can be nearly as great as under perfect competition. Additionally, the inherent product differentiation might be beneficial to consumers.

Oligopoly

In an oligopoly, there are few suppliers and many buyers. How few? Few enough that at least some of the largest suppliers can affect the market, meaning that they can alter the price for themselves and others by bringing different amounts to sale. A firm's action that alters the market price might cause one or more rivals to react and that reaction will affect the original firm as well as others. The interactive nature of competition in an oligopoly gives firms an incentive to collude to do what is in their collective interest rather than compete. The potential for collusion and the consequent reduction in market performance is a great concern to policy makers and is the motivation for much antitrust law. However, collusion and inferior market performance are far from certain.

Oligopoly is not a single market structure but a category of them. That with the greatest potential for collusion is duopoly—a market with two suppliers. The incumbents need share the benefits of collusion only two ways. In addition, each is as well suited as possible to monitor the other firm's behavior to detect non-collusive behavior and to punish it when it occurs. Another market structure would be three or more large suppliers. Another would be one or two major suppliers with additional small suppliers, sometimes called a “competitive fringe.”

Strategy and conduct vary a great deal among firms in oligopolized markets. A firm might aggressively try to expand sales and market share or try to charge high prices to obtain greater profits in the short run. A firm might try to set the price or accept the price set by rivals; it might price low or maintain excess capacity to deter entry; it might try to develop new technologies or imitate those developed by rivals; it might advertise to create customer loyalty or not; it might compete with quality, customer service, price, or a differentiated product. Each of these strategies has implications and their varied interactions among rivals in a market have implications for market performance.

Much like monopoly, opinions about oligopoly have changed a great deal over time. There is now recognition that the forces for collusion and poor market performance are often more than offset by concomitant competitive forces. This phenomenon is explained in game theory by the “prisoner's dilemma.” The individual firm's (or prisoner's) incentive is to compete, which is directly contrary to the group's interest of restricted output and higher price. The Nash equilibrium is for all firms to compete.

Apart from the strategic implications of the prisoner's dilemma, several competitive forces are at work in an oligopolized industry. In some, technological conditions, such as economies of scale, might have given rise to the market structure. This is the case in many military industries where only a very few efficiently sized suppliers can operate in the market. A second is that in some markets only the most efficient firms are likely to be successful and command large market shares. A third is that the potential entry of firms currently outside the market might have a powerful competitive effect even if they never actually enter—the thesis of contestable markets. A fourth is legal restrictions on collusion, whether overt or tacit.

Cartels

A “cartel” is a collusive association among suppliers within a market. Its purpose is to increase the collective benefits of its members at the expense of consumers by reducing competition.

People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.

--Adam Smith¹²

A cartel can be a formal association with written or oral agreements or an informal one with no direct communication at all. What is important is that its members act cooperatively among themselves rather than competitively. Roughly, the purpose of a cartel is to act as a joint monopoly.¹³

In order for a cartel to be successful, it must:

- (1) comprise firms with a common interest in restricting competition,
- (2) agree on how each will restrict its own competitive behavior, and
- (3) police the agreement by monitoring the behavior of members to detect cheating and punish cheaters.

Item (1) is easy. Firms operating in the same market can increase their collective profitability by cooperating instead of competing. Item (2) can be difficult, especially if firms have different cost structures. Firms with different costs want different outcomes and there is often no obvious or “fair” way to divide the benefits of cooperation. Item (3) is often extremely difficult, especially if there are many firms. It is generally difficult to know who is violating the cartel agreement when it occurs. Even if the violator is known it is difficult to punish him. In many cases, the only real punishment is to respond in kind, which drives price and joint output farther from the cartel’s preferred levels.

Supplier cartels are a special case of what Mancur Olson has called a “distributional coalition.” It is in the individual interest of each member or potential member of such a coalition to compete rather than cooperate, but individual competition is harmful to the group’s collective interest. Because competition or violation of the group’s code is hard to detect and to punish, successful distributional coalitions are far rarer than they are potentially beneficial to their members. Those that form successfully frequently break down in time unless they are enforced by government action (Olson, 1982).

¹² Quoted in Carlton and Perloff, p. 121.

¹³ “Roughly” only because the collective cost structure of firms in a cartel might not be the same as that of a monopolist and the cartel might only partly collude.

Recent Oligopoly Studies

Cooper (1997) developed a model of duopoly price setting with costly information. He found that such markets have a unique equilibrium, which is for one of the firms to acquire pertinent information and set the industry price and for the other to follow the price and invest nothing in information.

Athey and Schmutzler (2001) also developed a model of leaders and followers using game theory with investment as the basis for competition. They found that investment strategies often lead to increasing dominance of the leader, especially if the market is characterized by network effects, learning by doing, or high advertising intensity. In some cases, the follower or “lagger” benefits more from his investment. They found that in some situations investment is a strategic tool in the sense that one firm might invest to decrease the investment of a rival.

Evans and Kessides (1994) did an empirical study of airline pricing. They found that airlines tend to charge higher prices for city-pair routes served by carriers with extensive inter-route contacts. They conclude that airlines that compete in multiple city pairs tend to refrain from aggressive pricing in any one pair for fear of retaliation in another.

Symeonides (2002) developed a model of multi-product firms. He found that if these firms compete by proliferating varieties of products to generate additional sales, collusion among them becomes more difficult and less likely.

Liao and Tauman (2002) modeled a market with competition among multi-product suppliers, each of which offers its products individually or “bundled” as a package. They found that in such an industry an equilibrium always exists and that consumers always select the outcome that maximizes net social benefits. Bundling, Liao and Tauman conclude, is a process that does no harm and might increase efficiency and benefits to consumers.

Jacobs (2001) studied international mergers that create oligopolies. He noted that there was a great increase in international mergers in the late 1990s. Some of these mergers created significant market power or increased existing market power in the global market. Jacobs observed that an important issue pertaining to such mergers is the buyer power they create and the potential to injure competition upstream.

Recent Studies of Corporate Mergers

The U.S. economy has experienced numerous “waves” of corporate mergers, going back a hundred years or more. Some observers have opined that mergers have been corporate America’s response to antitrust laws--that is, their way around the law at any given time. The motives for mergers are controversial. One view is that mergers are intended to increase efficiency and profitability. Another is that mergers are intended to increase profitability, but not necessarily efficiency (Carlton and Perloff, pp. 19 – 22).

Increasing profitability without increasing efficiency might be accomplished by increasing market power in one or more markets. This is the concern of the antitrust authorities. Mueller (1997) argued that mergers are an instrument of empire building by profitable corporations that has little to do with efficiency considerations.

The most recent merger wave, dubbed “merger-mania” by the media, began in the late 1970s and has continued more or less unabated until the present. In a recent study, Rodrigues (2001) found that the incidence of mergers depends on a number of conditions including the expected competitiveness of the market after the merger and the potential to economize on fixed costs. Mergers, he found, affect market concentration, although in different ways.

V. Technology and Network Industries

Nothing characterizes the modern economy more than the application of technology and rapid change. Technology has created important new industries and has changed traditional ones. Modern telecommunications, for example, affects nearly every market. The printing press, invented half a millennium ago was a new technology that revolutionized communications and the ability to store and disseminate information. The industrial revolution, which began in Great Britain in the late 18th century, was based on new technologies in the control of energy, transportation, and machine-based production. The 19th century brought the steam engine, the domestication of electricity, artificial light, elevators, automobiles, the sewing machine, photography, phonographs, telegraphs, telephones, Pasteurization, and much better machines to do just about everything. The early and mid-20th century brought radio, television, refrigerators, air conditioning, xerography, a revolution in synthetic materials and pharmacology, and computers. Still, the rate of technological advancement seems to have quickened in the last 30 years and with it has come many changes in the economy.

Gandal (2001) studied the market for Internet search engines. He found that early entrants, notably Yahoo, still have an advantage, although it has diminished over time. Yahoo’s advantage is based partly on incumbency and partly on its provision of a superior service. Overall, barriers to entry are low in this market and many recent entrants have succeeded. Gandal’s finding is similar to that of Agarwal and Gort (2001), mentioned earlier, that the advantage of first movers has decreased sharply in recent years because of the reduction in first movers’ absolute cost advantage.

Faulhaber and Hagendorn (2000) studied the market structure of broadband telecommunications. They concluded that the growth of the Internet has created a market for a telecommunications network. They found that oligopolistic competition is likely to emerge in this market with demand levels approaching today’s cable television.

Like technology, network industries have existed for a long time. Awareness of them has increased as has their apparent importance in the economy because of synergies of technology. Economidas (1996) defined “network” as being “composed of links that connect nodes (p. 674).” Linkage is the crucial characteristic of any network. The

complementary nature of components within the system is nearly as crucial. Nodes are the means of this connection.

I would define a “network service” as one that provides a connection to an indeterminate number of significant linkages. Because the number is indeterminate, so is the exact nature and value of the service. Examples of network industries include air and rail service, which are linked through hubs, postal and other delivery services, linked through central processing points, the telephone system, and computerized Internet and electronic mail services.

Two important distinctions among kinds of networks can be made. First, network linkages might be strictly connections to supplier services or it might be among consumers as with e-mail and the telephone system. The value of the network to consumers increases with the size of the network; in the case of consumer-based networks it increases with the number of consumers that purchase the service.

The second distinction is between single-node and multiple-node networks. In the latter case, a node might connect with a number of final supply points and also with one or more other nodes, creating a complex system. In the single-node or “simple” network, depicted in Figure 3, the node is indicated by the letter “N.” Lines connecting to it represent linkages. The network depicted in Figure 4 has multiple nodes, indicated by “A,” “B,” and “C.” Lines connecting to each of them are linkages. Anyone connected to A, B, or C at any point is also connected to all other ports connected to any of the three nodes.

The economics of networks is fairly simple according to Economidas’ analysis. The linkages within networks generate positive externalities or “network externalities.” This means that each additional linkage improves the network and therefore increases its potential value to consumers. Economidas describes networks as being comparable in market structure to vertically related industries with a production or consumption externality. This explanation seems to apply most appropriately to complex networks. Economidas shows that perfect competition fails to provide an optimal result in a network industry much as competition fails in the presence of an externality. Competition in a network industry will supply less than the socially optimum quantity of the service. He notes that a monopolist supplying a network service will supply even less than competitive suppliers if it cannot price discriminate. Presumably then, if it can price discriminate, it might supply more and provide a more efficient market than one supplied competitively.

Researchers have found other difficulties with network industries. Kristiansen (1998) found that network externalities might induce firms to introduce incompatible technologies early to protect individual market “turf,” thereby raising overall R & D costs. Firms competing in this way might benefit themselves but increase net social costs by delaying the introduction of compatible technologies. Lafront and Tirole (1998) found that competition among interconnected networks might not have a competitive equilibrium.

Clougherty (2002) studied U.S. airline mergers. He views the air transportation industry as a collection of networks. He concluded that mergers increase efficiency by improving these networks and significantly increase the international competitiveness of the U.S. air transportation industry.

Schmidt (2001) did a similar study of U.S. freight rail rates and came to similar conclusions. He found that large networks under single ownership are very efficient. Inter-line shipments are costly. Consequently, mergers among carriers are often desirable in spite of the resulting increase in overall market power.

VI. The North American Industry Classification System

Beginning in the 1930s, the U.S. Government developed and maintained a system of industrial classification for tracking and analyzing economic activity. The initial system was called the “Standard Industrial Classification” or “SIC.” After adoption of the North American Free Trade Agreement in 1994, the government replaced the SIC with the “North American Industry Classification System,” or “NAICS.” NAICS expanded the scope of the system to the three economies in NAFTA and provided much more explicit coverage of services and newer technologies (U.S. Bureau of the Census).

Some U.S. government agencies and private enterprises still use the SIC. The U.S. Customs Service uses the internationally recognized Harmonized System to track internationally traded goods and services and as the basis for tariffs and other trade policies. Other systems are used by the United Nations and governments around the world.

It is important to note that the NAICS, SIC, and the Harmonized System are all systems of *classification*, not compendia of market or industry definitions. This fact is testimony to the difficulty of usefully defining markets or industries in a consistent way. The government collects supplier data every five years in its Census of Manufacturers and at other times. It classifies data by establishment, not by supplier. Sometimes data from a single establishment are broken down among NAICS codes if all needed information is available and it is appropriate to do so.

Some of the United States industries included in NAICS, that were not included under the SIC are the following:

- Semiconductor machinery manufacturing
- Fiber optic cable manufacturing
- Convenience stores
- Warehouse clubs and superstores
- Satellite telecommunications
- Paging
- Temporary help services
- Telemarketing bureaus

- Hazardous waste collection
- HMO medical centers
- Casinos

Within NAICS, economic activity is classified with six digits. The first two digits represent the broadest industry classification, which the Census Bureau calls “sectors.” The twenty sectors are:

- 11 Agriculture, Forestry, Fishing, and Hunting
- 21 Mining
- 22 Utilities
- 23 Construction
- 31-33 Manufacturing
- 41-43 Wholesale Trade
- 44-46 Retail Trade
- 48-49 Transportation and Warehousing
- 51 Information
- 52 Finance and Insurance
- 53 Real Estate and Rental Leasing
- 54 Professional, Scientific, and Technical Services
- 55 Management of Companies and Enterprises
- 57 Administration Support and Waste Management and Remediation Services
- 61 Educational Services
- 62 Health Care and Social Assistance
- 71 Arts, Entertainment, and Recreation
- 72 Accommodation and Food Services
- 81 Other Services, except public administration
- 91-93 Public Administration

Fifteen of the nineteen nongovernmental sectors are services. The distinction between a service and a physical product does become blurry in some cases. For example, construction is considered a service, but a completed building is not. However, rental of space within a building or its sale is a service. Retail trade is a service regardless of what is being sold. Nevertheless, fifteen of the nineteen classified non-government sectors are services, which about corresponds to the share of value added provided by services industries in the economy. Under the SIC system, the broadest classification included nine nongovernmental divisions. Of these, five and part of another were services.

After the first two, each of the remaining four digits adds progressively more specificity. For example, sector 52 is “finance and insurance.” 523 is “securities, commodity contract, and other financial investments and related activities;” 5231 is “securities and commodity contracts intermediation brokerage;” 52312 is “securities brokerage,” which has no further sub-categorization. 523120 is also listed as “securities brokerage,” and is described as “(E)stablishments primarily engaged in acting as

agents....between buyers and sellers in buying or selling securities on a commission or a transaction fee basis.”

All told NAICS comprises 1,170 industries in a combined North American economy of approximately \$12 trillion (U.S. \$). Dividing, one arrives at an average size of an industry classified in NAICS of about \$10 billion. Many of the industry classifications are fairly broad--broader than under the SIC system which used seven digits and applied only to the United States at a time when its economy was much smaller.

Industries that support the military and specific parts of the military itself are generally much narrower than the most specific classifications for them in NAICS.¹⁴ This lack of specificity means that the extensive data collected by the Census Bureau has limited value to military analysts. NAICS classifications that pertain to industries supporting the military include the following.

- 332995 Aircraft artillery manufacturing
- 336411 Aircraft manufacturing
- 332993 Ammunition (except small arms) manufacturing
- 336992 Guided missiles and space vehicle manufacturing
- 336415 Guided missile parts and space vehicle propulsion unit and propulsion unit parts manufacturing
- 336992 Military armored vehicle, tank, and tank component manufacturing
- 332993 Missile warhead manufacturing
- 332994 Rifle, except recoilless, manufacturing
- 336995 Rifles, recoilless, manufacturing
- 336611 Ships, shipyards, ship repairing
- 332992 Small arms ammunition manufacturing
- 332994 Small arms manufacturing
- 336611 Submarine building
- 336992 Weapons, self-propelled, manufacturing

The military itself is classified in NAICS as follows.

- 982110 National Security
Includes “government establishments of the Armed Forces,” including the Air Force, Army, Marine Corps, Military courts, Military police, Military training schools (except the service academies), the National Guard, and the Navy.

- 611310 Colleges, Universities, and Professional Schools
Includes the military service academies.

¹⁴ These industries might be thought of as the “defense industrial base.” This phrase has been defined various ways reflecting the complexity of a defense sub-economy within the larger economic system. For a discussion see Kyriakopoulos, Irene, and Donald Losman, “Economics of Mobilization in the Information Age.”

926120 Regulation and Administration of Transportation Programs
Includes the U.S. Coast Guard and the Merchant Marine

ICAF and the National Defense University are included in industry
982110.

The Census Bureau NAICS website is naics@census.gov. A website for general information on industrial classifications is <http://faculty.philau.edu/russow1/product.html>.

VII. Conclusion: Analyzing Markets and Industries

A number of conclusions emerge from this analysis. Markets are a valuable concept and vital to understanding the nature and consequences of competition in the economy. They are also imprecise. They are imprecise because no definition gives a clear demarcation of where one industry ends and another begins or how specific they are. And no definition gives a clear indication of who operates within a given market and who does not. Because of this imprecision, markets are difficult to analyze. In addition, the modern economy is one in which change is more rapid, markets are more segmented, and suppliers are more proactive in effecting change than in the past.

In analyzing markets, one is wise to define the question to be answered clearly, use all available pertinent information, and judiciously selects analytical methods. A wise analyst recognizes the limits of market analysis and draws conclusions cautiously.

An important part of ICAF's Industry Studies Program is the analysis of industry performance. A good approach based on the analysis reported in this survey would be the following method in five steps.

Step 1: Define the objective

Identify the characteristics of good performance for the industry. Among them, determine relative importance. A strategic planner might identify different performance characteristics or weigh them differently from an antitrust practitioner or someone else. Desired characteristics might include: (1) large net benefits for consumers, (2) sufficient profitability for suppliers at least to cover their opportunity costs, (3) rapid improvement of products or services, (4) the ability to surge in time of national crisis, and (5) enhancement of the performance of other industries to the extent feasible.

Step 2: Identify important characteristics

Determine the market and the industry, consumers, and suppliers. Determine market structure characteristics and suppliers' conduct and strategies. Determine objective characteristics of market performance such as profitability and the rate of product improvement.

Step 3: Interpret the information

Based on structural and other characteristics, determine the Nash equilibrium for the market. Compare it to actual performance. Determine the cause of market structure and conduct characteristics and their implications. Make reasonable predictions of how the market will perform in the future.

Step 4: Evaluate performance

Evaluate the performance of the industry in terms of how well it meets the characteristics for good industry performance defined in step 1.

Step 5: Consideration of public policy

Based on the evaluation in step 4, your knowledge of the industry, and your knowledge of how markets work, consider possible public policies that might improve industry performance. Assess specific policies and their likely effects. Identify how the industry is currently performing and how that would likely change if a given policy were adopted. Consider costs and possible risks. If you propose a change in policy, explain fully what you expect and why.

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Appendix I-B

METHODOLOGY FOR INDUSTRIAL ANALYSIS FOR ICAF INDUSTRY STUDIES PROGRAM

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I. Introduction

The mission of the Industrial College of the Armed Forces (ICAF) is to educate prospective military and civilian leaders in the formulation and execution of national strategy and the management of resources for that purpose. ICAF's Industry Studies Program contributes to this mission by providing students with in-depth industry knowledge and skills for analyzing industry from a strategic perspective. This document provides a methodology for that analysis.

The industry analysis has two objectives. These are (i) to evaluate the performance of the industry in terms of promoting economic welfare and serving national strategic needs and (ii) to determine what, if any, change in government policy would improve the industry's performance. This methodology provides a basis for achieving these objectives focusing on product markets. Within markets, firms compete and economic benefits obtain. Within markets, government policy towards industry affects economic performance.

Markets, Industries, and the Industry Study

In common discourse, the words "market" and "industry" are used nearly interchangeably. However, there are distinctions between the two that are important for industry analysis. For this purpose, "market" is defined as the institutions and activities associated with buying and selling one or a group of closely competing products or services and the agents that buy and sell them. This definition is general, allowing the analyst discretion to delineate markets in terms of breadth and geography. This generality is endemic to market analysis, notably anti-trust and unfair international trade actions, in which the determination of the relevant "product market" or "like product" often has considerable effect on the outcome of litigation. "Industry" is defined as the suppliers in a specified market.¹⁵

In nearly all cases, an ICAF Industry Study will comprise more than one market and more than one industry. The terms "IS group" or "industry group" might be used to

¹⁵ For more detailed definitions and discussion of these terms see Gerald Berg, 2002, "Markets, Competition, and Industry Analysis: Modern Views in a New Economy," published in ICAF's Economic Notes and in the Industry Studies Handbook.

refer to all of the industries comprised in a given Industry Study. For example, the aircraft Industry Study comprises markets and industries for large commercial jet aircraft, smaller jet aircraft, military aircraft, tankers, airlift, and helicopters, among others.

Information Useful for Industry Analysis

In the course of the Industry Study, students will uncover a great deal of information on their industry. Some will be useful for analyzing the industry including the numbers and sizes of consumers and suppliers, the kinds of goods and services produced and sold, product characteristics and uses, firms' financial histories, methods of competition, the forms and degree of product differentiation, research and development effort, the pace of innovation, cost characteristics of firms in the industry, profitability, stability of incumbent buyers and sellers, exogenous factors that affect competition such as government regulations or barriers to entry, and "business models" or strategies. It will be helpful to keep close track of this information and to analyze their implications.

Example 1—Large Commercial Aircraft

In the global market for large commercial jet aircraft, there are only two competitors, Boeing and Airbus. Economic researchers have found that two competitors might compete as fiercely as in a market with multiple competitors, but might also compete only weakly or even collude.¹⁶

To the extent that two incumbents in a duopoly supply highly similar products, there is potential to compete on price, quality, and service. To the extent that they supply differentiated products that are not highly substitutable in consumption, there is less potential for these forms of competition and greater likelihood that each enjoys substantial market power in its respective submarket. Knowledge of product characteristics and business strategies are helpful in determining how closely they compete.

In the case of Boeing and Airbus, there is substantial, although not perfect, overlap of the kinds of aircraft they supply and missions these aircraft can perform. Boeing and Airbus compete strongly for sales of large commercial aircraft and expend considerable effort to improve their products.¹⁷

Firms' financial statements might be helpful for analyzing their operations and strategies. These statements reveal a great deal about costs, operating margins, methods of financing, and firm strategy. For example, firms with large non-operating costs need substantial margins to cover these costs. Firms that raise large sums of new capital are either investing a great deal in research and development (R & D) or physical capital or are having trouble covering costs from operations. Firms that borrow a great deal, hence are highly leveraged, are putting themselves in riskier positions than those that raise capital by issuing equity. Firms engaging in speculative activities, like developing new technologies, are likely to have limited access to pure loans. As a result, they will

¹⁶ For a discussion of competition with few competitors, see Berg (2002).

¹⁷ For a discussion of the competition between Boeing and Airbus, see ICAF Industry Study Papers 2005, Industry Study Paper, "The Aircraft Industry."

probably have to raise capital by issuing new equity and creating new claimants on any future profits.

Template for Analysis

The methodology presented in this paper can be thought of as a template for industry analysis. It is organized into three broad stages. These stages are (1) determination of the markets in which the IS operates and the means by which competition occurs, (2) assessment of industry performance in each market in terms of economic welfare and propensity to respond favorably in a national emergency, and (3) evaluation of possible changes in public policy. The first stage provides the foundation for the second; the second provides the foundation for the third. Within each stage are several steps. The stages and steps of the methodology are described in the following sections.

II. Markets and Competition

Because nearly all competition among firms occurs within markets, determining the markets in which the IS operates is the first step in analyzing the industry. Once done, the remainder of the industry analysis is based within these markets. The remaining steps in this stage of analysis include determining the economic structure for each market, identifying firms' strategies, and determining the means by which firms and sometimes consumers compete within markets.

Determining Markets

Market determination, or more precisely market delineation, is crucial to all of the analysis that follows. Market delineation has important legal implications as well. In antitrust litigation, the determination of the relevant "product market," can have a critical effect on how a case is decided.

Example 2—Cellophane

In the 1950s, the U.S. government sued DuPont for monopolizing the cellophane product market. Cellophane is a transparent wrapping material that tends to hold its shape and retains moisture and odor. DuPont claimed that cellophane is not a separate product market, but rather a part of a larger product market of flexible wrappers. In a controversial Supreme Court decision, DuPont won its point and the case.¹⁸

Similarly, in international trade litigation, the determination of the domestic "like product" that has standing to petition the government for relief from import competition is often critical to the determination of domestic injury and consequently the disposition of a case. And, in regulated markets, market delineation determines the applicability of regulations and consequently how firms do business.

¹⁸ Crandall, Maureen, 2005, "Antitrust in the Digital Age: an Overview" in ICAF's [Economic Notes](#).

The defining characteristic of a market is the similarity of products marketed within it. Similarity is assessed and sometimes measured by “substitutability,” meaning the degree to which consumers regard one such product for sale as being an acceptable substitute for another or in some cases suppliers regard them as substitutable in supply. In general, products in the same market are highly substitutable; products in different markets are less substitutable.

Consumption Substitutability Quantitatively, consumption substitutability is measured as the relative change in the quantity demanded between two products resulting from a change in their relative prices. Formally, this is called the “cross elasticity of demand” and defined by the equation below.¹⁹

$$\eta_{xy} = \Delta Q_x / Q_x \div \Delta P_y / P_y ,$$

where η_{xy} is the cross elasticity in consumption between goods x and y, $\Delta Q_x / Q_x$ is the percentage change in consumption of good x, and $\Delta P_y / P_y$ is the percentage change in the price of good y.

No one expects you to solve this equation, but it might serve as a useful guide in your analysis.

Production Substitutability Economists refer to this as “transformation” in production. It is generally defined in terms of a firm’s cost of transforming or converting from the supply of one product for another. The “marginal rate of transformation” is quantified as the ratio of the firm’s marginal costs for the two products. There is no formal theory or measure of product supply substitutability for industries.

Example 3—Biotechnology

Biotechnology has been defined as “(A)ny technique that uses a living organism, or parts of organisms, to make or modify products, to improve plants or animals, or to develop microorganisms for specific uses.”²⁰ Techniques or products produced include pharmaceuticals, a variety of other medical devices, improved agricultural seeds and fertilizers, and weapons. These products are not substitutes in consumption. But they are substantially substitutable in production because many were developed and are produced with the same or similar technologies and skills. For this reason, it is reasonable to consider biotechnology an industry.

As a technical guide, you might apply the rule used by the Federal Trade Commission and Department of Justice in U.S. antitrust law.²¹ This rule is that a product market is a product area over which a hypothetical monopolist’s price would be at least 5

¹⁹ Mansfield, Edwin, 1982, *Micro-Economics/theory and Applications*, Fourth Edition, W. W. Norton and Company, New York, p. 119.

²⁰ Office of Technology Assessment, 1991.

²¹ A detailed explanation of market determinations is provided in Berg (2002).

percent higher than the price that competitive firms would charge. In the absence of technical tools to measure this hypothetical price differential, you will have to make an assessment. A market space can be considered a market if there is a high degree of similarity of products and services within it and low degree of similarity within it from outside of it.

Market Structure

Once the market or markets in the IS group are defined, it will be useful to classify each by the kind of market, sometimes called “market structure,” and to the extent possible determine structural characteristics. Market structures include perfect competition, monopoly, monopsony, bilateral monopoly, monopolistic competition, and oligopoly. These are discussed at length in Berg (2002), Baumol and Blinder (2006), and many other standard economics texts. Within each of these classifications, there might be many variations. For example, “oligopoly” comprises many possible industry variations with the common characteristic that each has few suppliers with recognizable interdependence.

Regarding specific structural characteristics, a good explanation is provided by Berg (2002):

“(M)arket structure’ comprises all conditions affecting the market that are fixed in the short- to medium-run. Because they do not vary, these conditions are said to be “exogenous” or outside the control of agents in the market in this time frame. They include the minimum efficient size of operation (economies of scale), legal restrictions such as patents or regulations affecting competitive behavior, barriers to entry to the market or costs of exit, and the size distribution of buyers and sellers. Some would add product differentiation, meaning the degree to which products competing within the market vary in some characteristics. Wristwatches, for example, vary by quality and somewhat by the functions they perform. Retailers vary by location. A barrier to entry is any condition that imposes additional costs on entrants. Some would define “barrier” to be a cost not incurred and never incurred by incumbents . . . Barriers include customer loyalty, uncompetitive access to inputs or channels of distribution, minimum efficient firm size, and, with the less stringent interpretation, advantages of learning by doing.”

It will be very helpful to observe information on market structure in the course of the Industry Study. This information will be helpful in determining broad market structures for the industry and understanding forms of competition within the industry.

Example 4—Electronics

ICAF’s Electronics IS covers semiconductors, which are widely used in defense and consumer products. The industry group comprises four product markets, namely: memory, micro-processors, logic, and analog. Each entails specific products that complement and are not substitutes for the others. All are vital to the production and delivery of information services. Each market has suppliers that specialize in its products and its own market structure. Micro-processors, for example, has two major suppliers,

Intel and AMD. Operating in a virtual duopoly, these firms compete aggressively in some, but not all aspects of their business.

Firms' Strategies

A firm's strategy, or "business model," is its plan for competing in markets and making money. A firm spokesman might tell you what it is, but be aware that what s/he tells you is for public relations.

Michael Porter (1980) analyzed business strategies in depth. He identified three general strategies for firms with high profit-making potential. These are (i) overall cost leadership, being the lowest cost producer in the market, (ii) product differentiation, supplying a product that is different in some significant way, limiting consumption substitutability with rivals' products, and (iii) focus, concentrating on a particular buyer group or geographic market. Focus itself is subject to some variation and there are overlaps among the three broad strategies.

Business strategies have a direct and often major effect on the forms in which competition occurs and ultimately on market performance.

Example 5

A market contains three major suppliers. All three try to differentiate their products and avoid direct price competition with rivals. Each prices somewhat conservatively to discourage new entry and encroachment of rivals into its "turf." This industry is likely to perform like a weak oligopoly. Profitability is likely to be somewhat above competitive levels and the pace of innovation slow.

If instead, two of the suppliers try to establish themselves as cost leaders while the other differentiates, competition is likely to be much stronger with prices more or less competitive, but with some variations in characteristics and quality of products supplied.

Forms of Competition

Forms of competition include specific actions and patterns of behavior of firms intended to advance their business strategies. These include pricing, advertising and promotions, research and development, innovation, and any efforts to differentiate their products. It will be helpful to observe the forms of competition in the course of the Industry Study. They might reflect in some manner market structure. They might also go part way towards determining market performance.

Example 6

A market contains a large number of small suppliers who supply a limited range of products but engage in a great deal of research and development for patentable new products. They finance their R & D with large issues of equity and borrowed venture capital. In all likelihood, many will fail, but some might successfully develop viable new products and earn large profits. Short-term profits might be high for some. The pace of innovation and change in the industry is likely to be rapid.

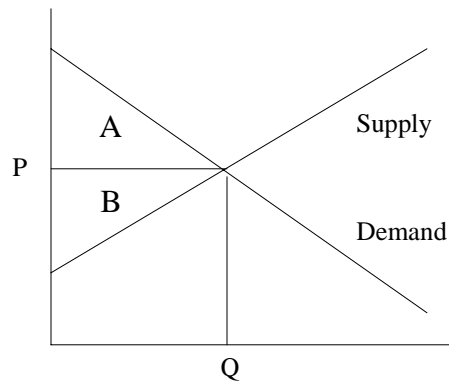
III. Industry Performance

For the purpose of ICAF's industry analysis, industry performance has two components. One is general economic welfare or net benefits generated in the economy in normal times. The second is how well the industry responds or can be expected to respond to special or acute needs that might arise from a national emergency. I will call this performance component "national emergency response and adjustment," or "strategic response." The components are considered in turn.

General Economic Welfare

The economic welfare generated in a market is the net value it generates. Net value can be defined as the benefits to consumers minus costs of production, absent any external effects.²² Breaking this down further, net value is the sum of benefits to consumers in excess of the price they pay and the revenue obtained by suppliers in excess of supply costs.

Figure 1. Net Value Generated in a Market



Net value is depicted in Figure 1. The height of the demand curve represents the marginal value of the product to consumers over the range of quantities depicted. If quantity Q is consumed at price P , the net value to consumers is the area under the demand curve down to P and out as far as quantity Q . This area is region "A." The supply curve in a competitive market represents industry marginal cost over the range of supply depicted. The net value acquired by producers is the area above the supply curve

²² An external effect or "externality" is a benefit or cost incurred by someone not a party to the market transaction of the good or service in question. For example, burning coal releases the toxic gas sulfur dioxide into the atmosphere that is then breathed by everyone nearby. Externalities are difficult to measure because they are not represented in market observations. For further discussion, see Gwartney, Stroup, Sobel, and Macpherson (2006), pp. 113 – 118.

up to P and out as far as quantity Q. This area is region “B.” This analysis abstracts from fixed costs not subsumed in the supply curve and any external benefits or costs. Given these conditions, a good approximation of the short-term net benefits generated in the market depicted is the sum of areas A and B.

In the likely event that you do not have all of the necessary information to perform this analysis quantitatively, it can still serve as a useful guide in your thinking. You might be able to make a qualitative assessment of net welfare generated in a market by considering price and sales, quality, service to consumers, product variety or differentiation, and the rate of product innovation. Ask yourself if firms are pricing at about average cost. Are they making normal profits or more or less? Are they making reasonable efforts to innovate and improve their products? Are they trying to resolve shortcomings of their products and service to customers? You might be able to draw inferences from the degree of competition. A highly competitive market in the absence of externalities is likely to generate maximum net benefits, at least in the short run.

In this analysis, suppliers’ measured profits can have conflicting interpretations. On its face, profits are a positive part of net value, as shown in Figure 1. This is a reasonable interpretation as long as profitability does not exceed the normal level in the economy—that is, the opportunity cost on invested capital at similar risk levels. However, profitability exceeding this level is a sign that the industry is less than perfectly competitive, favoring the suppliers. If this is the case, net value to consumers is almost certainly less than it would be in a competitive market.

Before this analysis is complete you might find it helpful to review your conclusions about market structure, conduct and strategy, and industry performance with the two standard economic paradigms that link them conceptually. These paradigms, “Structure-Conduct-Performance,” and “Strategy-Performance,” are explained in Berg (2002).

National Emergency Response and Adjustment

An industry provides value by its capacity to support the nation’s response and adjustment to a national emergency. An event such as a terror attack, or the outbreak of war, or a pandemic, might create a significant immediate or near-term disturbance to the economy that is sometimes called a “shock.” As described in Berg (2004), an economic shock is a sudden change in economic capability or demand requiring a significant and possibly costly adjustment. Events that might be considered include the following.

- (1) A war or increased threat of war requiring an increase in military capital and manpower requirements.
- (2) A terror or other attack within the United States or elsewhere that causes acute damage or leads to a significant response.
- (3) An outbreak of a pandemic such as avian flu.

- (4) A natural disaster requiring a major response such as occurred in 2005 with Hurricane Katrina.

This is not an exhaustive list. You can probably think of other events that would produce a need for a substantial adjustment within your IS with important consequences for national well being. As a practical matter, it will probably be sufficient to consider one or two important shock-inducing events and analyze how your industry would respond. As an example, consider a sudden increase in the size and budget of the military of 20 percent. It makes little difference for this analysis what the reason is for this change. What is important is how great the increase in demand for the industry's output would be and how the industry would respond.²³ The industry might support such a military buildup directly or indirectly. Combat and munitions systems would support it directly. Other industries, such as transportation and health care, might do so more indirectly.

The effect of an increase in military spending on specific industries can be quantified with a sector-based economic forecasting model. Oxford Economics, which also does macroeconomic forecasting, has such a model, as do some other professional forecasters. The question to ask would be how great of a change in demand for the industry's output would result from a given disturbance such as a general economic buildup of a given percentage. Then consider how well the industry would respond to the change in demand. In particular, could it change the quantity it supplies commensurately and if so at what change in costs? The answer to this question provides a sound basis for assessing the industry's capacity to respond to such a disturbance.

Example 7—A 20-Percent Military Buildup

Consider the disturbance created by a 20-percent general increase in military spending in one year. The first step would be to estimate the effect of this disturbance on the quantity demanded of the product or service provided by the industry in specific markets with constant prices. This would be based on a sector-based forecasting model. Then evaluate the cost of supplying this change in demand beyond the existing average cost of supply.

Suppose that an immediate 20-percent military expansion were forecast to result in an 8-percent increase in demand for the industry under study. Suppose that an 8-percent increase in the quantity supplied in one year would increase average costs by 10 percent. Then the cost in this industry of supporting the military expansion would be 10 percent times 108 (10.8) percent of the costs of supplying the military in the baseline year.

²³ In the years 2000 – 2006, real U.S. military spending increased every year and usually by more than five percent. See [Economic Report of the President, 2006](#).

IV. Government Policies to Improve Industry Performance

Ordinarily, no change in government policy is warranted if an industry is performing as well as it can. If it is not, a change in policy might be warranted, but only if it improves performance by enough to outweigh costs the change imposes. Not all performance failures can be improved; not all improvements are worth the cost.

Possible policy responses to a performance failure for general economic welfare and emergency response are considered. A proposed policy change should ultimately be analyzed in terms of its combined performance effects on all aspects of the industry's performance and the cost.

General Economic Welfare

A competitive market generally produces maximum net benefits in the short run, absent an externality. This result of optimal performance and process by which a competitive market achieves it is described at length in Berg (2002) and Baumol and Blinder (2006). The competitive process promotes both technical and allocative efficiency, meaning that the industry produces what it does in the cheapest possible way and that the size of the industry is optimal. It would be almost impossible for a government policy to improve on the performance of a competitive market, except in the presence of an externality. However, a market might fail to produce maximum net benefits if competitive conditions are not met or if there is an externality.

Based on your newfound learning of economics, the guidance provided in this methodology, and other references available to you and your growing knowledge of your IS, you will need to determine if your IS industry provides the maximum possible net benefits or fails to do so. If it fails, you can consider a change in policy to improve performance. Traditionally, government policies to address market failure include the following.

- (1) Direct government provision, as with public goods.
- (2) Antitrust legislation and enforcement, promoting rules of conduct in the private sector.
- (3) Regulation, usually of prices, forms of products or services, or means of competition.
- (4) A tax or change in the rate or form of taxation.

Regulation comprises a wide array of government requirements on the form of the product or service, the method of producing it, or the means of sale and delivery to the consumer. For a proposed regulation, it is important to consider the full costs and consequences imposed on the public, which might require careful thought because some of the effects of government intervention are indirect—difficult to identify or measure and sometimes to foresee.

Example 8—Gas Shortages and Gas Lines

World political and economic events led to sharp increases in the world price of crude petroleum in 1973-4 and again in 1979-80. If markets in the United States had worked unimpeded, these events would have led to sharp price increases for downstream and competing products such as gasoline and heating fuel. Finding this to be impolitic, the United States Government instituted price controls. Limited price increases in the presence of much higher costs naturally led to shortages prompting the Government to allocate the available supply of gasoline to specific regions and markets. Demand exceeded supply at the controlled prices and by varying amounts in different places. Absent an effective rationing of the supply of gasoline at the pump, American motorists queued up in long lines, sometimes for hours, to buy gasoline. It was rationing by inconvenience and very inconvenient and inefficient it was.

In 2004 – 2006, when crude oil prices again rose copiously, and especially in 2005 after Hurricane Katrina disabled a sizable share of U.S. oil refining capacity, gasoline prices spiked. This time, the Government did not regulate prices or impose regional supply allocations. Prices rose a great deal. Motorists grumbled, but only a little, and drove less. There were no queues. The system worked efficiently.

If you detect a performance failure, consider a policy change that might improve performance. Consider possible remedies from the list above. A policy that addresses the cause of the performance failure most directly usually produces the best result. Most important, consider the probable benefits and costs of any proposed policy change.

Strategic Response

Following your analysis, if you believe that the industry would respond less well than it could, consider a policy change that might improve its potential response. A few very general possibilities include the following:

- (1) Stockpile a product or resource that might be needed in a national emergency. The national strategic petroleum reserve is a case in point.
- (2) Create incentives for the desired behavior or capability. DOD sometimes pays more for immediate procurement to maintain at least two national suppliers of a vital product in the belief that in the long run this increases competition and efficiency and lowers cost to DOD.
- (3) Secure priority access to a product or resource that might be vital to the government in a national emergency.

As always, consider costs and benefits of any proposed policy before endorsing it, including the effects on general economic welfare in normal times. A change in policy is in the national interests only if its benefits, properly considered, outweigh its costs.

Example 9—The Jones Act

Following the poor performance of U.S. industrial mobilization in World War I, Congress undertook two major actions to help improve the nation's responsiveness in a national mobilization. One was to create the Army Industrial College (later renamed the "Industrial College of the Armed Forces"). The other was the Jones Act.²⁴ The Jones Act requires that all water-borne cargo moving between U.S. ports be carried in ships built in the United States, manned entirely with U.S. citizens, and flying the U.S. flag. The purpose of the Act was to promote a domestic merchant fleet that could support the nation's shipping needs during a national emergency. The Jones Act remains on the books today.

The increased costs to the U.S. economy because of the Jones Act have been estimated in the billions of dollars annually. In the eighty-six years since its enactment, there are few recorded instances in which Jones Act ships made a significant contribution in war or other emergencies. Although the copious overall costs of the Jones Act are obvious, some interests benefit from the Act and lobby tirelessly against its repeal whenever the issue is raised.

²⁴ Formally, the "Merchant Marine Act of 1920."

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Appendix II

General Issues and Specific Questions for Consideration

- Assessment of long-term competitive position of US firms in the international market place. Assess the firm's strategies for competitive preeminence into the 21st century.
- Identification of conditions; e.g., market factors, emerging technologies, government actions affecting industry's ability to supply defense requirements.
- Determine the extent and condition of planning by government, industry and firms to identify defense requirements and to meet these requirements including an assessment of the acquisition system's ability to capitalize upon emerging commercial technologies with high military potential.
- Assess the capability of industry to respond to current and credibly projected defense requirements for peacetime production, production surge and wartime sustainability conditions.
- Develop realistic policy options available to the government for enhancing industry response to defense requirements.
- Suggest preferred options available to selected industries to improve peacetime production, production surge, and wartime sustainability.
- Identify the bottlenecks and pacing items for peacetime, surge and sustained production.
- Determine the potential for assistance from foreign facilities under mobilization or surge conditions.
- Consider the effect of current US policies on the national and international industrial base and develop recommended changes complete with supporting rationale.
- Assess the implications of the European Community or other regional trading blocks to the specific US industrial base element under study.
- Visit related financial institutions (e.g., investment bankers) to learn about sources and costs of capital investment and five-year trends.
- Visit related political, social and economic institutions to understand the pressures, policies and trends that will impact your industry over the next five years.
- What are the long-term effects of rationalization/downsizing?

- What are the views of the industry concerning the government's policies of prototype vice production and its reliance upon reconstitution to support national defense? What is industry's view of the government's ability to rapidly acquire commercially available advanced technological equipment?

GENERAL AREAS OF INTEREST AND SPECIFIC QUESTIONS

The national science, technology and industrial base must support the materiel requirements of US strategy through efficient peacetime production, production surge capabilities to accelerate needed additions to inventory in emergencies and preparedness for indefinite wartime sustainment.

This goal provides three broad areas of interest to our Industry Study Program:

(1) The current peacetime status of each industry including an evaluation of its operating efficiency and ability to remain viable economically, politically and socially in the face of declining military budgets and increased international competition;

(2) Planning within the government and between the government and industry to identify national security requirements and to communicate these requirements to members of the industrial base; and

(3) The ability of the industry to develop and produce national security requirements effectively and efficiently in peacetime and to satisfy requirements for crisis involving surge and mobilization.

The following subjects represent the nature of the interest and the types of questions students ask during their domestic field studies and, to the extent they are appropriate, during international field studies. Clearly, the list is not complete, nor do all items necessarily apply to any one visit. Before a visit takes place, the faculty leader or student representative develops, with the activity being visited, mutually agreed areas of interest that may or may not be identified here.

For this academic year we are particularly interested in the following themes:

(1) The impact upon your industry of the September 11th attack and how effective has been your industry's and the government's response?

(2) The trends in international trade and competitiveness.

(3) The possible industrial strategies to ensure competitive preeminence far into the 21st century.

(4) The impact on the productive base of increased reliance upon outsourcing and service support contractors.

(5) An assessment of the acquisition system's ability to take timely advantage of emerging commercial technologies of interest to defense with particular emphasis on insertion of commercial technologies.

(6) The impact of information technology on the industry's productive capacity and ability to compete globally.

BUSINESS AND INDUSTRY

Domestic Business Environment

- What is your assessment of the current economic environment? How does the declining US military budget and increased competition affect your industry? What strategies are you employing to cope with these problems?
- Forecast the trends in sales and profitability of your company and of the industry in which the firm operates.
- What long-range policies is your company implementing to remain competitive nationally?
- How are you using information technology to increase productivity and international competitiveness?
- What are your supplier resource constraints/scarcities and how dependent are you on imports?
- What policies exist within your corporation to moderate or eliminate the adverse impacts of known resource constraints?

International Business Environment

- What countries provide competition to and cooperation with US firms in your industry? How viable are US firms in worldwide competition? What strategies are you using to respond to this competition?
- What factors influence the strength of this foreign competition? Wages? Sales? Technology? Government assistance?
- Do US firms in your industry have foreign subsidiaries? What foreign firms are established in the US?
- Forecast the future of joint ventures with foreign firms.

- To what extent have allied or bilateral co-production efforts impacted upon your industry? What do you forecast?
- To what extent are "offsets" impacting your current and projected international business environment?
- What are your firm's concerns regarding technology transfer and US government policy/restrictions?

Finance and Financial Institutions

- What is your company's principal source of capital? What financial institutions do you use?
- How does your company's ability to obtain financial resources compare with the ability of foreign competitors to attract funds? How does this affect the competitiveness of US firms vis-à-vis foreign competition?
- How does the current economic environment affect the performance of your industry? What are your projections?
- Have any innovative financial practices been introduced recently, which would improve your ability to attract venture capital?
- What is the impact of government regulation on the financial institutions, and therefore, your industry?

Government-Industry Interaction

- How do you describe your company's relations with local, national and international governments? What mechanisms do you employ to present your case?
- What possible strategies can the US government pursue (enact) to assure the survival of your industry and its international competitiveness?
- What changes to the defense acquisition system would allow it to take timely advantage of emerging commercial technologies of interest?
- What is the impact of government regulations on your company's operations?
- What problems arise in connection with government procurement practices and procedures?

- How do your profits on government business compare with profits on other business?
- What impact does your company feel as local government copes with increasing costs of government services?
- What tax relief or economic assistance is provided to you through local, state and Federal programs and what problems are associated with these programs?

Research and Development

- What is your industry's record of investment in research and development? What are your projections for the future? How does your investment level compare to your major competitors?
- What has been your experience in bringing an item from R&D to successful production for the market?
- Is your industry devoting sufficient resources to R&D? If not, what changes should you make?
- What role, if any, has been played by government funded independent Research and Development (R&D) programs?
- How would you compare the technology of the company versus its foreign competitors?
- What R&D consortia does your company support?
- What international R&D cooperative programs is your company involved in?

Work Force/Labor

- How well does the US public education system provide the skills you need in today's technology oriented, international business environment?
- How does your company select, train, retrain, and retain people?
- Do you have a Total Quality Management (TQM) program? Are you using its principles in a similar program?
- What critical skills (management, engineering, scientist, production, etc.) are you losing as a result of defense cutbacks and restructuring?
- What has been your experience in labor matters?

Surge, Mobilization and Preparedness Planning

- How has Federal policy and planning enabled you to know what you might be asked to do to meet surge and mobilization demands for defense?
- What is your assessment of your capability to meet these demands?
- What would be your critical resource constraints? Where would the major bottlenecks occur in expanding production by a factor of 2? A factor of 4? To meet surge or mobilization demands?
- What options are available to overcome the bottlenecks or problems?

Appendix III

Factors to Consider: Structure, Conduct and Performance (The Classical Approach to Industrial Analysis)

STRUCTURE: the market environment that influences rivalry among buyers and sellers

- # of sellers/producers (monopoly, oligopoly or free market?)
 - domestic/foreign
 - concentration ratio (top 4 = what % market)
- # of buyers (monopsony, free market?)
- % sales to Fed/DOD (other gov't influence/leverage?)
- Entry barriers:
 - high R&D costs or capital costs/size
 - specialized/skilled labor
 - high technology
 - patents/secrets/gov't protection
 - other players - 3rd party insurance ?

CONDUCT: pricing policies and product characteristics that influence market transactions

- Pricing policies (who and how is price set?)
- Buying practices of consumers/gov't acquisition policies
- Management practices
- Labor practices (labor or capital intense?)
- Research and development: who does, who pays, who benefits?
- General attitude (traditional US arrogance?)
- Capital investment

PERFORMANCE: an appraisal of the quality of the resulting allocation process

- Trends in sales/shipments adjusted for inflation
 - # firms in the trend (growth=strength?)
 - look for mergers/consolidations/bankruptcies
- Profitability - return on assets or net worth
- Productivity - Labor Statistics (output per man-hour)
- Quality of products/services - consumer reports/preferences
- Cost of products - trends (electronic down, chicken down, defense up)
- Export competitiveness
 - Export Ratio = exports/US production (this should be large or growing to indicate strength)
 - Import Ratio = (imports/total new supply) - (imports/US production + imports) [this should be small or declining to indicate strength]
- Wage scale and benefits - high or low?

Appendix IV

Strategic Industrial Analysis: What Makes an Industry Strategic? (The Technology Approach)

STRATEGIC INDUSTRY DEFINED: An industry that is a primary cause of significant economic growth at a given time. Historically such industries include the railroad industry in the 19th century United States, the cotton industry in early 19th century England and the chemical industry in late 19th and early 20th century Germany. The information industry might be a current strategic industry. The issue of strategic industry analysis is relevant to the current and ongoing debate on the proper goals and role of government in setting industrial policy. The idea of a strategic industry suggests that economic growth can be stimulated by an economic "lever" without the need for comprehensive government intrusion into the industrial marketplace. Many disagree with this position. The following analysis technique drawn from the work of Julian Gresser is offered as a framework from which the question of industrial policy may be addressed from a less anecdotal perspective.

Step 1. Defining the Industry - how to define the boundaries of an industry. It is suggested that we must rethink our basic notions of an industry as defined by product lines or marketplace arrangements and begin to focus of inter-industry relationships and inter-industry technology flows. In essence, the challenge is to define the technological boundaries of the industry. These boundaries often change over the life cycle of an industry.

For ICAF purposes, this systems approach should be balanced by the more traditional industry definitions embedded in the government's North American Industrial Classification system (formerly called the standard industrial code or SIC) . If balance is not used the twenty industry studies will claim a total percent of gross domestic product output far in excess of the real total. For example, agribusiness using the suggested systems approach may "claim" all farm output, all food processing (manufacturing) output, transportation's share of food products moved, retail's share of restaurant meals sold, etc.

With this caveat in mind, it is suggested that from a strategic industry perspective industry can no longer be defined as a set of companies who share certain methods of production and product properties. Rather an industry should be defined as a set of companies interconnected as suppliers and market, committed to diverse processes and products but over-lapping in the end use functions they fill and the technologies they employ. Industries are increasingly dependent in achieving high rates of productivity growth upon skills and resources external to and, perhaps, unfamiliar to themselves.

Step 2. Assessment of the standard economic indicators of the industry:

General indicators and trends

- (1) growth in shipments or sales
- (2) exports
- (3) employment
- (4) productivity

Research, invention, innovation and a substantial commitment to:

- (5) research
- (6) high levels of investment, defined as a current use of resources which increases future output
- (7) high rates of innovation and invention (innovation defined as the commercial realization of invention)

Economic Production:

- (8) sharply increasing scale - defined as increasing output/factor production as a function of scale
- (9) specialization
- (10) scope
- (11) the learning curve and product life cycle (life cycle defined as the relationship between labor costs and output as a function of experience)
Product life cycle tends to be shorter in strategic industries.
- (12) vertical integration - strategic industries tend to become vertically integrated

Step 3. Technical Indicators:

- (1) dual use - most strategic industries have technologies with both civilian and military applications
- (2) core technology - level of uniqueness and its economic role in the industry
- (3) knowledge (information) intensive, convergence of technology, complementary use of technology, synergism, interdependence

Step 4. Social and Political Indicators:

- (1) generalizable pattern of production: mass, one off, etc.
- (2) generalizable pattern of commerce: business practices that extend beyond the industry
- (3) national perceptions of wealth, prestige and power
- (4) scale ratios of society: impact on society - increased life expectancy, etc.; greater educational achievement; reduced crime, etc.

Step 5. Secondary and Tertiary Effects:

- (1) high multiplier: use of industry revenues outside the industry
- (2) deep "penetration" of the input-output matrix: impact on other industries to significantly reduce costs/prices
- (3) forward and backward linkages: economic and technical connections with other industries that also encourage rapid economic growth
- (4) high rate of feedback and alteration: technical influence in down stream or up stream suppliers - drive for quality includes subcontractors, etc.

Step 6. High External Benefits, High External Costs:

Strategic industries confer large benefits to society in general far exceeding the market value of their products or the industry. Costs - externalities - may also be large as a strategic industry is rapidly growing - for example, the pollution costs attendant with the rapid growth of railroads and the supporting steel industry.

Source: Gresser, Julian, Partners in Prosperity, New York: McGraw-Hill Book Company, 1983

Appendix V

Competitive Advantage: Porter's Prescription (International Competitive Advantage)

...The only meaningful concept of competitive advantage at the national, industry and firm level is productivity. Productivity requires constant upgrading.

...A nation can improve productivity by specializing just as a firm does, but nations do not compete - firms do.

...Analyze competitive advantage against the very best worldwide competitor. Generally those with competitive advantage have sustained and substantial exports and significant outbound capital investment.

...Structural analysis: competitive position is a function of industrial structure or the underlying technical and economic characteristics of an industry. The threats from new entrants, rivalry of competitors, the bargaining power of suppliers and threats of substitution all drive improvements, not calls for protection.

...Two basic types of competitive advantage: lower cost through productivity improvements and product differentiation from quality, performance, etc.

...Innovation is the key to competitive advantage - constant improvements in technology and better ways of doing things.

...Typical innovations that shift competitive advantage include new technology, new and shifting buyers, emergence of a new industrial segment (biotechnology, robotics, etc.), shifting input costs (off shore assembly with cheaper labor) and changes in government policy (lower corporate taxes).

...Sustaining competitive advantage depends on sustaining the source of the advantage and, most importantly, sustained and constant improvement.

...Review Porter's diamond of national advantage: (1) factor conditions - labor, infrastructure; (2) demand conditions - home and export market; (3) related and supporting industries - Are they world class?; and (4) firm strategy - the nature of domestic and foreign rivalry.

Source: Porter, Michael E., 1990, *The Competitive Advantage of Nations*, New York: The Free Press

Appendix VI

Profile of Selected Indicators: A Menu of Things to Consider

Report data and always include trends where available by industry average and/or representative firm - for example use the best US firm and compare to best foreign firm. Suggest the method of comparison include, as a minimum, comparison of the US industry to first-rate foreign competition.

(1). INDUSTRY STRUCTURE

<u>Issue</u>	<u>Indicator</u>
A. Contribution to GDP	-value added (VA) by industry sector -VA as a percent of GDP -VA as a percent of total sector VA (i.e. the aircraft industry VA as a percent of manufacturing or durable goods VA) -distribution of VA among components of income (wages, interest, rents, taxes, profits, etc.)
B. Distribution of Industry Product	-value of gross domestic output -% to final demand -% to immediate demand -% to consumption, investment, government, foreign -five largest intermediate markets
C. Input Sources	-five largest suppliers -assessment of capacity of suppliers (utilization rate)
D. Production Function	-technical input-output coefficient -trend in efficiency
E. Competitive Characteristics	-dominant form of market organization -producer or consumer dominated? -major competitors
F. Concentration	-five largest domestic firms - % of gross output -five largest worldwide firms - % of gross output
G. Conglomerate Activity	-tendency toward extension: vertical, horizontal discontinuous?

(2). EMPLOYMENT AND LABOR RELATIONS

<u>Issue</u>	<u>Indicator</u>
A. Contribution to Total Employment	<ul style="list-style-type: none">-industry employment level and trends-industry % of total employment; % of sector employment-% employment by five largest firms-% of production workers and trends vs. non-direct labor and overhead-comparison to major foreign competition
B. Labor Force Characteristics	<ul style="list-style-type: none">-age, skill/education distribution - trends-demographic characteristics and trends
C. Union Representation	<ul style="list-style-type: none">-largest trade or craft unions-union employment % of total employment-local, regional or national representation-trends in union membership % of industry employment
D. Collective Bargaining	<ul style="list-style-type: none">-pattern of negotiations, strikes, lock-outs-length of contracts-unique work rules, etc.
E. Compensation Patterns	<ul style="list-style-type: none">-wages and trends-benefits and trends-compensation compared to other industries and foreign competition
F. Dislocation Factors	<ul style="list-style-type: none">-automation/technology/innovation impacts-capital intensity - trends-comparison to foreign competition

(3). PARAMETERS OF PERFORMANCE

<u>Issue</u>	<u>Indicator</u>
A. Profitability	<ul style="list-style-type: none">-profit as a % of sales or shipments-profit on gross assets/ return on investment-profit maximization practices-profit compared to other industries and foreign competition
B. Liquidity	<ul style="list-style-type: none">-current ratio=current assets/current liabilities-composition of working capital-acid test ratio = (current assets-inventory)/current liabilities
C. Leverage	<ul style="list-style-type: none">-debt/total assets-composition of debt-terms of debt; trends in debt
D. Cost Structure	<ul style="list-style-type: none">-fixed/variable cost-unit labor costs-costs trends and comparisons with foreign competition
E. Productivity	<ul style="list-style-type: none">-output/man-hour-output/total inputs-sales/employee-trends and comparison with foreign competition
F. Security Prices	<ul style="list-style-type: none">-prices of equity-debt instruments-price/earnings ratios-instruments most used in new financing-cost of capital; foreign comparisons
G. Sources of Capital	<ul style="list-style-type: none">-requirements-markets-investment instruments-government subsidization-foreign comparison
H. Financial Strength	<ul style="list-style-type: none">-debt/equity ratio-credit position-asset position-trends and foreign competition comparison

(4). PRODUCTION/TRANSFORMATION PROCESS

<u>Issues</u>	<u>Indicator</u>
A. Dominant Method of Production	-descriptive -capital expenditure pattern -modernization/efficiency trend
B. Impact of Technology	-descriptive - degree information technology has or is changing industry -impact on development and production process -labor displacement -productivity changes - output/man-hour or output/total inputs
C. Degree of Capital or Labor Intensity	-capital/worker - trends -capital/unit of output -comparative international trends
D. R&D Expenditures	-as % of sales -basic/applied R&D % -government or company supported
E. Energy Dependency	-embargo or price escalation planning or response -sources and location of energy inputs -cost and impact of price escalation
F. Location Determinants	-geographic concentration -trends
G. Degree of Market Dependency	-concentration relative to major markets -transport cost as % of price -adequacy of transport facility

(5). IMPACT OF OUTPUT FOR DEFENSE

<u>Issue</u>	<u>Indicator</u>
A. Contribution to National Security	<ul style="list-style-type: none">-% of sector output for defense – trends-criticality to defense of industry product as direct or secondary input-availability of alternative sources
B. Organization of Sector	<ul style="list-style-type: none">-private or government ownership %-capacity requirement for national security: peace, limited war, general war-status of production base: cold, war, hot or standby-level of foreign dependency-alternatives to foreign dependency
C. Defense Contract Performance	<ul style="list-style-type: none">-technical performance level: R&D, production-cost growth experience-level of government oversight-level of contractor investment in development-history of relationship with government-profit as % of sales/gross assets/equity
D. Sensitivity	<ul style="list-style-type: none">-sensitivity/reactions to variations in defense expenditures: exit, merger, downsize-change in % of sales to DOD-composition of product line & alternatives-financial viability-government cooperation to decreased orders
E. Surge/Mobilization Capacity	<ul style="list-style-type: none">-time to produce (D to P)-capacity utilization rates - how measured, how much surge available-impediments to rapid increases in output-impact of advanced manufacturing technology and just-in-time inventory methods on surge
F. Planning	<ul style="list-style-type: none">-adequacy of government mobilization planning-currency of the requirements-industry reaction to defense planning

(6). SURGE DEMAND/MOBILIZATION AND PREPAREDNESS PLANNING

<u>Issue</u>	<u>Indicator</u>
A. Requirements	<ul style="list-style-type: none">-major resource inputs-material content of output-energy content of output-dependency on critical raw materials-dependency on water
B. Resource Geography	<ul style="list-style-type: none">-location of major inputs - foreign?-resource competitors-potential for substitution or expansion
C. Resource Technology	<ul style="list-style-type: none">-trends in resource exploration/availability-depletion outlook - substitution-R&D efforts to minimize dependency-environmental constraints on availability or substitution-outlook for improved efficiency of resource use
D. Preparedness Planning	<ul style="list-style-type: none">-conformity to government planning assumptions-assessment of planning quality-assess mobilization potential - full/partial-assess industry responsiveness-industry vulnerability to attack/sabotage-alternate sources
E. Stockpile	<ul style="list-style-type: none">-availability of needed materials in government stockpile-availability of needed materials in private sector inventories
F. Capability to Support National Security Needs	<ul style="list-style-type: none">-descriptive assessment-assess continued interest in defense orders-outlook of capacity availability

(7). STRATEGIC ASPECTS OF THE INDUSTRIAL SECTOR

<u>Issue</u>	<u>Indicator</u>
A. Dependency on Foreign Markets	<ul style="list-style-type: none">-% output exported-comparative prices with foreign competition-trends share of global market-major foreign competitors
B. Dependency on Foreign Sources: US or foreign	<ul style="list-style-type: none">-% inputs imported-% input imports from own firm's foreign subsidiary-vulnerability of sources to expropriation, embargo
C. Contribution to US Trade Position	<ul style="list-style-type: none">-size/% of trade balance-net balance on the current account
D. Direct Investment	<ul style="list-style-type: none">-level of outflow - where to-level of inflow - from whom-trends
E. Foreign Competition in US Market	<ul style="list-style-type: none">-foreign share % of US market - trends-five largest foreign firms - % US market
F. Multinationals	<ul style="list-style-type: none">-five largest multinational firms - % of global market country of ownership, location of production-organizational form of the world leaders-determinants of leadership - output volume, price quality, wage rates, management, technology, growth rates
G. Policy Conflicts	<ul style="list-style-type: none">-industry position - free trade, protection-impact of economic nationalism vs. multinationalism-comparative advantage-trends in cartels-impact of NAFTA, EU and other trading zones
H. Foreign Military Sales	<ul style="list-style-type: none">-marketing strategy-level of government support-FMS as % of output-effect on economies of scale-potential for mobilization-pricing policy

-coproduction agreements, impact of offsets
-technology transfer issues

Appendix VII

Commercial Technology Insertion Questions

DOD is seeking to utilize the best available technologies, from whatever source, in both future acquisitions and in the support for existing military systems. The insertion of best available technologies sometimes, but not always, results in an improvement in technical performance. An equally important result is some measurable reduction in cost at one or more points in the life cycle of the system.

One key element in this effort is the identification of commercial technologies that provide opportunities for insertion. DOD plans may rely principally on contractors for this technology identification function. These following questions deal with:

The ability of defense contractors to thoroughly survey possible opportunities, understand technical and business-related barriers that would impede their use, and harness potential incentives to overcome barriers and actually use the best available technologies.

The ability of commercial contractors to understand defense needs and technical and business-related barriers and incentives to supporting those needs.

Normalizing questions (if not asked elsewhere).

- What percentage of your firm's products is sold directly to the Department of Defense?
- What percentage of your firm's products is sold to Department of Defense contractors?
- What percentage of your firm's products is sold directly to commercial customers?
- What percentage of your products is sold as components? Is your company foreign or domestic?

Questions for contractors with current defense sales.

(1) How do you keep abreast of commercial (domestic and foreign) technology developments that may be applicable to your defense interests or to your commercial interests?

(2) How do (would) you use the information from (1) above for the improvement of defense systems? New systems? - Existing systems? Systems that you are now involved with in some way? Systems that you are not now involved with? Under what circumstances would you make recommendations to use such a technological development to your current defense customers? Under what circumstances would you try to cultivate new defense customers? What else might you do with the information? Why? Is there a difference if the source of the technology is domestic vs. foreign? If yes, what are the implications of both?

(3) To what extent does a decision to "make something" vice "buy something" affect how you would use the defense-related information from (1) above? How do you approach make/buy decisions? What are the most important variables and constraints in this decision process?

(4) How do performance versus life cycle cost tradeoffs affect the course of action for Question (2) above?

(5) What is the business case for the course of action selected in (2) above? How do technical risks enter into the equations? How does cost risk enter into the equation? What are the differences between a foreign and domestic technology?

(6) What problems have you faced in using (or attempting to use) a commercial technology in a defense application? A foreign-sourced technology? How has this experience affected your attitude regarding the use of commercial or foreign-sourced technology?

(7) If the commercial technological opportunity for a defense system comes from a lower tier, are there disincentives to you in introducing that opportunity to your customers? How are such disincentives affected if the source is a current supplier? Not a current supplier? A foreign company?

(8) What can be done to overcome those disincentives?

Questions for suppliers of commercial technology.

(1) How do you keep abreast of commercial (domestic and foreign) technology developments that may have an affect on your business interests?

(2) Are you able to assess the implications (better performance, reduce life cycle costs, etc.) of your technology developments for defense customers, if you were to decide to market to the military or to military contractors?

(3) Assuming you are able to discern value of your technology to defense, are there barriers for you to overcome in marketing to a defense contractor in that regard? Marketing directly to the Defense Department? Other than the commonly termed acquisition reform-related ones, what are the barriers that must be overcome? Are these barriers from your point of view, barriers from the point of view of the defense contractor, or Defense Department? How can these barriers be overcome?

Possible shorthand versions of the preceding questions follow:

(Note – the same normalizing questions would apply.)

Questions for contractors with current defense sales.

- (1) How do you learn about the latest commercial technology developments?
- (2) How well are you able to assess the value of these developments for DOD?
- (3) Given an assessed value, what are your options for marketing the technology development to defense (either DOD directly or defense contractors) and what are the variables that affect your decision on which option to take?
- (4) What are barriers to making the decision to market to defense?
- (5) What are the barriers to getting the technology in defense systems? How can these barriers be overcome?

Questions for suppliers of commercial technology.

- (1) How do you learn about the latest commercial technology developments?
- (2) How well would you be able to assess the value of these developments for DOD, assuming you would want to market to DOD?
- (3) Given an assessed value, what are your options for marketing the technology development to defense (either DOD directly or defense contractors) and what are the variables that affect your decision on which option to take?
- (4) What are barriers to making the decision to market to defense?
- (5) What are the barriers to getting the technology in defense systems? How can these barriers be overcome?

Appendix VIII

DOD "Essential" Industry Capabilities Assessment Steps

- a. Verify the military requirement:
 - (1) Supply and equip force structure?
 - (2) Readiness and sustainment?
 - (3) Design, develop, and manufacture next generation products?

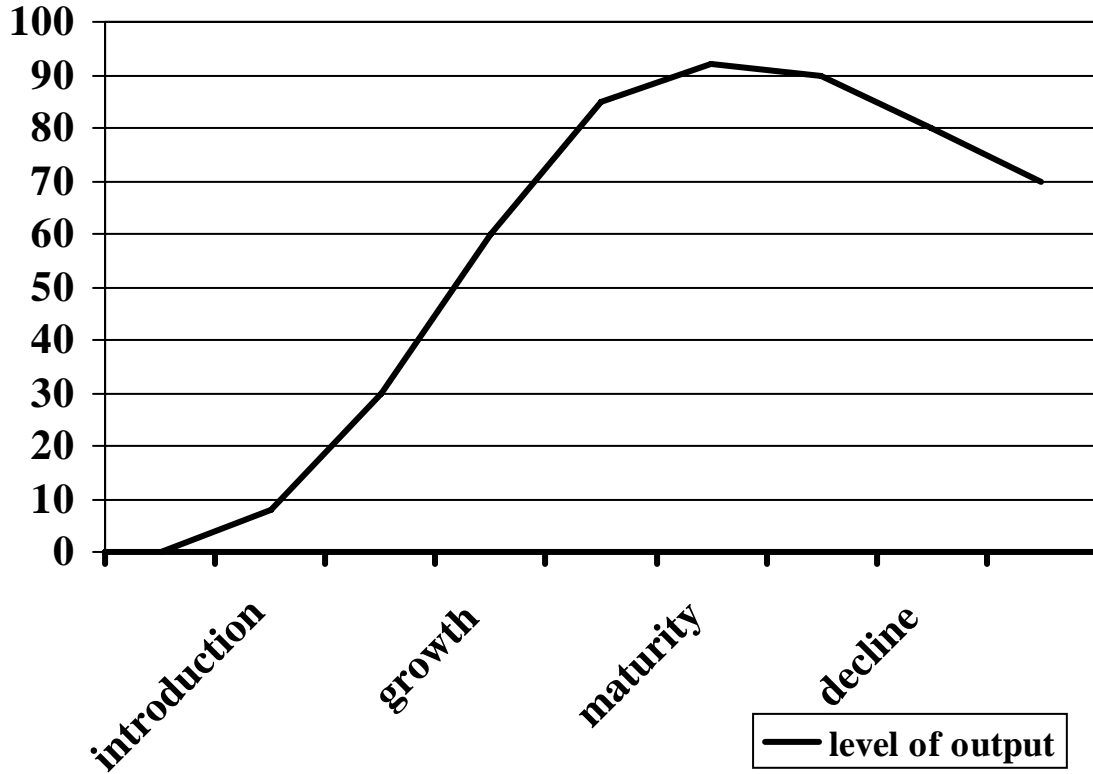
- b. Is capability truly unique?
 - (1) Exists in single product line or supplier, or very limited set of suppliers?
 - (2) Related products use similar capabilities?
 - (3) Loss would impact defense products?

- c. Will capability be lost?
 - (1) Due to supplier or product line profitability?
 - (2) Due to reduction or interruption of development or manufacturing?

- d. Evaluate alternatives:
 - (1) Substitutes?
 - (2) Buy out needs?
 - (3) New technology?
 - (4) Maintain production?
 - (5) "Smart" shutdown?

Appendix IX

The Life Cycle of an Industry



CHARACTERISTICS OF LIFE CYCLE LOCATION

	INTRODUCTION	GROWTH	MATURITY	DECLINE
<i>Buyers & buyer behavior</i>	High income purchaser	Widening buyer group	Mass market	Buyers are sophisticated
	Buyer inertia	Consumer will accept uneven quality	Saturated market	
	Buyers must be convinced to buy the product		Repeat buying – choice among brands	
<i>Products and product change</i>	Poor quality	Products have technical and performance differentiation	Superior quality	Little differentiation
	Product design and development key	Reliability key for complex products	Less differentiation	Spotty quality
	Many different product variations; no standards	Competitive product improvements	Less rapid changes	
	Frequent design change	Good quality	More trade-ins	
	Basic product designs			
<i>Marketing</i>	Very high advertising sales ratio	High advertising, but lower % of sales	Market segmentation	Much lower advertising costs
	Creaming price strategy	Advertising and distribution key to non-technical products	Efforts to expand the life cycle	
	High marketing costs		Broaden the line; service deals more prevalent	
			Advertising competition	
			Lower advertising to sales ratio	

	INTRODUCTION	GROWTH	MATURITY	DECLINE
<i>Manufacturing and distribution</i>	Overcapacity	Under capacity	Some overcapacity	Significant overcapacity
	Short production runs	Shift to mass production	Optimum capacity	Mass production
	High skill content	Scramble for distribution	Increasing stability of manufacturing process	Specialty sales channels
	High production costs	Mass sales channels	Lower labor cost	
	Specialized sales channels		Long stable production	
			Pare down lines to improve margin	
<i>Trade</i>	Some exports	Major exports	Falling exports	Few exports
		Some imports		Major imports
<i>Overall strategy</i>	Best period to increase market share	Practical to change price or quality image	Bad time to increase market share if a low share company	Cost control is key
	R&D, engineering are key	Marketing the key function	Competitive costs are key	
			Marketing critical	
<i>Competition</i>	Few firms	Many firms if easy entry	Price competition	Firms exit; few left
		Mergers and casualties	Shakeout & increase in private brands	
<i>Risk</i>	High risk	Risk covered by growth	Cyclicality sets in	Damage control

	INTRODUCTION	GROWTH	MATURITY	DECLINE
<i>Margins and Profits</i>	High prices and margins	High profits	Falling prices; lower profits	Low prices and low margins
	Low profits	Highest profits	Lower margins	
	Price elasticity to seller not as great as maturity	Fairly high prices	Lower dealer margins	
		Lower prices than at introduction	Stable market share	
		Recession resistant	Poor acquisition climate	
		High profit/earning	Lowest prices and margins	
		Good acquisition climate		

Source: Michael Porter, *Competitive Strategy*

Appendix X

Reference Books, Materials and Sources

GENERAL INDUSTRY INFORMATION (that can be acquired through NDU Library and/or online)

Standard Industrial Classification Manual
<http://www.census.gov/epcd/www/sic.html>

North American Industry Classification System
<http://www.census.gov/epcd/www/naics.html>

US Industry & Trade Outlook
<http://www.ita.doc.gov/td/industry/otea/outlook/webnotice.html>

Encyclopedia of American Industries
Uses both SIC and NAICS Codes

Encyclopedia of Emerging Industries. Relatively new industries. Has a SIC to NAICS Conversion Guide.

Standard & Poor's Industry Surveys. Individual profiles, housed in binders, updated periodically.

STATISTICAL SOURCES

Statistical Abstract of the United States
<http://www.census.gov/statab/www/>

Main Economic Indicators, OECD. This includes statistics for OECD-Member countries, and is in English and French.

Economic Report of the President online from 1995 to present. This is from the Council of Economic Advisors.
<http://w3.access.gpo.gov/eop/>

Business Statistics of the United States. Arranged by subjects and industry groups, uses SIC and NAICS Codes.

Handbook of Labor Statistics. Includes salaries and projections.

International Marketing Data and Statistics

Finding Statistics Online

COMPANY DIRECTORIES

D&B Principal International Businesses. Arranged by Country and SIC Code

Hoover's Handbook of Emerging Companies

Standard & Poor's Register of Corporations

The United States Government Manual

INDUSTRY-SPECIFIC REFERENCE BOOKS (not comprehensive, please check NDU IQ, or the Reference area for others)

Agricultural Statistics

<http://www.usda.gov/nass/pubs/agstats.htm>

Aerospace Facts & Figures

Aviation and Aerospace Almanac

Education Statistics of the United States

Handbook of Industrial Robotics

Jane's International Defence Directory

Oil & Gas Journal DataBook

Minerals Yearbook

<http://minerals.usgs.gov/minerals/pubs/myb.html>

Health, United States, 2002 (with chartbook on Trends)

Located in Government Documents

Health Care Policy and Politics

The Facts on File Dictionary of Biotechnology and Genetic Engineering

Plunkett's InfoTech Industry Almanac

PriceWaterhouseCoopers Technology Forecast. Mobile Internet: Unleashing the Power of Wireless.

PriceWaterhouseCoopers Technology Forecast

Internet Security Dictionary

Ward's Motor Vehicles Facts & Figures

INDUSTRY-SPECIFIC PERIODICALS

American Machinist

American Metal Market

Automotive News

Chemicalweek

Coal Age

Commercial Carrier Journal

Engineering News Record

FDIC Quarterly Banking Profile

IEEE Micro

Marine Log

Modern Metals

Petroleum Economist

Progressive Railroading

Telecommunication

Traffic World

Transportation Journal

Several of these publications have an annual yearbook, sourcebook, or industry directory.

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