

EXAM CONTENT MANUAL

VERSION 1.0

CLTD

CERTIFIED IN LOGISTICS, TRANSPORTATION AND DISTRIBUTION



APICS

Certified in Logistics, Transportation and Distribution

Exam Content Manual

Version 1.0

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Letter to Candidates

Dear Candidate:

Congratulations! On behalf of APICS and the members of the Certified in Logistics, Transportation and Distribution (CLTD) Subcommittee, I would like to thank you for your expressed interest in the APICS inaugural certification program in the field of logistics, transportation and distribution.

The new CLTD certification is designed to provide a body of knowledge, technology know-how, and standards for those in the logistics, transportation and distribution industries. Created as a result of the recent merger between APICS and the American Society of Transportation and Logistics (AST&L), the APICS CLTD sets the global standard for logistics best practices and assists employers in developing the personnel needed to meet customer demand. As one of the fastest growing industries in the world, transportation and logistics remains the second largest employment sector in the United States, employing over six million people, and projected to generate almost 300,000 new jobs through 2018.

The APICS CLTD certification supersedes AST&L's Certified in Transportation and Logistics (CTL) program and is aimed to lessen the impact of the logistics industry's skill gaps. The program takes an end-to-end supply chain view of logistics operations, extending from inbound materials management, outbound distribution, and reverse logistics, to encompass all the integrative process steps that define supply chain logistics. The APICS CLTD certificate program provides you with the knowledge to effectively manage the integration of these activities to maximize a company's value chain. By earning the APICS CLTD designation, you will have demonstrated the mastery of logistics best practices.

This APICS CLTD Exam Content Manual (ECM) provides you with an overview of the program, an outline of its body of knowledge, key terminology, and recommended references. The outline is divided into the following eight diagnostic areas with the relative emphasis of each area indicated by the percentage figure:

- Logistics and Supply Chain Overview (8%)
- Capacity Planning and Demand Management (8%)
- Order Management (10%)
- Inventory and Warehouse Management (17%)
- Transportation (22%)
- Global Logistics Considerations (17%)
- Logistics Network Design (10%)
- Reverse Logistics and Sustainability (8%)

A sample of ten questions is provided to illustrate the type of questions you will encounter on the exam. We recommend the APICS CLTD ECM as one of your references as you prepare for the CLTD exam.

We wish you every success in the pursuit of your CLTD designation.



Yemisi A. Bolumole, Ph.D., CTL
CLTD Subcommittee Chair

Introduction

This Exam Content Manual provides guidance for individuals preparing for the CLTD certification examination. The objective of this manual is to outline the APICS CLTD tested body of knowledge.

The main section of this manual begins with a statement about the scope of the subject matter, followed by a descriptive outline of the content. Key terminology and a bibliography of suggested references are provided. The section concludes with sample questions similar to those that appear on the examination, correct answers for the sample questions, and brief explanations as to why they are correct.

The recommended procedure for mastering the subject matter is to:

- review the content outline, which defines the scope of the material.
- study each topic, using the suggested references.

At the end of each major section is a list of the references that apply to the topics in that section. The first number indicates the sequence number for the reference in the bibliography section and the numbers in parentheses indicate the relevant chapters within that reference.

Candidates should understand the definitions of key terminology and the application of the outlined tools, processes, and techniques.

Sufficient references are given that provide different approaches to the material covered in each diagnostic area and different styles of presenting the information. Reading periodicals, such as APICS magazine and the APICS Supply Chain Management Now E-newsletter, will also help you keep up-to-date about changes in the industry.

About the APICS CLTD Examination

The APICS CLTD examination consists of 150 multiple-choice questions, of which 20 are pre-test questions that do not contribute to the total score, but are necessary for research purposes. Candidates should answer all exam questions. There is a 3 ½ -hour time limit for the exam.

For more information about testing and registration policies and procedures, call APICS Customer Service at 1-800-444-2742 (United States and Canada) or +1-773-867-1777.

Question Format

All of the questions on the CLTD examination are intended to test one's understanding of the CLTD body of knowledge. In addition, it is helpful to understand the various formats of questions on the examination. The following three examples illustrate the types of multiple choice questions found on the examination:

For Example 1, choose the response that best completes the statement.

Example 1: The 80-20 rule is an application of:

- A. statistical process control
- B. defect measurement
- C. root cause analysis
- D. Pareto analysis

(The correct answer is D.)

For Example 2, choose the response that best answers the question.

Example 2: Which of the following is used as a key performance indicator (KPI) to measure variability of demand through the supply chain?

- A. bullwhip effect
 - B. fill rate
 - C. inventory turns
 - D. internal failure
- (The correct answer is A.)

For Example 3, evaluate the statements and provide the most appropriate response. The answer is not one person's opinion; it is the accepted choice according to the APICS body of knowledge.

Example 3: The most significant advantage of strategic sourcing is:

- A. finding suppliers who can provide materials at lowest cost.
 - B. using technology to select low-cost, high-quality sources of materials.
 - C. developing long-term supplier relationships.
 - D. having a process for recurring transactions with single suppliers.
- (The correct answer is C.)

Taking the Test

The test is designed to evaluate a candidate's knowledge of the subject matter. Therefore, the key to success is a thorough understanding of the subject matter. All questions are based on the current CLTD body of knowledge as defined in the exam content manual.

When you start your exam, read the directions carefully. Be sure you understand the directions before you begin to answer any questions.

Read each question carefully and thoroughly. If a question includes stimulus material such as a table, graph, or situation, be sure to study it before you answer the question. Avoid

assuming information not given, as well as assuming you know what is being asked without reading the question completely, or "second guessing" the question. Every effort has been made to avoid misleading wording and to provide sufficient information for each question.

Choose the best answer from the choices given. Care has been taken to avoid misleading choices. Do not look for hidden tricks or exceptions to the norm. For each question, one and only one of the four choices represents the correct answer.

Once you begin the test, approach the questions in order, but do not waste time on those that are unfamiliar or seem difficult to you. Go on to the other questions and return to the difficult ones later if you have time. If you have some knowledge about a particular question, you may be able to eliminate one or more choices as incorrect. Your score on the test will be based on the number of questions you answer correctly, with no penalty for incorrect answers; therefore, it is to your advantage to guess rather than not answer a question. Avoid changing an answer unless you are absolutely certain you marked the wrong answer.

Interpreting Test Scores

Scoring is based on your correct responses. There is no penalty for incorrect answers. The omission of an answer will be counted the same as an incorrect answer.

The APICS CLTD scaled score range is 200–350. The minimum passing score is 300. You will receive your final exam score along with diagnostic information on your performance.

Studying for the APICS CLTD Exam

APICS offers a number of resources to help individuals prepare for the APICS CLTD examination.

APICS CLTD References

Bibliography. The APICS CLTD Examination Subcommittee has identified a number of references for the APICS CLTD examination. These are listed in the Bibliography section of this manual. All the references contain excellent material that will assist in test preparation. For additional information on the APICS CLTD references, visit the APICS website at apics.org/CLTD, or call APICS Customer Service at 1-800-444-2742 (United States and Canada) or +1-773-867-1777.

A candidate may discover that the material covered in the chapters of one reference duplicates material covered in another reference. Both sources are included as references to allow candidates some discretion in selecting test preparation materials that they find accessible and understandable.

In deciding if a single reference is sufficient, candidates should assess their own level of knowledge against both the descriptive examination specifications and the detailed topic list contained in the content outline. If there are any areas of weakness, the candidate should consult another reference as part of the test preparation process.

Content outline. The content outline provided in this document should be considered a primary resource for exam preparation. It provides an overview of the major topics included in the exam, as well as a list of the concepts that are relevant to that topic.

APICS Dictionary. The *APICS Dictionary* is an essential reference to the exam content manual and APICS exams. Within the profession, terminology varies among industries, companies, and the academic community. The examination uses standard terminology as defined in the *APICS Dictionary*. Recognizing the terms and understanding their definitions are essential.

Terminology

In studying for the APICS CLTD certification exam, candidates may discover multiple terms used to denote the same technique. An example of this is *customer service ratio* and *fill rate*. APICS has attempted to provide consistency with preferred terminology. However, synonyms are often used by authors in the various references used to compile the body of knowledge. Candidates are encouraged to be familiar with all terms and concepts listed within the outline and key terminology section, using the *APICS Dictionary*, 15th edition as the primary guide for definitions.

Additional Resources for APICS CLTD Candidates

In addition to the cited references, it may be helpful for you to pursue chapter-sponsored courses, college courses, APICS workshops, self-study courses, or courses offered by the APICS network of authorized education providers (AEPs) as a means of learning the body of knowledge tested in the certification program. A wide variety of courses and materials is available. As with any investment, you should research various courses before choosing one.

APICS CLTD Learning System

The APICS CLTD Learning System is a comprehensive professional development and certification preparation program. This self-directed program combines print material and online interactive tools. This system is also offered in instructor-led formats.

The APICS CLTD Learning System does not “teach the test” and in many areas *reviews* concepts but does not teach concepts. The APICS CLTD Learning System provides a thorough review of the subject matter, but it should not be used without the most current APICS CLTD Exam Content Manual as a means to direct the candidate’s study. There will likely be some content in the APICS CLTD Learning System not covered by the exam; conversely, there will likely be some content in

the exam not covered by the learning system. Thus, it is essential for candidates to use the current exam content manual in their studies.

APICS CLTD Instructor-Led Review Courses

The instructor-led format combines the APICS CLTD Learning System print and online components with the leadership of a qualified instructor; peer collaboration; company networking; and a structured, set schedule to keep participants on track. Learn more about APICS recognized instructors at apics.org/recognizedinstructors or find local APICS partners that provide APICS CLTD courses at apics.org/finder. For courses in North America, visit the Partner and Event Finder on the APICS website at apics.org/finder or call APICS Customer Service at 1-800-444-2742 (United States and Canada) or +1-773-867-1777 to obtain contact information for your local chapter. For courses outside North America, visit apics.org/international to locate the nearest partner.

APICS Educational Programs

In addition to the annual APICS International Conference & Expo, APICS offers a variety of educational programs. For a list of APICS learning opportunities and information on course availability, call APICS Customer Service at 1-800-444-2742 (United States and Canada) or +1-773-867-1777.

For a complete list of APICS resources, visit the APICS website at apics.org or call APICS Customer Service at 1-800-444-2742 or +1-773-867-1777.

APICS CLTD Certification Maintenance: Continuing Professional Development

The Importance of Certification Maintenance

The growing number of individuals choosing to pursue professional development through the APICS CLTD program indicates a strong awareness that continuing education and skills development are essential to meeting the information and technological challenges in today's rapidly evolving workplace and global marketplace. Professional development opens doors to individual career opportunities and organizational success.

Although APICS CLTD recognition and maintenance are voluntary programs, they equally demonstrate one's commitment to achieving the highest level of professional development and standards of excellence.

The APICS CLTD certification maintenance program upholds both the objectives of the APICS CLTD program and the APICS vision to promote lifelong learning. This flexible program recognizes that individuals are at various levels in their careers, come from many industries, have different educational needs and career goals, and have varying access to continuing education. Thus, requirements for maintaining certification can be met through multiple sources and a variety of professional development activities. These sources and activities are intended to help prepare for the challenges ahead and maintain a professional edge by:

- preserving the currency of hard-earned certification credentials
- expanding your knowledge of the latest industry practices
- exploring new technology solutions
- reinforcing skills
- improving job performance
- demonstrating commitment to excellence
- increasing competitive advantage

To promote professional growth and lifelong learning, APICS CLTD designees must complete the certification maintenance program every five years. For complete details on how to maintain your APICS CLTD designation, please visit apics.org/careers-education-professional-development/certification/maintenance.

APICS Code of Ethics

When you start an examination, you will be asked to pledge to abide by the APICS Code of Ethics. Once certified, you pledge to continue your education to increase your contribution to the supply chain management profession. After achieving the APICS CLTD designation, you pledge also to share your knowledge with others by participating in APICS research and educational activities at local, district, national, and international levels.

APICS Code of Ethics is as follows:

- Maintain exemplary standards of professional conduct;
- Not misrepresent your qualifications, experience, or education to APICS or others you serve in a professional capacity;
- Respect and not violate the United States Copyright of all APICS materials, including but not limited to courseware, magazine articles and other APICS publications, APICS conference presentations, and CLTD, CPIM, CSCP, and SCOR-P examination resources. In this same spirit, you must not violate the copyright of other organizations and individuals in your professional capacity;
- Not engage in or sanction any exploitation of one's membership, company, or profession;
- Encourage and cooperate in the interchange of knowledge and techniques for the mutual benefit of the profession;
- In your professional capacity, respect the fundamental rights and dignity of all individuals. You must demonstrate sensitivity to cultural, individual, and role differences, including those due to age, gender, race, ethnicity, national origin, religion, sexual orientation, disability, language, and socio-economic status;
- In your professional capacity, not engage in behavior that is harassing or demeaning to others based on factors including, but not limited to, age, gender, race, ethnicity, national origin, religion, sexual orientation, disability, language, or socio-economic status;
- Adhere to this Code of Conduct and its application to your professional work. Lack of awareness or misunderstanding of an ethical standard is not itself a defense to a charge of unethical conduct;
- Contact the Ethics Committee when uncertain whether a particular situation or course of action violates the Code of Conduct; and
- Not to become the subject of public disrepute, contempt, or scandal that affects your image or goodwill.

Failure to abide by APICS Code of Ethics policy may result in sanctions up to and including decertification.

APICS Certified in Logistics, Transportation and Distribution (CLTD)

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Scope of the Subject Matter

The APICS CLTD certification examination covers concepts, tools, and processes which illustrate the supply chain-wide system perspective of logistics. The CLTD emphasizes the microanalysis of logistics, distribution, and transportation services. Managing the logistics system requires an oversight of transportation, order processing, inventory, and the combination of warehousing, material handling and packaging; all integrated through a network of facilities with a goal to support customer service, manufacturing, and purchasing operational requirements. The subject matter is organized into eight content areas:

Logistics and Supply Chain Overview

This section provides an overview of the macro and micro logistics processes and systems which define forward and backward material and information flows in the supply chain. With reference to its primary goal to achieve consistent customer service at the lowest total cost, this section addresses the synchronized and integrated approach to logistics management. This section illustrates logistics' cross-functional relationships with marketing, finance, and manufacturing operation requirements, showing how logistics "fits" into the totality of business operations.

Capacity Planning and Demand Management

This section addresses the strategic and operational considerations, and important trade-offs related to procurement, manufacturing, and customer relationship management, in terms of their separate and combined impact on logistics requirements. It emphasizes the resource-alignment tasks that define how organizations develop forecasts by which logistics and other departmental plans are created.

Order Management

This section addresses the related concepts of order management and customer service, highlighting the major steps required to manage and execute customers' orders with an emphasis on logistics' key role in influencing customer service. Order management defines and sets the logistics process in motion while customer service is the task by which logistics outputs are measured and defined.

Inventory and Warehouse Management

With a detailed examination of the related concepts of inventory and warehouse management, this section addresses the various methods and techniques that firms use to control, manage, and store inventory in the supply chain. This section emphasizes the economic and service benefits and the support role that warehousing plays in the logistics system. It illustrates the various managerial decisions in planning and implementing inventory and warehouse operations, including facility type, layout and design, receiving, picking and put-away strategies, material handling equipment, product-mix analysis, and audits.

Transportation

This section covers the major principles and processes of transportation management, administration, and economics. It addresses the fundamental responsibilities of transportation and traffic managers to include: knowledge of the transportation functionality of inventory repositioning throughout firms' supply chains, pricing, tariffs and rate structure, routing optimization,

freight auditing, claims administration, and specialized transport-related services.

Global Logistics Considerations

With an emphasis on the more complex total cost analysis required to navigate today's global landscape, this section addresses the rules, processes, and qualitative and quantitative techniques that logistics managers need to succeed in global supply chains. It includes an understanding of transportation modal analysis, security considerations and regulations, duties, documentation, and restrictions that define the global operating environment.

Logistics Network Design

This section addresses the transportation and inventory economics that critically define supply chain network design considerations. It includes an introduction to the modeling tools and techniques which enables supply chain spatial and temporal integration, and addresses the need for today's logistics managers to extend this responsibility to include the processes, resources, and tools for managing risks.

Reverse Logistics and Sustainability

This section addresses the expanded view of reverse supply chain flows to incorporate a general overview of sustainability. It includes a focus on the key factors and activities that define reverse logistics processes and logistics social responsibility considerations with triple bottom line implications.

The successful candidate will be able to actualize the leadership responsibility of logistics to design and administer systems to control the movement and positioning of material and information flows, in order to satisfy customer requirements at the lowest total cost. Based on an understanding of the processes, best practice methods, and tools used by today's logistics managers, the successful candidate will be able to define the actions necessary to implement selected solutions to address specific supply chain situations and opportunities. This includes an understanding of, and the ability to manage:

- the major inputs and outputs of the logistics systems with an emphasis on its value-creating role within the supply chain
- the interdependent components within the logistics system and between logistics and other business functions in the supply chain
- an integrated logistics facility network design strategy that includes an understanding of trade-offs that influence total logistics costs
- the effects of variance in a logistics system, employing collaborative processes and mechanisms to minimize these variances while reducing operations costs, enhancing productivity, and meeting customer requirements
- the changing role of various stakeholders, specialists, and trading partners which define the increased complexity of managing logistics within the current global marketplace.

In addition, the candidate preparing for the APICS CLTD certification examination must have a fundamental understanding of the following key business concepts:

- Business acumen (qualitative skills, math, statistics)
- Ethical considerations (morals, character, habits)
- Leadership

APICS CLTD Content

Eight content areas have been designed to organize the APICS CLTD domains. The relative importance of these topics will vary among industries, but the figures given below show the percentage designated for each section on the exam.

Diagnostic part	Main topic	Percentage of exam
I	Logistics and Supply Chain Overview	8%
II	Capacity Planning and Demand Management	8%
III	Order Management	10%
IV	Inventory and Warehouse Management	17%
V	Transportation	22%
VI	Global Logistics Considerations	17%
VII	Logistics Network Design	10%
VIII	Reverse Logistics and Sustainability	8%

Content Outline

I. Logistics and Supply Chain Overview

Logistics is the core of supply chain management. Fundamental concepts include managing logistics as a cohesive system,

understanding tradeoffs to present a logistics strategy that aligns with organizational strategy, and finding the most effective mix of revenue producing services for the cost of providing that service. Measurement and continuous improvement are emphasized as ways to meet and exceed the pressures of globalization and the steadily increasing customer expectations for logistics.

A. Logistics Fundamentals

It is important to understand the scope of logistics, including how it fits within the larger role of supply chain management and business strategy. The concept of trade-offs is used to show how the interconnected nature of the various areas of logistics, while a review of logistics' process flows puts things into a different perspective. Achieving the full value of logistics requires a balance between costs, customer satisfaction, and service levels. Emphasis is given to an understanding of why methods of accounting for logistics costs is important for logistics management and overall business success.

Knowledge and skills in this area include:

1. Logistics introduction
 - a. Definitions
 - b. Scope of logistics
 - c. Principles and components
 - d. Drivers
2. Supply chain management and the role of logistics
 - a. SCOR® Model
 - b. Economic impact of logistics
 - c. Effects of globalization and e-commerce
3. The value of logistics management
 - a. Creating competitive advantage
 - b. Reducing transportation, labor, and inventory costs
 - c. Increasing customer satisfaction and service levels
4. Logistics costs
 - a. Cost allocations
 - b. Activity-based costs

B. Logistics Strategy within the Supply Chain

The many aspects of logistics strategy include altering tactics to account for product life cycle stages, finding the right balance between services and their costs, fitting in with existing organizational structures, developing strong relationships at the appropriate level, assessing strategic level risks including security, and designing the right key performance indicators to encourage desired behavior.

Knowledge and skills in this area include:

1. Goals and objectives, service levels
2. Value proposition and creation
3. Product life cycles
4. Cost and service optimization
 - a. Transportation/warehousing
 - b. Inventory (space)
 - c. Labor
 - d. Technology
5. Organizational design and supply chain synchronization
6. Logistics relationships
 - a. Relationship types
 - b. Strategic alliances
 - c. Types of collaboration
7. Risk management
 - a. Identifying and managing exceptions
 - b. Strengths, weaknesses, opportunities, and threats (SWOT)
8. Supply chain security
9. Segmentation
 - a. Market
 - b. Value
 - c. Physical characteristics
 - d. Geography
 - e. Sales/demand
 - f. Mode
 - g. Network

10. Right to operate

- a. Regulatory
- b. Social

11. Key performance indicators (KPIs)

C. Lean Logistics

Continuous improvement methodologies need to become ingrained in an organization's culture and strategies if they are to succeed. These methodologies should be addressed up front from the perspective of logistics' role in eliminating all forms of waste while maintaining high quality and designing supply chain agility. It is imperative that logistics functions be proactive in assessing the need for change and then realizing it. Methods of continuous improvement include lean logistics, agile systems, and the philosophy of six sigma.

Knowledge and skills in this area include:

1. Continuous improvement philosophies
 - a. Lean principles
 - b. Six sigma
 - c. Agile supply chain

References: 1; 2 (chapters 2, 14, 15, 16); 3 (chapters 2, 3, 4); 6 (chapter 1); 7 (chapters 1, 12, 17, 18); 9 (chapters 1, 3, 4); 10 (chapters 1, 2, 6, 36)

Note: *The first number indicates the sequence number for the reference in the bibliography section and the numbers in parentheses indicate the relevant chapters within that reference.*

II. Capacity Planning and Demand Management

Logistics capacity planning and related decisions rely on efficient forecasts, so it is important to understand the concepts behind forecasting and its application to logistics decisions. This involves understanding how logistics can help direct and prioritize in order to better match supply to demand. The effective acquisition of inventory also requires a collaboration between procurement and logistics.

A. Aligning Supply and Demand

Logistics professionals need an understanding of the concepts behind forecasting, especially the resource-alignment tasks through which organizations develop forecasts by which logistics, manufacturing, purchasing, and other departmental plans are created.

Knowledge and skills in this area include:

1. Why forecasts are created
 - a. Bullwhip effect
 - b. Factors affecting demand
 1. Trend
 2. Cyclical
 3. Seasonal
 4. Random
 - c. Forecasting process
 - d. Forecasting methods
 1. Qualitative
 2. Quantitative
2. Interpreting forecasts
 - a. Accuracy of forecasts (error rates)
 - b. Exception management

B. Translating Demand into Capacity Planning

Practitioners use forecasts or other demand information and translate it into high-level capacity plans for warehousing and transportation to deliver customer service at a consistent level.

Knowledge and skills in this area include:

1. Information flow
 - a. Data mining
 - b. Visibility
2. Transportation considerations
 - a. Transport decisions (mode, carrier, route selections)
 - b. Inbound capacity
 - c. Outbound capacity
 - d. Throughput
 - e. Load planning
3. Warehousing considerations
 - a. Mode
 - b. Storage

- c. Equipment
- d. Labor
- e. Throughput (constraints)

C. Demand Management

In its cross-functional interrelationships with sales, marketing, purchasing, and manufacturing operations, logistics works to orchestrate and coordinate demand and supply in order to resolve interface conflicts by systematically considering plausible trade-offs. This requires an understanding of processes including sales and operations planning (S&OP), master production scheduling (MPS), materials requirements planning (MRP), and distribution requirements planning (DRP).

Knowledge and skills in this area include:

1. Demand characteristics
 - a. Production
 - b. Business-to-consumer (B2C)
 - c. Business-to-business (B2B)
 - d. E-commerce
 - e. Supplier to customer
2. Planning and scheduling
 - a. Sales and operations planning (S&OP)
 - b. Collaborative planning, forecasting, and replenishment (CPFR)
 - c. Master production schedule (MPS)
 - d. Material requirements planning (MRP)
 - e. Enterprise resources planning (ERP)
 - f. Distribution requirements planning (DRP)

D. Sourcing and Procurement of Inventory

Logistics needs to closely coordinate its activities with procurement to ensure a stable source of supply at reasonable total logistics system costs. This involves the procurement processes of selecting suppliers and generating contracts with the appropriate terms and conditions, which ensure performance is adequately monitored and controlled.

Knowledge and skills in this area include:

1. Procurement process
2. Purchasing strategy
 - a. Make-or-buy decisions
 - b. Strategic sourcing and purchasing
3. Supplier selection
4. Contract terms and conditions
5. Coordinated logistics
6. Procurement technology
7. Key metrics

References: 1; 2 (chapters 4, 6, 7); 3 (chapters 7, 11, 13); 6 (chapters 6, 7); 7 (chapters 3, 5, 6, 7); 9 (chapters 5, 6, 11, 13); 10 (chapters 12, 13, 15)

III. Order Management

At the core of the logistics process is the customer order, which serves as the trigger setting logistics in motion. Order management activities include a variety of tasks aimed at planning, designing, and controlling processes which manage and execute customers' orders. At the core of these processes is customer relationship management since every decision and activity that logistics takes should be with the customer in mind. By developing a customer service management strategy, logistics can deliver on the seven rights of customer service which enhances long-term customer satisfaction and creates lifetime customers.

A. Customer Relationship Management (CRM)

CRM is an important marketing philosophy that emphasizes all customers as being top priority, including internal customers or end consumers. By implementing the steps of a CRM process, relationships with key stakeholders can be optimized throughout each transaction.

Knowledge and skills in this area include:

1. Implementing the CRM process
2. Trade-off analysis

B. Order Management

Logistics professionals work closely with procurement specialists who source required materials and components from suppliers for the manufacture of products. Once the purchase order processing is completed, logistics confirms the goods received match the original order and a routing guide is used to assist in the multiple decisions that must be made.

Logistics relies on systems, such as Electronic Data Interchange (EDI) and transportation management systems which enable order visibility to identify the status of any customer order and to coordinate complex inbound flows, intracompany movements, and outbound orders. Supplier and carrier performance is tracked and measured so that improvements can be made on an ongoing basis, making logistics more efficient and effective.

Tailoring, aligning, and managing relationships with the supply chain partners will enhance the performance of the entire supply chain.

Knowledge and skills in this area include:

1. Inbound order management
 - a. Logistics role in supplier relationship management (SRM)
 1. The goal of SRM
 2. Confirming goods receipt
 3. Routing guide
 - b. Inbound process
 1. Information flow
 2. Lead time
 - c. Advance ship notice (ASN) process
 - d. Packaging requirements
 - e. Order receipt
 1. Order tracking
 2. Order visibility
 - f. Transportation plan
 - g. Freight forwarders

- h. Track and measure supplier and carrier performance
 - 1. Key performance indicators (KPIs)
 - 2. Best practices
- 2. Intracompany orders
- 3. Outbound order management
 - a. Order cycle time
 - b. Order cycle stages
 - 1. Order transmittal
 - 2. Order processing
 - 3. Order picking and assembly
 - 4. Order delivery
 - c. Exceptions and change management
 - d. Freight terms
 - e. Destinations
 - 1. Exports
 - f. Aligning order and fulfillment channels
 - 1. Multi-partner networks
 - 2. E-commerce

C. Customer Service Management (CSM)

Customer service management (CSM) is the ability of an organization to meet the needs, inquiries, and requests from customers. Developing an effective CSM strategy ensures that the seven rights of customer service will be achieved—the right product, the right quantity, the right condition, the right place, the right time, the right customer, the right cost. Customer service extends after the transaction by servicing products and providing parts. In order for logistics to further refine its service, customer feedback is gathered on processes, products, and customer satisfaction in order for improvements to be incorporated as best practices.

Knowledge and skills in this area include:

- 1. Meeting customer needs
 - a. Customer service management elements
 - b. Customer service management strategy

- 2. Sales and marketing support
- 3. Technical support, service, and parts
- 4. Performance measurements
 - a. Process
 - b. Product
 - c. Satisfaction

References: 1; 2 (chapter 3,); 3 (chapter 8); 6 (chapter 7); 7 (chapter 9); 9 (chapter 10); 10 (chapter 3)

IV. Inventory and Warehouse Management

Inventory and warehouse management involves maintaining inventory levels in a manner that aligns with the business strategy and goals, supporting the coordination of supply and demand, while protecting inventory value. Warehouse management also entails the movement of materials and goods into and out of storage efficiently, safely, and with minimal inventory damage. As business practices and technology evolve, inventory and warehouse management must adapt to new distribution channels and customer/consumer expectations by creating new processes that deliver the desired results.

A. Inventory Management in Logistics

To fulfill its basic functions, inventory resides at many points in the supply chain. Excessive levels of inventory create additional costs for the organization and exposure to risk in fluctuations and changes in customer demand. Because of its critical impact on the bottom line, effective inventory management is now seen as a way to create value in the business. It is more imperative than ever to understand the unique role that inventory plays in the business strategy.

Knowledge and skills in this area include:

- 1. Role of inventory management
- 2. Inventory types
 - a. Raw materials
 - b. Work in process (WIP)
 - c. Finished goods

- d. Maintenance, repair, and operating (MRO) supplies
 - e. Pipeline stock (in-transit inventory)
3. Functions of inventory (classifications)
- a. Anticipation
 - b. Cycle stock/lot size
 - c. Safety stock
 - d. Hedge
 - e. Buffer
 - f. Decoupling

B. Inventory Management Methods

Managing inventory effectively requires meeting competing goals to minimize inventory costs and maximize customer/consumer service. A clear understanding of what contributes to inventory carrying costs is, therefore, a prerequisite to crafting an appropriate inventory management strategy. These costs can be controlled through more effective approaches to inventory ordering that minimize the amount of time inventory resides in the pipeline, which reduces the risk of accumulating excess and potentially obsolete inventory.

Knowledge and skills in this area include:

1. Costs of Inventory
 - a. Ordering costs
 - b. Carrying/holding costs
 - c. Handling costs
 - d. Stockout costs
 - e. Setup costs (one-time costs vs. overhead costs)
2. Order quantity

C. Inventory Control

Maintaining optimal inventory levels includes the related replenishment questions of “how much to order” and “how often to order.” The answers help create an inventory control approach that is both economical and service-oriented. Inventory control also requires deciding when to order, which in turn requires considering issues such as lead times, supply risk, and inventory review. Inventory control approaches focus on increasing the rate of

inventory turn and helping the business capture the value of inventory investments more quickly.

Knowledge and skills in this area include:

1. When to order
2. How much to order
 - a. Economic order quantity (EOQ)
 - b. Conditions of uncertainty
3. ABC analysis/classification
4. Cycle counting
 - a. Count all (wall-to-wall)
 - b. Control group
 - c. Random sample
 - d. Count for accuracy
5. Kitting/dekitting
6. Just in time (JIT) and kanban systems
7. Inventory turnover

D. Warehousing Strategy and Management

Warehouse management strategy aims to deploy the firm’s warehousing assets and skills to advance the business goals. The warehouse strategy must be aligned with the corporate strategy and objectives and also with the organization’s supply chain strategy, which defines the role of each warehouse, including its location, size, and capabilities. The strategy is implemented through efficient and effective warehouse processes, a safe and efficient warehouse layout that supports warehouse operations, and the use of appropriate warehouse technology.

Knowledge and skills in this area include:

1. Warehouse strategy
 - a. Role of warehousing
 - b. The economics of warehousing
 - c. Challenges of warehousing
2. Types of warehouses
 - a. Ownership types

- b. Uses/roles of warehouses
 - 1. Raw materials storage
 - 2. Sub-assembly facilities
 - 3. Finished goods storage
 - 4. Distribution centers (DC)
 - 5. Cross-dock centers
 - 6. Fulfillment centers
- c. Structures
- d. Specialized warehouse services
 - 1. Climate-controlled
 - 2. Bonded, duty paid
 - 3. Hazmat
 - 4. Automated capabilities
- 3. Warehouse processes
 - a. Receiving
 - b. Storage
 - c. Picking and packing—FIFO, LIFO
 - d. Consolidation
 - e. Loading
 - f. Shipping
 - g. Replenishment
- 4. Facility layout decisions
 - a. Size of facility
 - b. Types of layouts
- 5. Warehouse operation
 - a. Outsourcing
 - b. Consignment
 - c. Value-added warehousing
 - d. Vendor-managed inventory (VMI)
- 6. Warehouse automation (managing space and labor)
 - a. Warehouse management systems (WMS)
 - b. Yard management system (YMS)
 - c. Enterprise resources planning (ERP)
 - d. Warehouse equipment and systems
 - 1. Picking
 - 2. Handling
 - 3. Storage
- 7. Performance Management
 - a. Quality
 - b. Audits

E. Packaging and Materials Handling

The effectiveness of packaging is influenced by product characteristics, economic and environmental goals, and the need for safe and efficient materials handling during storage and transportation. Appropriate packaging unitizes, protects, and can help businesses accomplish a variety of performance utility goals:

- Saving money by using less expensive packaging and by fitting more units in transportation and storage vessels, thus decreasing transportation and warehousing costs
- Saving time by aligning packaging with warehouse storage and equipment requirements
- Preserving the economic value of inventory investment by reducing the risk of damage and loss spoilage during storage and transportation
- Supporting the safety of workers responsible for handling materials and goods
- Achieving sustainable practices goals by using recyclable, recycled materials, and/or reusable packaging materials

Knowledge and skills in this area include:

- 1. Product characteristics
- 2. Packaging fundamentals
- 3. Unit loads
- 4. Materials handling
 - a. Equipment
 - b. Layout
 - c. Health and safety, security

References: 1; 2 (chapters 7, 9, 10); 3 (chapters 9, 11); 6 (chapters 8, 10, 11); 7 (chapters 4, 8, 16); 8 (chapters 1, 3 - 10, 14, 16); 9 (chapters 7, 12); 10 (chapters 13, 14, 16 - 22)

V. Transportation

Transportation moves goods and services across geographic lines, between where products are produced and where they are consumed, while allowing for competitive growth. At home and abroad, advances in transportation through technology and design have broadened the markets for both domestic and international competition. The wider a product's distribution and the greater its demand, the more manufacturers can leverage transportation's economies of cost. Logistics professionals are responsible for moving inventory throughout the firm's supply chain and to the firm's customers. They can use a combination of private and purchased transportation services with access to various modes of transportation, offering flexible solutions for transporting product from origin to destination.

A. Transportation Fundamentals

Transportation systems connect the various supply chain components and must be properly managed and controlled with complete visibility and strong communication between multiple stakeholders and transportation managers. Proactive transportation management is critical to an efficient and economical operation and should be considered when a company plans organizational and supply chain processes. An integral part of logistics, the transportation process represents one of the largest portions of a logistics manager's budget.

Knowledge and skills in this area include:

1. Transportation cost structure
 - a. Ways that goods are moved
 - b. Terminals
 - c. Vehicles
2. Transportation stakeholders
 - a. Shipper (consignor)
 - b. Recipient (consignee) of transported goods
 - c. Carrier of goods and agents
 - d. Government
 - e. Public

3. Transportation capabilities/intermediaries
 - a. 3PLs and 4PLs
 - b. Freight forwarders
 - c. Freight brokers
 - d. Customs broker
 - e. Export management companies (EMC), Export trading companies (ETC)
 - f. Shipping associations
 - g. Agents
 - h. Export packing companies
4. Carrier Types
 - a. Common
 - b. Contract
 - c. Exempt
 - d. Private carriers
5. Freight classifications
 - a. Less-than-truckload (LTL)
 - b. Truckload lot
 - c. Full-truckload (FTL)
 - d. Less-than-container-load (LCL)
 - e. Full-container-load (FCL)
 - f. Specialized
6. Selection considerations

B. Modes of Transportation

Transportation consumes time, financial, and environmental resources. Understanding the characteristics of the different transportation modes enables managers to make appropriate selections based on relative modal performance in terms of speed, availability, dependability, capability, frequency, and cost. Intermodal transportation combines two or more modes to execute the shipment process, and represent a key means of transportation service.

Knowledge and skills in this area include:

1. Road
 - a. Vehicle types
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges

2. Rail
 - a. Types of carriers/freight
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges
3. Air
 - a. Types of carriers
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges
4. Water (ocean or waterways)
 - a. Types of carriers
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges
5. Pipeline
 - a. Types of carriers
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges
6. Intermodal and multi-modal transportation, multi-stop
 - a. Container types
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges
7. Courier and parcel services
 - a. Types of carriers
 - b. Market structure
 - c. Operating and service characteristics
 - d. Issues and challenges

C. Transportation Management

Transportation management usually covers two areas: inbound and outbound flows. Transportation management's goal is to reduce transportation costs and increase delivery reliability through collaboration between all participants in the transportation transaction: carriers, providers, and non-

vessel operating agents. Transportation managers must effectively manage the entire transportation process—from long-range strategies and operational planning to day-to-day execution.

Knowledge and skills in this area include:

1. Transportation network design and mode selection
 - a. Routing analysis and optimization
 - b. Trade-offs in transportation design
 - c. Utilize data driven business intelligence
2. Carrier selection
 - a. Selection factors
 - b. Outsourcing considerations
 - c. Contracts
 1. Master contracts
 2. Purchase orders
 3. Templates, key sections
 4. Best practices
3. Rate tariffs
 - a. Manual vs. automatic
 - b. Standardize charges
 - c. Rates per mode
 - d. Drivers
 - e. Contract types and rates
4. Documentation
 - a. Terms of sale
 - b. Master bill of lading
 - c. House bill of lading
 - d. Freight bill
 - e. Freight claims
 - f. Proof of delivery
5. Tracing, tracking, expediting, and consolidation
 - a. Timeline vs. location
 - b. Optimization
 - c. Electronic data interchange (EDI)
 - d. Exception management
6. Demurrage, routing and billing
7. Special product considerations

8. Transportation cost forecasting and budgeting
 - a. Economic considerations
 - b. Market considerations
 - c. Security considerations
 - d. Regulation requirements
9. Freight settlement

References: 1; 2 (chapter 8); 3 (chapter 10); 4 (chapters 2 - 8); 6 (chapters 12, 13); 7 (chapter 7); 9 (chapter 13); 10 (chapters 24 - 29)

VI. Global Logistics Considerations

For the global logistics manager, successful participation in international trade requires awareness and knowledge of a number of key components, including but not limited to:

- the infrastructure and systems of the countries to which it will export goods
- the regulations which govern each country that its shipments will travel through
- the customs clearing and documentation requirements for each shipment as dictated by each country and transportation mode used
- an understanding of how it can reach mutual agreement on the terms of sale, methods of payment and finance terms trade participants; and
- the process of determining the currency to be used for payment, transfer pricing and potential understanding of how free/foreign trade zones (FTZ) influences duties paid and total landed costs. Coordinating these international trade elements is an essential skill set for today's logistics professionals.

A. Infrastructure and System

By identifying the macroenvironmental factors of global logistics that impact countries and organizations around the world, logistics professionals can be better prepared to manage their array of service providers, related transportation costs, and substitute product offerings. A variety of important international trade theories and practices, as

well as discussion of the relative quality and quantity of transportation infrastructures across modes and countries provide a solid historical and geographic perspective of the many components that impact global trade today.

Knowledge and skills in this area include:

1. Macroenvironmental factors influencing international logistics
2. International Infrastructure
 - a. Transportation
 - b. Utilities
 - c. International trade specialists

B. Regulations

Virtually every aspect of international trade is governed by regulations created by the government of each country through which a shipment will pass. With most international transactions, product shipments typically pass multiple borders, thus increasing the complexity of required documentation, safety and security measures, and involvement of logistics and trade specialists. Trade agreements and trading blocs can be used to facilitate international trade by mitigating against some of these complex procedures. Navigating the various changing export restrictions and lists of restricted/denied parties requires a working knowledge of each country's current regulations, quotas, control lists, and end use certificates.

Knowledge and skills in this area include:

1. International trade
 - a. Trade agreements
 - b. Trading blocs
 - c. Trade compliance
2. International transportation regulations
 - a. Government policies and regulations
 - b. International Air Transport Association (IATA)
 - c. Anti-bribery and corruption practices

3. Transportation safety
 - a. Labor safety regulations
 - b. Standards for equipment and vehicles
 - c. Dangerous goods and hazardous materials
 - d. Environmental
 - e. Security
4. Methods of entry
 - a. Import/export regulations
 - b. Export restrictions
5. Customs clearance
 - a. Duty
 - b. Harmonized System of Classification
 - c. Valuation
 - d. Tariffs
 - e. Customs brokers

C. Customs Clearing and Documentation

Today's logistics managers must be knowledgeable in preparing all the required documentation needed by customs to ensure that the customers' shipments arrive safely, securely, without damage, and on time at their final destination. Ease in using the Harmonized System Classification codes is vital to properly specifying the goods for export and each code assignment ultimately dictates the tariff rate charged for those products.

Knowledge and skills in this area include:

1. Invoices
 - a. Commercial invoice
 - b. Pro forma invoice
 - c. Consular invoice
2. Import documents (sales documents)
 - a. Certificate of origin
 - b. Certificate of manufacture
 - c. Certificate of inspection
 - d. Certificate of free sale
 - e. Import license
 - f. Certificate of insurance
 - g. Carnet
3. Export documents
 - a. Shipper's export declaration (SED)
 - b. Export license
4. International transportation documents
 - a. International bill of lading
 - b. Ocean bill of lading
 - c. Air waybill (AWB)
 - d. Road waybill

D. Finance and Payment Options

Global trade can often associate with higher levels of financial risks as a result of the many unknown variables that can impact international transactions. All parties must evaluate their risk of exposure and identify which financing and payment options are most appropriate and amenable to the parties involved. There must be agreement on all the terms of sale and the method and timeframe of payment. Familiarity with International Commercial Terms, also known as Incoterms®, is essential to clarifying and understanding how responsibilities are assigned between buyers and sellers in each transaction.

Knowledge and skills in this area include:

1. Terms of sale
 - a. Contract terms and conditions
 - b. Incoterms®
2. Methods of payment
 - a. Cash in advance
 - b. Letter of credit
 - c. Bills of exchange
 - d. Open account

E. Currency and Tax Considerations

Similar to the selection of terms of sale and financing, global trade participants must decide which currency will be most appropriate for payment, based on the convertibility of the selected currency and the risk of fluctuation. As trade participants individually strive for sustained profitability, this must be appropriately balanced with levels of risk exposure between buyers and

sellers. Related options such as use of foreign trade zones and transfer pricing can lessen or mitigate these risks exposures.

Knowledge and skills in this area include:

1. Currency translation
2. Transfer pricing
3. Free/foreign trade zones (FTZ)

References: 1; 2 (chapter 11); 3 (chapter 3); 4 (chapters 1, 9, 10, 11, 14); 5 (chapters 1, 2, 3, 4, 6, 7, 9, 11, 12, 13, 16); 6 (chapters 12, 13, 14); 7 (chapters 7, 11); 9 (chapters 13, 14)

VII. Logistics Network Design

The design of the network of warehouses and transportation lanes enable supply to be provided at the place and time of demand most effectively. This involves choosing the optimal number, location, and type of warehouse facilities, which can be supported by using both manual and automated decision support tools. Risk management helps logistics professionals determine how they can help minimize uncertainty and provide more reliable organizational results.

A. Facilities Planning

Several factors need to be weighed to determine the proper location, number, and type of warehouse facilities given the trade-offs with transportation. This requires a detailed analysis of transportation and distribution requirements, while understanding the key trade-offs inherent in planning and deploying an optimized network.

Knowledge and skills in this area include:

1. Transportation requirements
 - a. Business strategy
 - b. Analysis of transportation requirements for customer
 - c. Trade-offs
 - d. Inventory location and levels, order size and frequency

2. Facility location decisions
 - a. Types of distribution networks
 - b. Deployment considerations/factors
 - c. Location techniques
3. Determining appropriate facility type

B. Distribution Network Design

Logistics professionals should follow a process to make the complex activities of network design easier to navigate, including understanding the various factors to consider when selecting a particular facility location. Distribution network design involves employing modeling techniques, such as heuristic, optimization, and simulation tools designed to help find the right balance among the competing needs of the multiple stakeholders involved in a modern logistics network.

Knowledge and skills in this area include:

1. Logistics network design process
2. Locational determinants – key factors
 - a. National/regional
 - b. Site-specific
3. Modeling approaches
 1. Optimization
 2. Simulation
 3. Heuristic

C. Risk Management

Risk management is a vital part of network design and must be included in order to make the network resilient and resistant to customer, financial, regulatory, security, hazard, business interruption, and other types of vulnerabilities. It is important for logistics professionals to learn the risk management process for identifying, prioritizing, and appropriately responding to each risk. These plans can include prevention or mitigation plans, as well as providing business continuity if a risk event occurs. Logistics requires an understanding of the types of insurance that can be acquired and the associated benefits and limitations. The amount of insurance

obtained needs to be measured against risk levels to make sure that the investment in insurance is appropriate for the business situation.

Knowledge and skills in this area include:

1. Types (customer, financial, regulatory)
 - a. Mode selection
 - b. Choosing your carrier
 - c. Warehouse strategy
 - d. Build redundancy
 - e. Weather/environmental
 - f. Supplier failure
 - g. Avoid unnecessary costs
 - h. Visibility
2. Risk management process
3. Security
 - a. International organizations
 - b. Different country approaches
4. Business continuity planning
5. Packaging options
6. Insurance

References: 1; 2 (chapters 4, 12, 16); 3 (chapter 12); 6 (chapter 9); 7 (chapter 15); 10 (chapter 9)

VIII. Reverse Logistics and Sustainability

Companies around the globe use reverse logistics to manage their product returns in ways that actually turn the reverse flows into quantifiable value streams that not only contribute to the profitability of the organization, but also strengthen its triple bottom line (TBL) and its commitment to sustainability and social responsibility. These efforts make the organization more attractive to customers, suppliers, other supply chain participants, and to shareholders who value green initiatives, reduced carbon footprints and wiser usage of the world's finite resources.

A. Reverse Logistics

Logistics is involved in deciding if the firm's reverse logistics strategy can be handled internally by creating a central returns center or by hiring a third-party provider to coordinate the activities. These activities may include recalls, overstocks, reuse, refilling, repairing, remanufacturing, refurbishing, recycling, repurposing, recovery, and disposal. The firm must carefully weigh the benefits and challenges it will encounter for each of these sub-processes and develop a comprehensive strategy to master and manage its reverse flow processes and the value stream which will contribute positively to the organization's bottom line.

Knowledge and skills in this area include:

1. Key factors
2. Reverse logistics activities
 - a. Returns, recalls, overstocks
 - b. Reusable shipping assets
 - c. Reduce/reuse (refilling), repair, remanufacturing
 - d. Recycling, repurposing, recovery
 - e. Disposal (scrap, salvage)
3. Reverse logistics process
 - a. Forward and reverse flow, closed-loop supply chains
 - b. Steps to product returns process
4. Optimizing reverse logistics
 - a. Reverse logistics costs; strategic view
 - b. Avoidance strategies
 - c. Key management elements
 - d. Key technologies
 - e. Benefits
 - f. Challenges

B. Sustainability

Logistics plays a critical role in demonstrating social responsibility that is valued by its customers, shareholders, and the community. It can impact each dimension of social responsibility, safety, human rights, diversity, philanthropy, and ethics, by implementing specific tactics in its operations. With these targeted efforts and sustainability initiatives, logistics will impact the organization's triple bottom line (TBL) which measures their economic, social, and environmental impact.

A commitment to sustainable processes and practices and choosing suppliers and other supply chain members according to those requirements will help the organization be a good environmental steward for the long-term.

Knowledge and skills in this area include:

1. Logistics social responsibility considerations
 - a. Dimensions
 - b. TBL impacts
 - c. Frameworks, standards, and guidelines
 1. United Nations Global Compact
 2. Global Reporting Initiative (GRI)
 3. ISO Standards (ISO 14001, ISO 50001)
2. Sustainability in the supply chain
 - a. Carbon footprints and offsets
 - b. Green initiatives
 1. Products
 2. Packaging
 3. Warehousing design and layout
 4. Material handling
 5. Transportation mode selection and alternatives

6. Reducing fuel consumption, alternative vehicle/fuel technologies
- c. Vendor selection
- d. Pricing incentives
- e. Other environmental impacts
 1. Dangerous goods
 2. Hazardous waste
- f. Monitoring and measurement

References: 1; 2 (chapter 16); 3 (chapter 15); 7 (chapter 10); 10 (chapter 37)

Key Terminology

An understanding of the following list of terms is recommended. The list is intended to be thorough but not exhaustive. The candidate is also expected to be familiar with the definitions of terms identified in the content outline. Definitions of these terms can be found in the *APICS Dictionary*, 15th edition.

A

advanced planning and scheduling (APS)
agile manufacturing
allocation
anti-bribery regulations
assemble-to-order
asset recovery
associative forecasting
automatic identification and data capture (AIDC)
automatic identification system (AIS)
available-to-promise (ATP)

B

backorder
balanced scorecard
barge
benchmarking
bill of lading (uniform)
break-bulk
bribes
broker
business intelligence

C

carbon offsets
cash-to-cash cycle time
center-of-gravity approach
closed-loop systems
commodity rate
container security initiative (CSI)
continuous replenishment
cost of goods sold (COGS)
cross-docking
cross-docking warehouse
cube rate
cube utilization
customs trade partnership against terrorism (C-TPAT)
customer service ratio

D

demand forecasting
demand planning
detention
dunnage
dwell

E

80-20
embargo

F

fill rate
freight rate

G

gatekeeping

H

Harmonized Tariff Schedule (HTS)

I

inventory accuracy
inventory shrinkage

L

landed cost
life cycle analysis
line haul

M

make-to-order
make-to-stock
master service agreement
motor carrier
multisourcing

N

non-vessel-operating common carrier (NVOCC)

O

order fill rate
order to cash cycle
order transmittal

P

pallet
Pareto analysis
part-to-picker system
perfect order
picker-to-part system
pick-to-light
pick-to-voice system
postponement
private warehouse
public warehouse

R

radio frequency identification (RFID)
rail gauge
reorder point

S

seasonality
short-sea shipping
slip sheet
software-as-a-service (SaaS)
sorting
stockkeeping unit (SKU)
stowability
strategic planning

T

terms of trade
time series forecasting
total cost of ownership (TCO)
trailer on a flatcar (TOFC)
transportation management system (TMS)
truckload carriers
twenty-foot equivalent unit (TEU)

W

warehouse receiving
warehouse storage

Bibliography

All test candidates should familiarize themselves with the following references for this examination. The recommended references pertaining to the diagnostic area are listed at the end of each section of the content outline. The *APICS Dictionary* is available from the APICS Bookstore. Please visit apics.org/shopapics. All other references can be found at the APICS Amazon store at astore.amazon.com/apics01-20

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Sample Questions

The following ten questions are similar in format and content to the questions on the CLTD exam. These questions are intended for practice—that is, to enable you to become familiar with the way the questions are asked. The degree of success you have in answering these questions is not related to your potential for success on the actual exam, and should not be interpreted as such. Read each question, select an answer, and check your responses with the explanations on pages 28-29.

- In its simplest form, logistics:
 - is concerned with only the distribution of products.
 - is another term for transportation.
 - integrates inbound logistics with outbound logistics.
 - does not involve customer service.
- Warehouse management system (WMS) based task interleaving combines:
 - Put-away and replenishment operations
 - Replenishment and shipping operations
 - Shipping and put-away operations
 - Receiving and shipping operations
- A logistics manager works within a business where transportation capacity is near critical mass. Load planning is inefficient given the increasing volume of loads. Which of the following applications would enable better decision making and efficiency in planning loads?
 - Advanced planning and scheduling (APS)
 - Distribution requirements planning (DRP)
 - Enterprise resources planning (ERP)
 - Transportation management system (TMS)
- Which of the following metrics is considered external thus customer-facing?
 - Perfect order
 - Line fill
 - Inventory turns
 - Cycle count
- Inventory carrying costs generally include:
 - Inventory capital, storage, service, and risk costs.
 - Inventory capital, order, storage, and setup costs.
 - Inventory risk, service, setup, and order costs.
 - The fixed costs associated with a company-owned warehouse.
- Pallet-flow racking is perfect for facilitating:
 - last in, first out (LIFO).
 - cycle counts.
 - first in, first out (FIFO).
 - low velocity moves.
- The standard gauge of most of the world's rails will measure at:
 - 4 feet 6 inches.
 - 4 feet 8 inches.
 - 5 feet 6 inches.
 - 6 feet 4 inches.
- A ship, which is able to carry 6,000 twenty-foot equivalent unit (TEUs), would maximize its capacity by carrying which of the following containers?
 - 3,000 20' containers
 - 3,000 40' containers
 - 1,500 20' and 1,500 40' containers
 - 3,000 20' and 3,000 40' containers

9. Which of the following functions are associated with a supply-facing warehouse?
- (A) Manufacturing operations
 - (B) Consolidating shipments of finished goods
 - (C) Marketing strategies
 - (D) Inbound materials and components
10. A marketing initiative increases packaging dimensions for an existing product that remains unchanged. While the larger packaging may increase sales of the product, the impact on sustainability will be that:
- (A) less packaging will be thrown out.
 - (B) transportation capacity will be wasted.
 - (C) shipment density will increase.
 - (D) fewer shipments will be required.

Answers to Sample Questions

Note: References to the content outline appear in parentheses.

1. C (IA1) C is correct because the combination of materials management (inbound logistics) and outbound logistics of physical distribution was a natural progression of the post-deregulation development of logistics during the 1980s. A and B are incomplete perspectives of the system that defines logistics. D is incorrect because customer service is one of the key outputs of the logistics system.
2. A (IB4) A is correct because put-away and replenishment (picking) are typically opposite operations in warehouses. Task interleaving is a WMS-based task that typically combines dissimilar tasks in order to reduce traveling and increase productivity.
3. D (IIB2) D is correct because the planning capabilities of a transportation management system (TMS) assists transportation buyers and managers with key pre-shipment decisions. Critical TMS planning applications include routing and scheduling, load planning and optimization, and appointment scheduling. Advanced planning and scheduling (APS) is a system of techniques that integrates demand, production, and distribution planning during short, intermediate, and long-term time periods. An APS system allocates raw materials and production capacity optimally to balance demand and plant capacity. Distribution requirements planning (DRP) is used to help determine the appropriate level of inventory in order to manage and control replenishment schedules between an organization's manufacturing facilities and its distribution centers. Enterprise resources planning (ERP) systems are multi module application platforms that help organizations integrate information and key business processes via a common software platform and centralized database system.
4. A (IIIC4) A is correct because customer service can be looked at from an internal or external key performance indicator (KPI) perspective. B, C, and D are internal metrics while external metrics include perfect order and order fill rate performance. These external metrics are obvious to the customers and often directly influence customers' sales behavior since they impact customers' perception of the organization's strategies.
5. A (IVB1) A is correct because inventory carrying costs generally include those costs that are only incurred by inventory at rest and waiting to be used, i.e., those costs associated with manufacturing and moving inventory from one point to another within the firm's supply chain. There are four components of inventory carrying costs: capital costs, storage space cost, service costs, and risk costs. The fixed costs associated with a company-owned warehouse (option D) do not vary with volume of inventory manufactured/purchased. Setup costs (options B and C) refer to the expense incurred each time an organization modifies production or assembly processes.
6. C (IVE4) C is correct because pallet-flow racks are driven by gravity, making them perfect for fast-moving products with a first in, first out (FIFO) stock rotation. Last in, first out (LIFO) would be incorrect since this is typically more feasible with a push-back racking system. The other 2 options of cycle counts and low velocity moves are not relevant options in this case.

7. B (VB2) B is correct because 4 feet 8 inches is the global standard gauge as about 60% of the world uses this gauge. Answer A would be considered narrow gauge and answers C and D would be considered broad gauge rail.
8. B (VB4) B is correct since it equals 6000 TEU's which would maximize the capacity of the ship. Answers A and C do not maximize the capacity of the ship while D would be over the capacity of the ship.
9. D (VIA2) D is correct because supply-facing warehouses are used for incoming material and components into the facility. Options A, B, and C are wrong because they are all associated with demand or outgoing facing warehouses.
10. B (VIII B2) B is correct because increasing the package size only creates more wasted space. Fewer products in a shipment mean increased shipments using more fuel. A is incorrect because more packaging will be thrown out. C is wrong because shipment density will decrease, not increase. D is also wrong because more shipments are needed due to reduced density.

